

9. SITE 638¹

Shipboard Scientific Party²

HOLE 638A

Date occupied: 5 May 1985
Date departed: 6 May 1985
Time on hole: 18 hr
Position: 42°09.2'N, 12°11.8'W
Water depth (sea level, corrected m, echo-sounding): 4661
Water depth (rig floor, corrected m, echo-sounding): 4671
Bottom felt (m, drill pipe): 4673
Penetration (m): 44
Number of cores: None
Total length of cored section (m): 0
Total core recovered (m): 0
Core recovery (%): 0

HOLE 638B

Date occupied: 6 May 1985
Date departed: 12 May 1985
Time on hole: 6 days, 21 hr
Position: 42°09.2'N, 12°11.8'W (100 m east of Hole 638A)
Water depth (sea level, corrected m, echo-sounding): 4661
Water depth (rig floor, corrected m, echo-sounding): 4671
Bottom felt (m, drill pipe): 4673
Penetration (m): 431.1
Number of cores: 45
Total length of cored section (m): 431.1
Total core recovered (m): 210.5
Core recovery (%): 49
Deepest sedimentary unit cored:
Depth sub-bottom (m): 431.1
Nature: sandstone and claystone
Age: late Valanginian
Measured vertical sound velocity (km/s): 4.0 and 2.2, respectively

HOLE 638C

Date occupied: 12 May 1985 (1); 1 June 1985 (2)
Date departed: 23 May 1985 (1); 3 June 1985 (2)
Time on hole: 12 days, 16 hr
Position: 42°09.2'N, 12°11.8'W (100 m east and 30 m south of Hole 638A)
Water depth (sea level, corrected m, echo-sounding): 4661
Water depth (rig floor, corrected m, echo-sounding): 4671
Bottom felt (m, drill pipe): 4673
Penetration (m): 547.2
Number of cores: 14
Total length of cored section (m): 135.3
Total core recovered (m): 37.7
Core recovery (%): 28
Deepest sedimentary unit cored:
Depth sub-bottom (m): 547.2
Nature: sandstone and claystone
Age: Valanginian
Measured vertical sound velocity (km/s): 4.4 and 2.5, respectively
Principal results: Three holes were drilled at Site 638: Hole 638A as an engineering test hole, Hole 638B as a pilot hole to prepare for reentry operations, and Hole 638C as a multiple reentry hole.
The stratigraphic column, combining data from Holes 638B and 638C, to a depth of 547.2 meters below seafloor (mbsf), shown graphically in Figure 1, consists of the following intervals:
1. 0–183.6 m: upper Miocene to Pleistocene nannofossil ooze and chalk, occurring as a submarine valley fill.
2. 183.6–212.6 m: upper Barremian bioturbated micrite and couplets of laminated claystone and marlstone.

¹ Boillot, G., Winterer, E. L., Meyer, A. W., et al., *Proc. Init. Repts. (Pt. A), ODP*, 103.

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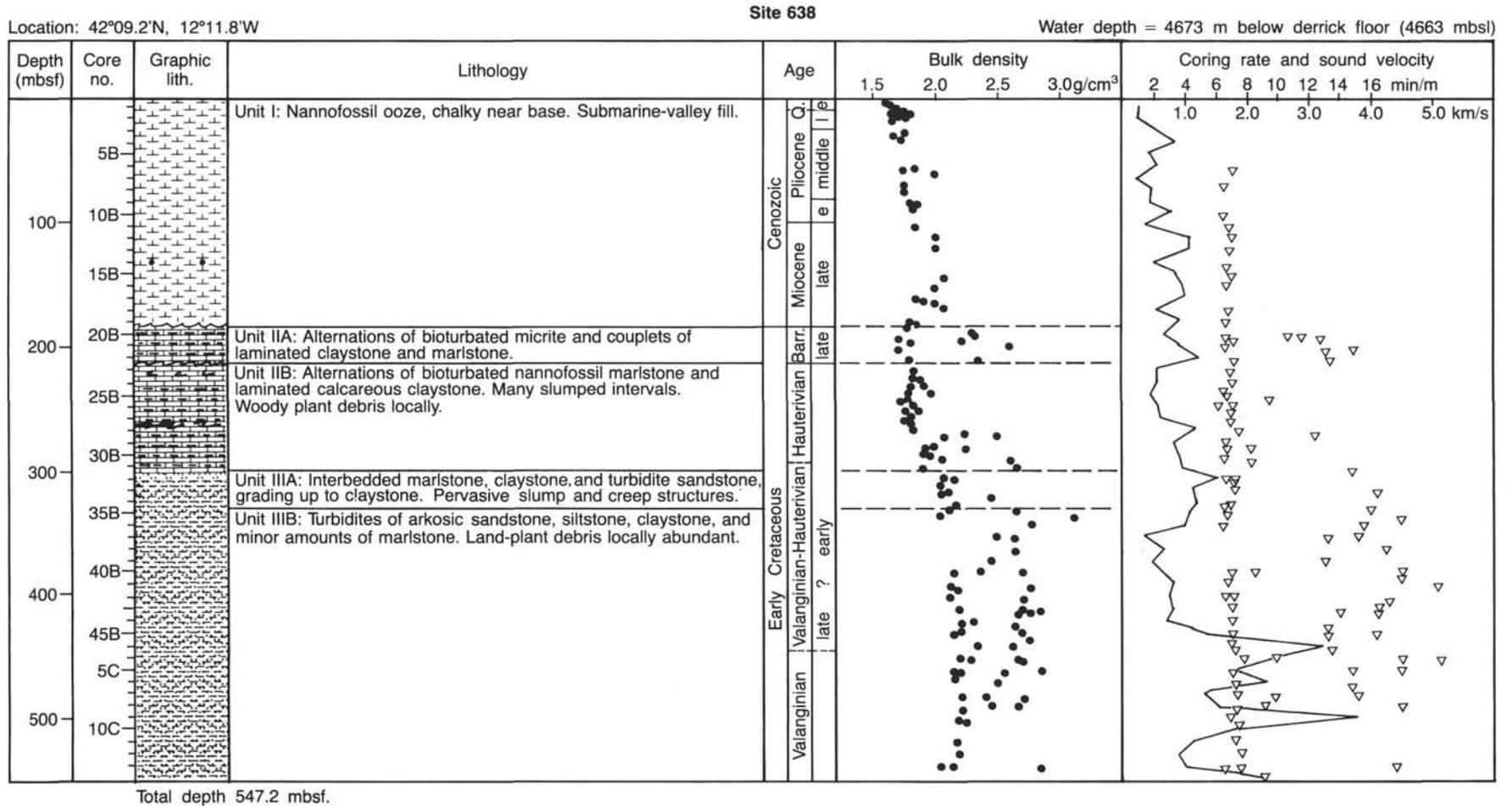


Figure 1. Stratigraphic summary log of Site 638 (Holes 638B and 638C).

3. 212.6–298.4 m: Hauterivian; alternations of bioturbated nanofossil marlstone and laminated calcareous claystone, with many slumped intervals. Woody plant debris is abundant locally.

4. 289.4–329.9 m: upper Valanginian to lower Hauterivian. Interbedded marlstone, claystone, and turbidite sandstone, grading up to claystone, with pervasive slump and creep structures.

5. 329.9–547.2 m: upper Valanginian to lower Hauterivian turbidites of arkosic sandstone, siltstone, and claystone, with minor amounts of marlstone. Land-plant debris is locally abundant.

Downhole logs of gamma ray, resistivity, sonic velocity, and density were taken over the interval from about 105 to 270 mbsf. These, in combination with laboratory measurements of velocity and density, provide an estimated thickness of about 40–75 m between the bottom of Hole 638C and the top of the carbonate platform, later drilled at Site 639 (see Site 639 chapter, this volume).

Finding Lower Cretaceous turbidite beds beneath the seismic reflector previously identified as the top of the pre-rift carbonate platform further illuminates the history of the Galicia margin, extending the syn-rift period back to at least the Valanginian and necessitating a reassessment of the regional seismic stratigraphy.

BACKGROUND AND OBJECTIVES

In addition to the general information on regional geology of the Galicia margin contained in the “Introduction, Objectives, and Principal Results” chapter (this volume), some data are pertinent from dredging near Site 638 at Stations DRO1 and DRO3 (Figs. 2 and 3) (Mougenot et al., 1985). Station DRO3 is only about 6 km northwest of Site 638, on the steep escarpment that exposes the lower part of the stratigraphic sequence scheduled for coring at the drill site (Fig. 3). The single dredge haul at station DRO3 contained fragments of many rock types: (1) crystalline rocks from the basement, including quartz monzonite, mylonitized granodiorite, and fresh basalt; (2) schist and argillite, tentatively assigned to the Lower Paleozoic; (3) litharenite and graywacke, resembling rocks from the Permian–Carboniferous, or perhaps from the Triassic or Ordovician sandstones in Portugal; (4) red sandstone, without fossils but resembling certain sandstones from the Triassic of Portugal; and (5) limestone of shallow-water facies, assigned to the Upper Jurassic or Lower Cretaceous.

The dredge data led Mougenot et al. (1985) and Boillot (pers. comm., 1985) to interpret seismic Unit 5 (Figs. 2 and 3) as being pre-rift carbonate-platform rocks, either resting directly on basement (“S” in Fig. 3) or occurring with Triassic sandstone between the limestone and basement. This in turn led to the interpretation of seismic Unit 4 as being a sequence of Lower Cretaceous syn-rift strata.

The fundamental processes, such as lithospheric thinning, faulting, and subsidence, that control the evolution of a passive continental margin cannot be clearly understood without a knowledge of the timing of these events. Cores from Site 638 were collected (1) to yield reliable data about the early history of the margin and about the timing of rifting and (2) to provide important information on the timing of the paleoenvironmental changes in this North Atlantic region. Specific problems investigated include the following:

1. The petrology and mutual relations of the rocks of the crystalline basement and the relations of these rocks to those exposed on the mainland of Iberia.

2. The rates and amounts of subsidence from the Triassic to the Late Jurassic, as clues to the history of crustal thinning before the onset of oceanic-crustal accretion.

3. The timing of the first appearance of marine waters, in what later became the oceanic rift, and the provincial relations of the biota in those waters.

4. The timing and drowning rates of the Jurassic carbonate platform.

5. The timing of significant transgressions and regressions, shifts in coastal onlap relations, and development of uncon-

formities to evaluate the effects of eustasy and vertical tectonic movements on the stratigraphy of this margin.

6. The determination of the age and physical significance of the many key seismic reflectors, as a prerequisite to regional interpretation of the observed seismic stratigraphy.

7. The timing of significant changes in major oceanographic variables such as temperature, oxygenation, fertility, bottom-current activity, and dissolution of carbonates.

The combination of continuous cores and downhole logs from Site 638, traversing the syn-rift and pre-rift sedimentary strata into the basement (Fig. 2), should reveal nearly the entire history of the margin, from the succession of rifting phases during the Mesozoic through the drowning of the carbonate platform and the progressive or sudden changes in the environment during the initiation of seafloor spreading.

OPERATIONS

Approach to Site 638

The transit to Site 638 began at 2105 hr on 4 May 1985, when *JOIDES Resolution* got under way from Site 637. We immediately learned how seismic-profiling procedures on this vessel are different from those used for so many years on *Glomar Challenger*. The *Resolution* steamed south at slow speed until the seismic-profiling gear was streamed. Then the ship turned back to head due north in the customary attempt to cross over the acoustic beacon on the seafloor at Site 637, a procedure that provides a sure seismic-reflection picture directly over the drill site. When *JOIDES Resolution* steams at speeds of more than about 1 kt, the hydrophones that receive the beacon signal are withdrawn for protection into wells within the hull, but because of the turbulence across the mouth of the wells, these signals are blocked out. We could only thus estimate our position with respect to the unheard beacon. Clearly, this experiment indicates that any seismic profiling done from the drill ship to establish the acoustic stratigraphy at a drill site must be done at the same time the beacon is dropped, while the ship is underway.

The ship continued north from Site 637 until our track intersected the track of multichannel seismic line GP-101, made by the Institut Français du Pétrole, that runs eastward across the planned location of Site 638 (Fig. 2B, this chapter). The ship then turned due east, and we attempted to follow this seismic line to the site. In fact, the ship had drifted somewhat south of the planned track; therefore, we changed course to a heading of about 070°. By the time we neared the area of Site 638 (Fig. 4), a satellite fix indicated that we were about 2 km north of line GP-101. This was quickly confirmed when the ship crossed the axis of the broad submarine valley at a depth shallower than was expected at the planned location of the site (at shotpoint 3095 on GP-101).

Next we made a back-and-forth survey to place ourselves either at shotpoint 3095 or at a place similar to it in the seismic stratigraphy. Concurrently, we used the 3.5-kHz echo-sounder to confirm that we would drop the acoustic beacon where a cover of soft sediments was sufficiently thick (about 100 m) to protect the bottom-hole assembly (BHA). A combination of wind and current caused the ship to drift appreciably, as apparent in the difference in width of the submarine valley on the echo-sounder records as we steamed on reciprocal courses. Because of infrequent satellite fixes, our dead reckoning was inadequate to position ourselves with much certainty; we, therefore, concentrated on finding a site appearing as much as possible like shotpoint 3095 (Fig. 5), even though arrival at the exact shotpoint seemed unlikely. At 0613 hr on 5 May 1985, we dropped a beacon where the reflection profile met the requirements we had set. We continued the profile well beyond the site of the dropped

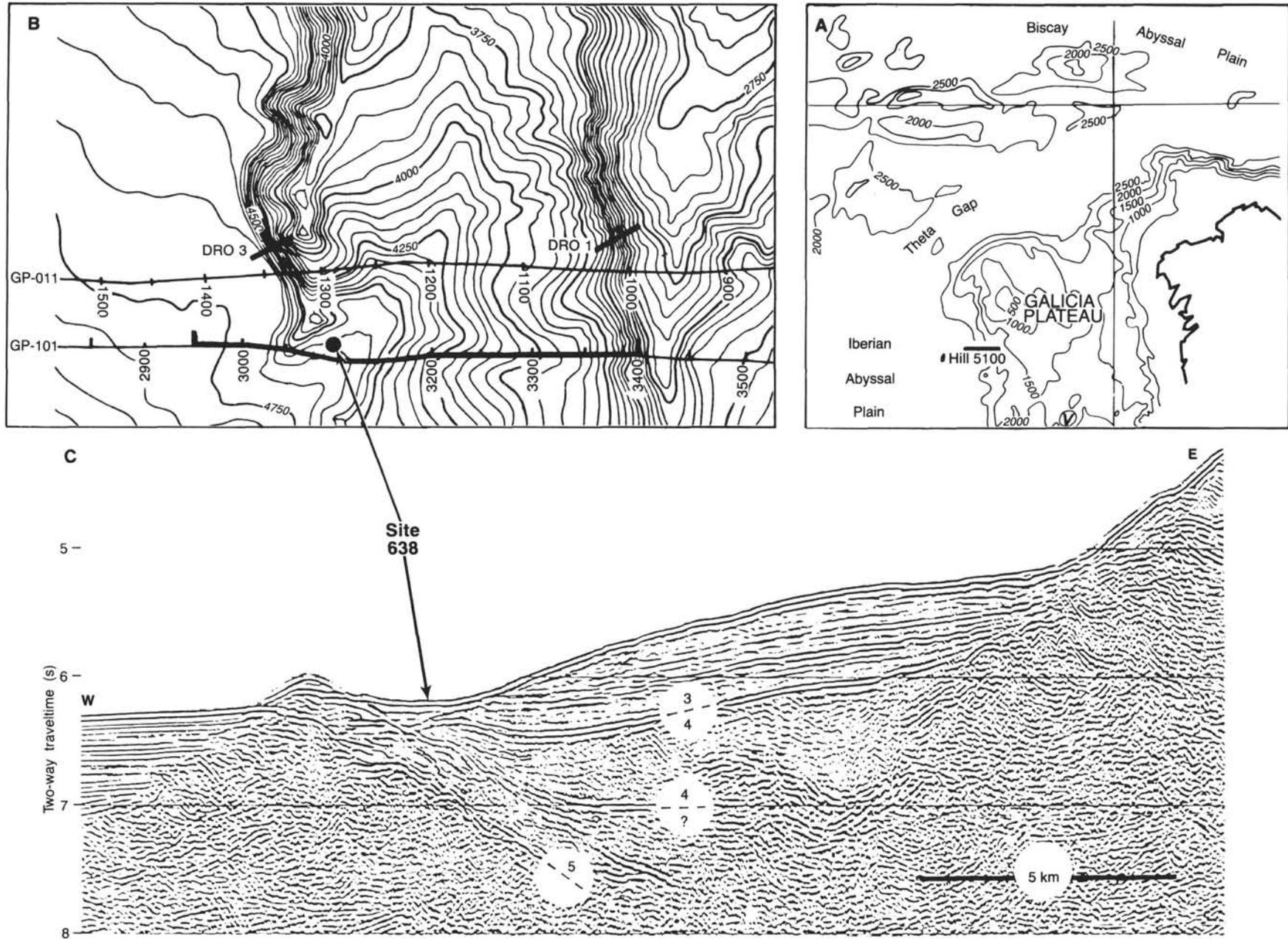


Figure 2. A. West Galicia margin. B. Map location of Site 638 and dredge sites DR01 and DR03 on Sea Beam map by Sibuet et al. (this volume). C. Location of Site 638 on multichannel seismic profile GP-101 (profile courtesy of L. Montadert). Post-rift strata, 3; syn-rift strata, 4; and pre-rift strata, 5 (interpretation before drilling). Vertical exaggeration, about $\times 2$.

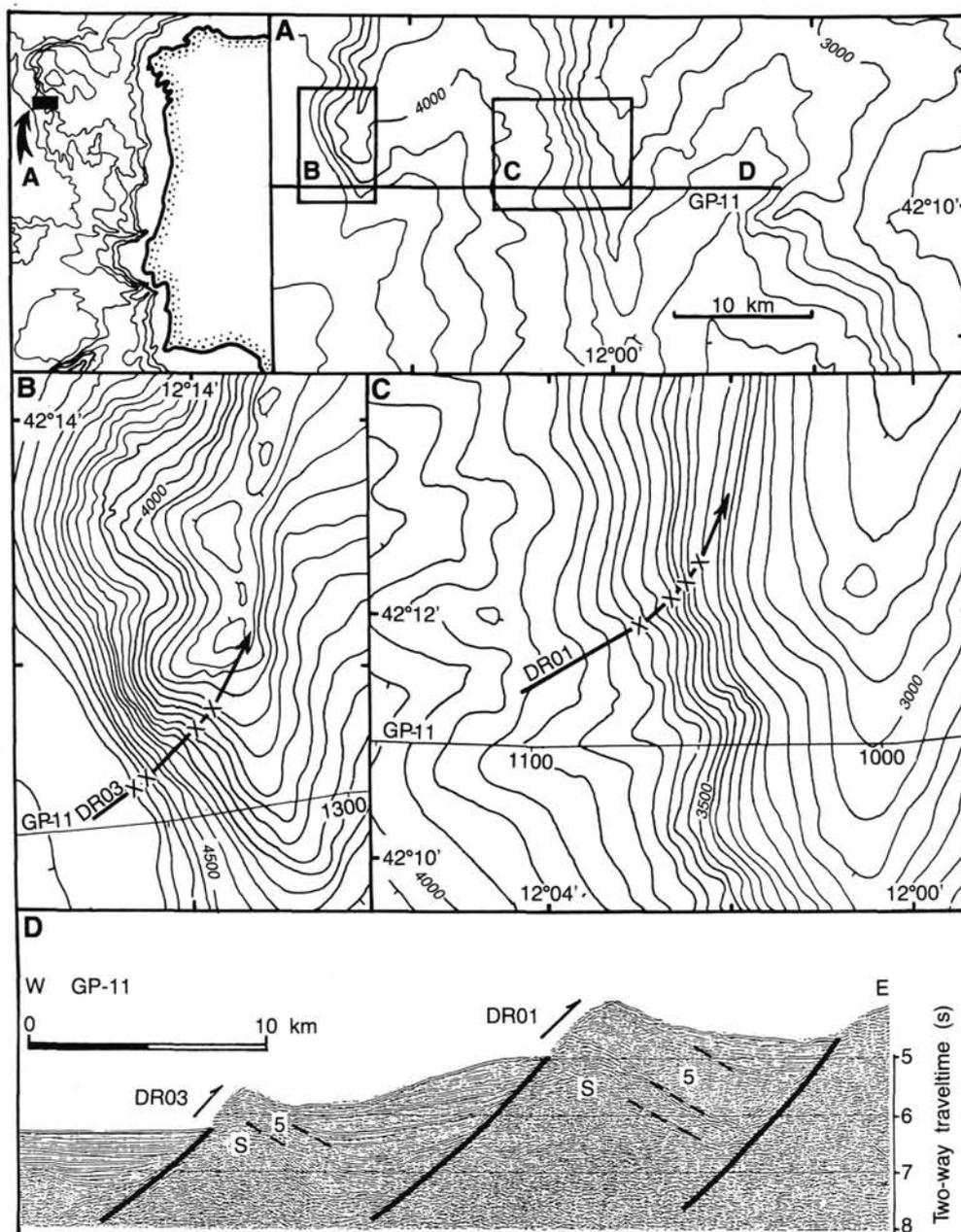


Figure 3. Locations of dredge Stations DR01 and DR03 on the Sea Beam map (courtesy of J. C. Sibuet) and on seismic profile GP-11 (courtesy of L. Montadert). Seismic units 5, pre-rift; and S, basement (interpretation before drilling). Vertical exaggeration, about $\times 2$. After Mougénot et al. (1985).

beacon, and after study of the record, we elected to drill the pilot hole for Site 638 at a location 200 m due east of the beacon. Here the seismic record appeared much like the record at shotpoint 3095, and the 3.5-kHz record (Fig. 5) revealed a flat terrace that on all previous crossings of the valley also showed sub-bottom reflectors indicating soft sediments. As depicted in Figure 4, the beacon was dropped slightly more than 1 km north and a bit east of shotpoint 3095.

After we had retrieved the seismic gear, the ship moved back over the beacon and stationed itself 200 m east of the beacon. Meanwhile, preparations were made for drilling a pilot hole at Site 638 to prepare for subsequent drilling of a reentry hole through the entire sedimentary section and into crystalline basement rocks.

Drilling, Coring, and Logging Operations

Hole 638A

First, the depth of the seafloor was established at Site 638. The echo-sounder gave a depth of 4671 m below the derrick floor, but the weight indicator for the drill string measured a firm bottom at 4673 m. We accepted this latter depth.

Next, the Hole 638A was spudded at 2145 hr on 5 May and opened to a depth of 44 mbsf by rotating the pipe and circulating at about 90 strokes per min (spm) at a pressure of about 650 psi. The ODP operations superintendent and the SEDCO drilling superintendent agreed that this "jet-in" test showed that a reentry cone and 44 m of 16-in. casing could be emplaced at this spot. The pipe was then pulled up to a level slightly above the

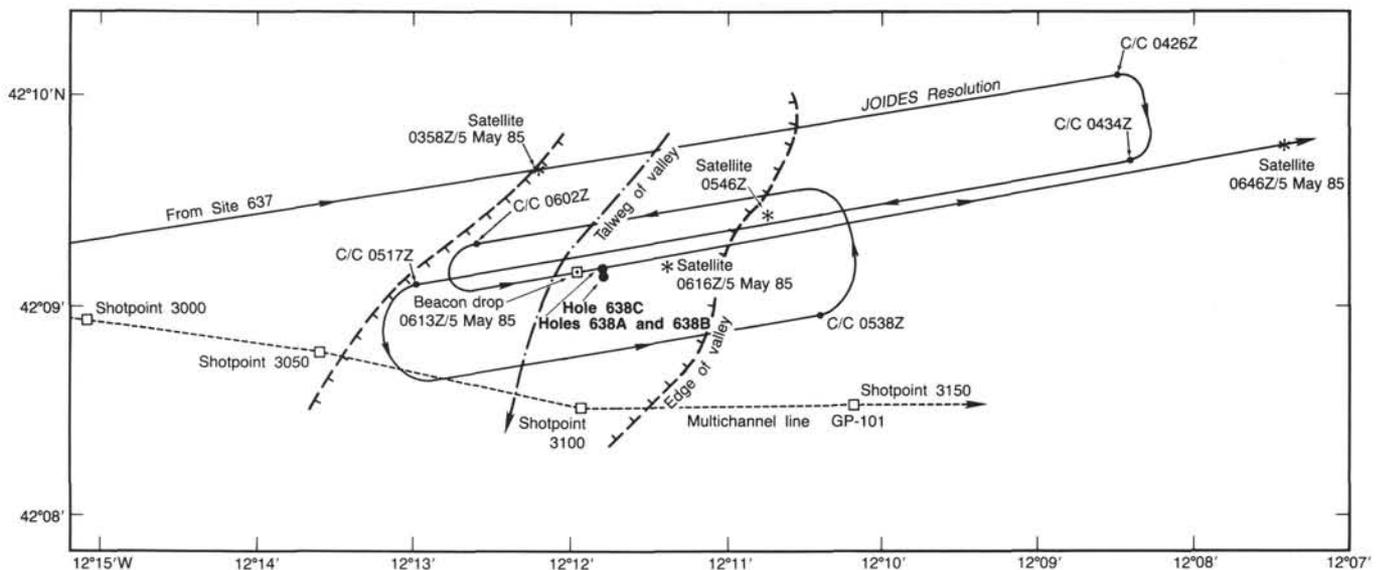


Figure 4. Approach to Site 638, showing location of Holes 638A, 638B, and 638C with respect to the acoustic beacon, and track of multichannel seismic line GP-101. Position of Hole 638B based on weighted average of 26 good-quality satellite fixes. Approximate position of the thalweg and of the change in slope at edges of the submarine valley in which the site is located are shown.

seafloor, and we were ready to begin the pilot hole, which would enable us to decide what length of casing, if any, was required in the reentry hole.

Hole 638B

Hole 638B, spudded at 0215 hr on 6 May, was continuously cored from the seafloor to a depth of 431.1 mbsf, recovering a total of 45 cores, in which the average recovery rate was 49%. Details of the coring record are shown in Table 1.

The coring proceeded without any serious difficulty and at satisfactory rates. The coring rate, in minutes per meter, for each core is graphed on Figure 1, which shows that little systematic change in rates occurred until the drill began coring the well-cemented sandstone layers in the Lower Cretaceous. Even here the average rates were not much slower than in the overlying marlstone.

The customary drilling disturbances were seen in the cores of Neogene ooze; the squeezing, diapirlike effects in the upper cores give way downward to better preservation of original structures but with the concomitant appearance of "drilling cakes," in which short sections of undisturbed core are separated by a drilling paste. The number of such cakes in a core generally correlates well with the number of heaves of the vessel during the cutting of a core. (This same observation was often made by scientists viewing cores taken by *Glomar Challenger*, but we did not expect to see these drilling cakes develop in cores taken with what appears to be an effective heave-compensation system on *JOIDES Resolution*.) In the Cretaceous marlstone, the drilling cakes are not separated by a layer of paste but rather are in close contact, their presence being signaled by the abrupt changes in apparent dip of inclined bedding or the termination of burrows and other internal sedimentary structures. We suggest that the lower end of the drill string, at the bit, still moves up and down enough to disturb cores, even as the heave compensator is operating.

In the lower 100 m of the hole, the recovery rate in the Lower Cretaceous turbidite sandstone unit was disappointing. Generally, only well-cemented sandstone was recovered, and we had no sure way of estimating what the unrecovered portions might be: poorly cemented sandstone or mudstone. As a compensa-

tion for the poor rate of recovery in the sandstone, the recovered pieces were virtually free of drilling-disturbed original structures.

The last few sandstone cores began to show that the drill bit might have been worn; the diameter of the cores became progressively smaller. Although the hard fingers of the core catchers scraping off friable sand could account for some of this, we decided that to stop drilling would be wise. As the coring rate in the sandstone was slowing, we also thought that the most efficient way to advance the drill would probably be to recore this interval in the planned reentry hole. We, therefore, terminated coring in Hole 638B at 0145 hr on 11 May and prepared to log the hole.

A serious concern during operations in Hole 638B was that the hole was not vertical, thus possibly causing difficulties during logging operations—a concern that proved well justified. A measurement at about 130 mbsf showed a deviation of 2°; another at about 295 mbsf gave a reading of 4.5°, and a last one at about 350 mbsf read 4.75°.

To prepare for logging, the hole was conditioned by circulating fresh-water drilling mud and by cleaning the hole by running the drill pipe up and down to remove any obstructions. A go-devil was pumped down, and the bit was released hydraulically. The hole was then filled with mud as the drill bit was pulled back up to a depth of about 100 mbsf. At 1830 hr on 11 May, the rig floor was free to begin rigging for logging.

The first set of instruments used included gamma-ray, sonic, resistivity, and caliper tools, which were lowered into the hole but could go no deeper than 278 mbsf. The tools were raised and lowered, each lowering at an increasing speed of descent, seven different times, with no sign of progress. The depth at which the tools stopped was near the depth where coring encountered rather brittle marlstone that fractured severely during the coring process and near the depth where a hole deviation of 4.5° was measured.

Whether the main obstruction to logging was the presence of "bridges" of rock jutting out into the hole or a bend in the hole or some combination of these two conditions is uncertain. We suspect that the use of fresh-water-base mud in the hole may lead to swelling and disintegration of clay and clayey rocks. The beneficial effects of the mud, in helping to suspend cuttings,

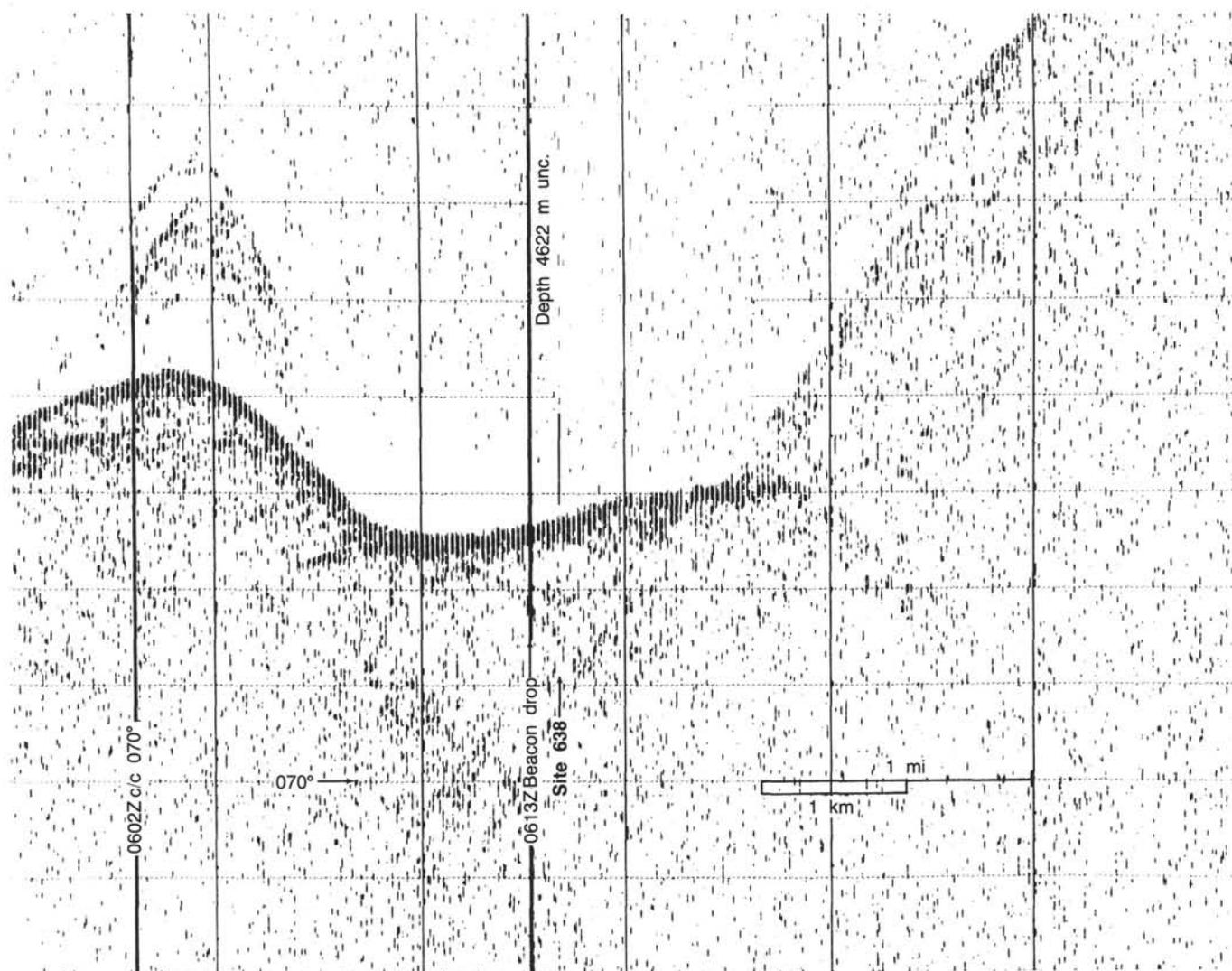


Figure 5. The 3.5-kHz echo-sounding record made from *JOIDES Resolution* during the approach to Site 638, showing place where the beacon dropped. Site 638 is located about 200 m east of the beacon.

has to be balanced against its possible deleterious effects. In any event, the hole was logged from the blocking depth back up to the base of the BHA. We regretted not having been able to obtain logs from the deeper levels of the hole to provide a basis for estimating the average velocity of sound in the sandstone unit. This estimate is prerequisite to estimating the depth to the seismic reflector identified as the top of the carbonate platform.

For the second logging run, we elected to use the L-DGO multichannel sonic tool, reasoning that its short length (only about 6 m) might enable it to pass the obstruction that had blocked the other, longer (20-m) set of tools. Yet this shorter tool could not be lowered any deeper than 164 mbsf, which is still well within the Neogene nannofossil ooze. Because the tool weighs only about 200 kg, compared to about 900 kg for the first set of tools run, even a minor bridge could stop it. A log was obtained for the 64 m from the blocking depth back up to the BHA; then the logging tools were cleared from the hole and the drill string pulled out. The final piece of pipe was on deck at 2245 hr on 12 May, and we began preparations to establish a re-entry hole.

One last, helpful piece of information came from inspection of the shank of the center bit, which was deeply grooved by the cones in the bit grinding against it. The bearings for the cones

were loose and the bit was, therefore, near the end of its usefulness when it was released. The bit had rotated for about 21.5 hr, counting only the actual times that the bit was turning and advancing downward.

Hole 638C

On 13 May, beginning just after midnight, a reentry cone, having 40 m of 16-in. casing hung below, was assembled for lowering to the seafloor to establish Hole 638C. Just before the lowering, the ship moved to a position 30 m due south of Hole 638B, about 200 m in a direction about 100° from the acoustic beacon. To provide continual beacon signals, a new, second beacon was dropped near the reentry cone. This beacon can be switched on or off by command from the surface; as soon as it reached the seafloor and was heard, it was turned off for future use.

The cone and casing were lowered to the seafloor. A hole 44 m deep was drilled using a 14 $\frac{1}{8}$ -in. bit; the casing and cone were unlatched from the drill string, and the pipe was pulled out of the hole. The drill bit arrived on deck at 2145 hr on 14 May, nearly a full day after the cone-setting operation had begun.

By 0630 hr the next morning, 15 May, the drill string, now equipped with a 9 $\frac{1}{8}$ -in. bit, was poised about 4 m above the

Table 1. Coring summary, Site 638. No cores were recovered from Hole 638A.

Core no.	Date (May 1985)	Time (hr)	Sub-bottom top (m)	Sub-bottom bottom (m)	Length cored (m)	Length recovered (m)	Percentage recovered
Hole 638B							
1R	6	0345	0.0	6.4	6.4	6.4	100.0
2R	6	0600	6.4	16.0	9.6	9.2	95.0
3R	6	0830	16.0	25.5	9.5	2.0	20.0
4R	6	1045	25.5	35.2	9.7	9.7	100.0
5R	6	1445	35.2	44.8	9.6	0.0	0.0
6R	6	1710	44.8	54.4	9.6	TR	TR
7R	6	1930	54.4	64.1	9.7	3.7	37.0
8R	6	2215	64.1	73.6	9.5	9.7	102.0
9R	7	0100	73.6	84.1	10.5	0.1	1.0
10R	7	0315	84.1	93.7	9.6	3.7	38.0
11R	7	0535	93.7	103.4	9.7	3.4	34.0
12R	7	0815	103.4	113.1	9.7	1.6	16.0
13R	7	1030	113.1	122.9	9.8	4.0	40.0
14R	7	1315	122.9	132.6	9.7	4.6	47.0
15R	7	1555	132.6	142.2	9.6	5.6	57.0
16R	7	1850	142.2	151.8	9.6	3.9	40.0
17R	7	2130	151.8	161.5	9.7	0.5	4.0
18R	8	0015	161.5	171.1	9.6	7.4	77.0
19R	8	0300	171.1	180.6	9.5	0.5	5.0
20R	8	0515	180.6	190.1	9.5	3.7	39.0
21R	8	0800	190.1	199.7	9.6	8.4	87.0
22R	8	1045	199.7	209.3	9.6	7.7	79.0
23R	8	1320	209.3	218.8	9.5	8.4	88.0
24R	8	1545	218.8	228.4	9.6	8.0	83.0
25R	8	1810	228.4	238.1	9.7	8.8	90.0
26R	8	2100	238.1	247.7	9.6	8.5	88.0
27R	8	2345	247.7	257.3	9.6	9.7	101.0
28R	9	0230	257.3	267.0	9.7	9.8	100.0
29R	9	0445	267.0	276.7	9.7	4.8	49.0
30R	9	0745	276.7	286.3	9.6	6.3	65.0
31R	9	1015	286.3	296.0	9.7	6.1	63.0
32R	9	1325	296.0	305.6	9.6	3.2	32.0
33R	9	1615	305.6	315.3	9.7	6.2	63.0
34R	9	1915	315.3	324.9	9.6	5.0	51.0
35R	9	2150	324.9	334.5	9.6	5.7	59.0
36R	10	0045	334.5	344.2	9.7	3.5	36.0
37R	10	0315	344.2	353.8	9.6	1.2	12.0
38R	10	0530	353.8	363.5	9.7	1.0	10.0
39R	10	0745	363.5	373.1	9.6	0.5	5.0
40R	10	1030	373.1	382.8	9.7	0.7	6.0
41R	10	1315	382.8	392.5	9.7	2.2	22.0
42R	10	1602	392.5	402.2	9.7	2.3	23.0
43R	10	1930	402.2	411.9	9.7	3.0	31.0
44R	10	2215	411.9	421.5	9.6	3.7	38.0
45R	11	0145	421.5	431.1	9.6	4.3	44.0
Hole 638C							
1R	18	1130	411.9	421.5	9.6	3.5	36.0
2R	19	0500	421.5	431.2	9.7	0.2	2.0
3R	20	0945	431.2	440.9	9.7	4.0	41.0
4R	20	1315	440.9	450.5	9.6	5.3	55.0
5R	20	1615	450.5	460.2	9.7	3.0	30.0
6R	20	2030	460.2	469.9	9.7	4.0	41.0
7R	20	2315	469.9	479.5	9.6	3.6	37.0
8R	21	0300	479.5	489.2	9.7	2.6	27.0
9R	21	0735	489.2	498.9	9.7	3.7	38.0
10R	21	1045	498.9	508.5	9.6	3.1	31.0
11R	21	1345	508.5	518.2	9.7	0.0	0.0
12R	21	1705	518.2	527.9	9.7	1.1	11.0
13R	21	2115	527.9	537.5	9.6	0.7	7.0
14R	22	0635	537.5	547.2	9.7	2.8	28.0

depth of the top of the cone, and a sonar tool made by Mesotech was lowered through the pipe and just out of the end of the bit, where it began scanning. After about 45 min of scanning and some maneuvering of the ship, the sonar image, displayed in color on a television screen, showed the four reflectors mounted around the rim of the cone as four bright targets around the sonar tool. Word went immediately to the drill floor to stab in the pipe. Because the sonar tool had no sound pick-up, we had no accurate way of confirming that the drill string had entered

the cone and casing unless we advanced the drill string downward to the 44 mbsf depth drilled during the emplacement of the cone. We therefore retrieved the sonar tool, dropped a center bit into the string to enable us to drill ahead, and lowered the drill string slowly, exploring for firm sediment. We were dismayed to find firm sediment only 20 m below the seafloor, rather than at 44 m. We drilled ahead to 44 m in firm material, proving that we were not dealing here with some accidental and virtually unexplainable fill material inside the casing. We con-

cluded that we had not reentered Hole 638C but had instead drilled a short hole outside the cone.

It was now 1800 hr on 15 May, and we began preparations for a second try at reentry. By midnight, the Mesotech sonar tool was again in position and scanning. This time the approach was slower, and it was not until 0600 hr on 16 May that the centered image of the reflectors again presented itself on the screen and the pipe was again stabbed into the cone. Again, the drill hit firm sediments at 20 mbsf, and we were again forced to conclude that we had missed the cone.

For the third and final try, we used a sonar tool made by Edo, which although not giving a color image, did have a sound pick-up. Just after midnight on 16 May, the Edo tool began its search, and at 0130 hr the reflectors showed a symmetrical pattern surrounding the tool; the drill string was again stabbed into the cone. Faint rattling noises and a loud click, as made by a tool joint going into the casing, led us to hope that we were at last truly and properly reentered. After the sonar returned to the derrick floor, a center bit was dropped and the pipe advanced 44 m without any resistance. We had indeed reentered Hole 638C.

One interesting piece of geological information resulted from all the sonar scanning: the depth of the seafloor in the immediate vicinity of the cone is about 6 m shallower than indicated by the weight change of the drill string. We decided that we would continue to operate *as if* the seafloor were at 4673 m below the derrick floor, but we would take a core right at the seafloor just after the drill pipe was pulled up through the level of the cone during one of the future round trips for reentry into this hole.

By 2230 hr on 16 May, we started drilling ahead without taking any cores but pausing to make surveys of the deviation from vertical of the hole. The deviation at 180 mbsf was 1°, at 265 mbsf it was 0.75°, and at 334 mbsf it was only 0.5°. At 0900 hr on 17 May, about 6½ days after we retrieved the last core from Hole 638B at a depth of 431 mbsf, we were ready to cut the first core in Hole 638C, to a depth of 421 mbsf.

For a long time, the first core was our only core. Because it showed that we were essentially at our anticipated stratigraphic level, but that the drilling disturbance of the core was significantly less than that of the final cores from Hole 638B, we waited expectantly for the second core, which did not return easily. When the overshot device used to retrieve core barrels arrived on deck, it arrived with only the topmost part of the barrel assembly, the main, lower part having unscrewed itself from the upper part at a joint that functions as a "quick-release" mechanism. Why or how it released itself was unclear, but we knew from watching the pump gauges that the barrel was seated in its normal place above the bit. To retrieve it we could either fish it out or pull out of the hole.

A suitable fishing tool was found and pumped down the hole, and then the overshot device was sent down to bring back the tool and the core barrel. The overshot device found the fishing tool but not at the top of the barrel; it was stuck at a depth 581 m *above* the seafloor. For the next try, the tool was sent down with the overshot device for added weight to aid in advancing the tool beyond the depth where it had stopped before. This time, the tool was stopped at a depth about 80 m higher up than the first time. We surmised that some foreign object, such as a rag or glove, which might have been introduced accidentally into the drill string, had floated up to this depth and was blocking the tools. Whatever the cause had been, we decided that the most efficient action would be to pull out of the hole, since we would be forced under any circumstances to make a reentry soon because the rotation time on the drill bit was now about 20 hr. During pull out from the hole, several pieces of sandstone and mudstone were discovered wedged into the drill pipe about 1165 m above the bit; evidently the top of the core barrel had opened when it separated into two parts, and pieces of core escaped upward into the drill string, causing the tool blockage.

The complete drill string was back on deck by about 0600 hr on 19 May. After a delay of about 2 hr for the routine cutting of about 50 m of the main drilling line that runs from the draw works and over the crown block and traveling block (this must be done after each 3500 "ton-miles" of drilling-line use), we began running pipe back to the seafloor to make the second reentry. At 2000 hr that same evening, the sonar tool began searching for the cone. The approach to the cone took more than 3 hr, but the reentry was successful on the first try. During the approach to the cone, we repeatedly saw a phantom reflector, located opposite the cone and at an equal distance from the sonar tool. This phantom, mirror image could have easily been confused with a real reflection at close range and may account for our having missed the cone twice during the first reentry in Hole 638C.

Coring continued normally from Cores 103-638C-3R through 103-638C-10R. The bottom few meters of Core 103-638C-11R cut quickly, but when we retrieved the barrel it was empty. Cores 103-638C-12R and 103-638C-13R cut quickly also, and each recovered only about 1 m of turbidite sandstone and claystone. Some of the sandstone beds are poorly cemented, and we speculated that uncemented sand layers might be common in the interval cored but that we were not recovering them. Core 103-638C-14R cut at a more normal rate, but while the overshot tool was coming up with the core, the pipe suddenly would not rotate or move up or down; it was firmly stuck. During the core-retrieval process, the driller had raised the bit up to a point about 7 m off the bottom of the hole to avoid any cuttings that might clog the water holes in the drill bit. We guessed that some loose sand might have collapsed into the hole and wedged against the drill string, most likely at about the place where we had cut Core 103-638C-11R, about 508–518 mbsf.

We recovered Core 103-638C-14R, and spent several hours trying unsuccessfully to free the pipe by pulling it up with a force of about 80,000 lb. We then lowered a severing tool, loaded with explosive pellets for firing and splitting the pipe. We placed the tool within one of the heavy drill collars about 44 m above the drill bit, at a depth of about 496 mbsf, which we assumed should be above the interval where the pipe was stuck. The explosives fired, but the pipe still could not be freed. Was it not severed or was the pipe stuck at a higher level in the hole? While pulling upward on the pipe while waiting to prepare a new explosive charge, the driller determined from the change on the weight indicator that the pipe had unexpectedly freed itself and that the whole BHA was still suspended from the draw works.

After filling the hole with mud, in anticipation of our returning later for logging, we pulled out of the hole and recovered the drill collar in which the explosives had fired. The explosion opened several gashes about 1 m long through the pipe and bulged it out about 3 cm; apparently the explosive was not designed to sever a thick-walled drill collar.

Considering the risk entailed in attempting to deepen Hole 638C and weighing the scientific priorities of Leg 103, we decided to abandon the hole and to try to drill at a place a few km to the west, where the strong seismic reflector, believed to be the top of a Jurassic carbonate platform, is near the seafloor. We departed Site 638 at 0635 on 23 May 1985 and went to Site 639.

On 1 June, after drilling four holes at Site 639, the ship returned to Hole 638C for additional logging. The transit from Site 639 was made by steaming slowly between the acoustic beacons at the two sites, using the thrusters, while concurrently making a complete round trip with the drill string, so as to change to a logging bit that would allow us to clean out Hole 638C and to pass the logging tools through the bit. The reentry took about 5 hr from the time the sonar tool began scanning until the pipe stabbed into the cone, at 2307 hr on 1 June. A full day was consumed cleaning out the hole in preparation for log-

ging, since we knew from our previous experience that bridges would probably be in the hole. By 2115 hr on 2 June, the hole had been cleaned as much as possible, filled with mud, and the drill string raised so that the logging bit was at a depth of 99 mbsf.

For the first logging run, the string of tools, which comprised the gamma-ray, caliper, sonic, and lateral-induction devices, could not be lowered deeper than 287 mbsf because of a bridge or a narrow obstruction in the hole. The logs obtained from 272 to 105 mbsf were of good quality; thus a second run was begun, using the gamma and density tools. This time, a bridge stopped the tools at 250 mbsf, but a good record was taken from there up to 105 m.

During the pulling out of Hole 638C, the threaded connections between drill collars and other connections in the BHA were inspected by the "magnaflux" technique (one of the many essential, but time-consuming procedures that subtract from the effective drilling time during a leg). At 2030 hr on 3 June, *JOIDES Resolution* departed Site 638, headed for Site 640.

SEDIMENT LITHOLOGY

The sedimentary section at Site 638 (Table 2) consists of 184 m of Cenozoic pelagic ooze (Unit I), overlying 364 m of Early Cretaceous marl and limestone (Unit II) and alternating claystone, marlstone, and sandstone (terrigenous turbidites) (Unit III).

Lithologic Unit I (0–183.6 m: Core 103-638B-1R through Sample 103-638B-20R-3, 3 cm)

Unit I, recovered only in Hole 638B, is 183.6 m thick and consists of white, pale-gray, and pale greenish gray nannofossil ooze and clayey nannofossil ooze. The sediment is generally soft, although Cores 103-638B-19R and 103-638B-20R contain material sufficiently indurated to be termed chalk. Core recovery was poor, and the recovered sediments were extremely deformed by drilling, so that any original internal structure is almost totally obliterated. Nonetheless, in some cores, original mottling and faint, diffuse lamination are observed. In Cores 103-638B-19R and 103-638B-20R, faint laminations in the chalk appear to dip at approximately 15°. The unit probably has been extensively bioturbated.

The sediment is composed of nannofossils with subordinate amounts of clay and minor amounts of foraminifers. Trace amounts of pyrite and scattered mineral grains, principally quartz, are ubiquitous. The carbonate content (see "Inorganic Geochemistry" section, this chapter) of the ooze ranges from 68% to 79% in Cores 103-638B-1R through 103-638B-6R, 68% to 93% in Cores 103-638B-7R through 103-638B-10R, and 81% to 99% in Cores 103-638B-11R through 103-638B-20R. Thus, the carbonate content increases downhole. Exceptions to the generally high carbonate contents are Samples 103-638B-10R-2, 90–105 cm, and 103-638B-18R-1, 0–65 cm, which consist of firm clay with less than 5% carbonate. In Core 103-638B-10R, the clay is green with black, zeolite-rich laminae. Clay in Core 103-638B-18R is reddish brown. In each of these occurrences, the lower part of the clay interval consists of nannofossil ooze and a jumble of hard, black, brown, and green clay clasts. These jumbles have the appearance of a debris flow (Fig. 6). Similar sediments, occurring as cuttings in Cores 103-638B-14R and 103-638B-15R, could be either cavings from the hole or debris flows. Certainly, the clay has been redeposited, because it contains Cretaceous microfossils (see "Biostratigraphy" section, this chapter).

Manganese-coated limestone (skeletal wackestone/packstone) pebbles occur in Sample 103-638B-1R-2, 80 cm, Core 103-638B-6R, and Sample 103-638B-11R-2, 118–123 cm. The base of Core 103-638B-17R contains a coarse-sandstone pebble. These exotic pebbles were probably eroded from nearby slopes. However, given the conditions of the hole, they could have come from any stratigraphic interval between the seafloor and the depth from which they were recovered.

The contact between the Miocene pelagic ooze and the underlying Cretaceous sediments, recovered in Core 103-638B-20R (see whole-core photograph of Core 638B-20R, this chapter), is sharp with no evidence of a manganese pavement, a lag deposit, or erosion.

Overall, the Cenozoic sediments at Site 638 are typical pelagic sediments deposited above the carbonate compensation depth (CCD). The occurrence of exotic pebbles, the minor but ubiquitous terrigenous component, the occurrence of clay layers appearing as "debris flows," and the site location being in a topographic low suggest that material locally transported from near-

Table 2. Lithologic units recovered at Site 638.

Lithologic unit/subunit	Lithology	Cores	Meters below seafloor
I	Nannofossil ooze	103-638B-1R-1, 0 cm– 103-638B-20R-3, 3 cm	0–183.6 (186*)
IIA	Bioturbated limestone, marlstone, and claystone/marlstone couplets	103-638B-20R-3, 3cm– 103-638B-23R-3, 27 cm	183.6–212.6 (216*)
IIB	Light-gray, bioturbated nannofossil marlstone	103-638B-23R-3, 27 cm– 103-638B-32R-2, 95 cm	212.6 (216*)–298.4
IIIA	Claystone/marlstone turbidite couplets	103-638B-32R-2, 95 cm– 103-638B-35R-4, 55 cm	298.4–329.9
IIIB	Coarse-grained sandstone turbidites	103-638B-35R-4, 55 cm– 103-638B-45R-CC, 25 cm and 103-638C-1R-1, 0 cm– 103-638C-14R-CC, 30 cm	329.9–431.1 (Hole 638B) and 411.9–547.2 (Hole 638C)

~~~~~ Unconformity  
 ===== Unit boundary  
 - - - - - Subunit boundary  
 \* On basis of logging

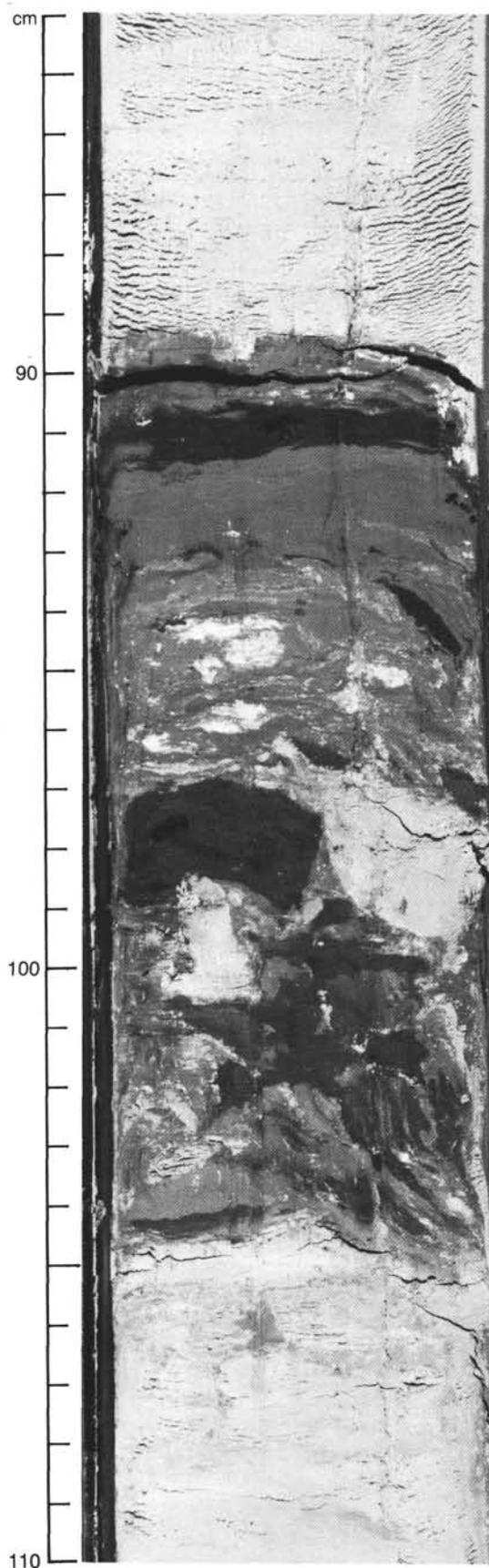


Figure 6. Debris flow of claystone clasts in Cenozoic pelagic ooze (Sample 103-638B-10R-2, 84–110 cm).

by slopes has been mixed with the pelagic sediment. The lower carbonate content of the sediment in the upper part of the sequence presumably results from increased clay sedimentation (or reduced carbonate sedimentation) during Pliocene–Pleistocene glaciation.

**Lithologic Unit II (183.6–298.4 m; Samples 103-638B-20R-3, 3 cm, through 103-638B-32R-2, 95 cm)**

Unit II consists dominantly of bioturbated nanofossil marlstone, limestone, and calcareous mudstone. It is divided into two subunits: an upper laminated subunit, rich in terrigenous material (Subunit IIA), and a lower, unlaminated, more calcareous subunit (Subunit IIB). The boundary between the two subunits is placed at Core 103-638B-23R-3, 27 cm.

**Subunit IIA (183.6–212.6 m; Samples 103-638B-20R-3, 3 cm, through 103-638B-23R-3, 27 cm)**

Subunit IIA is 29 m thick and is late Barremian in age (see “Biostratigraphy” section, this chapter). The upper boundary is sharp. Subunit IIA is truncated and unconformably overlain by the Neogene ooze of Unit I. The lower boundary was not recovered but is arbitrarily placed at Core 103-638B-23R-3, 27 cm, which coincides with the top of a slump, which also coincides with a biostratigraphic hiatus. Below this level, the sediments are noticeably more calcareous.

Subunit IIA consists of the following three lithofacies:

1. Light-gray (5Y 7/1) micritic radiolarian limestone and nanofossil marlstone, extensively bioturbated and locally showing faint banding and laminations.

2. Light-gray to gray (5Y 6/1, 5Y 7/1) micritic limestone and calcareous claystone with faint laminations, in places weakly bioturbated.

3. Regularly bedded couplets of gray to dark-olive gray (5Y 4/1, 5Y 3/2, 5Y 4/2), calcareous silt-bearing or silty claystone (mudstone) and light-gray to light-olive and greenish gray (5Y 5/1, 5Y 6/1, 5Y 6/2, 5GY 6/1) marlstone.

Each mudstone/marlstone couplet is typically from 1 to 5 cm thick and shows a gradual change in color from dark-gray claystone at the base to lighter gray, thin marlstone laminae at the top. The carbonate content increases from a few percent to 40%, and the grain size almost imperceptibly decreases upward (Fig. 7). The thickness ratio between the claystone and marlstone is relatively constant at 9:1. A few of the mudstone layers bear discrete silt or fine-sand laminae at the base and display faint parallel lamination. These couplets are probably turbidites, resembling the  $T_d$ - $T_c$  beds of the Bouma sequence. The amount of quartz is generally less than 10% but is as much as 30% in silty layers, and mica and feldspar are somewhat less abundant. Zircon, pyrite, and Fe-oxides are present in trace amounts. Zeolites exist in amounts up to 2% in the claystone. The laminae of Lithofacies 3 dip as much as 19°. A drift survey showed the hole to be 4°–5° out of vertical; the true dip of the beds is approximately 15°.

A matrix-supported, inversely graded pebbly bed having elongated clasts occurs in Sample 103-638B-22R-1, 130–150 cm and is interpreted as being a debris flow. In places, the bedding of Lithofacies 3 is contorted and plastically deformed, suggesting slumping (i.e., Samples 103-638B-22R-2, 120 cm, to 103-638B-22R-3, 30 cm).

The three lithofacies alternate over intervals of from 50 to 150 cm, and the boundaries between them are gradational. Lithofacies 1 and 2 are similar and are interpreted as being pelagic sediments deposited above the CCD, in an open-marine environment. Lithofacies 3 consists dominantly of clastic turbidites. Its irregular intercalation within the limestone and marl cycles suggests pulses in the redeposition of terrigenous muds.

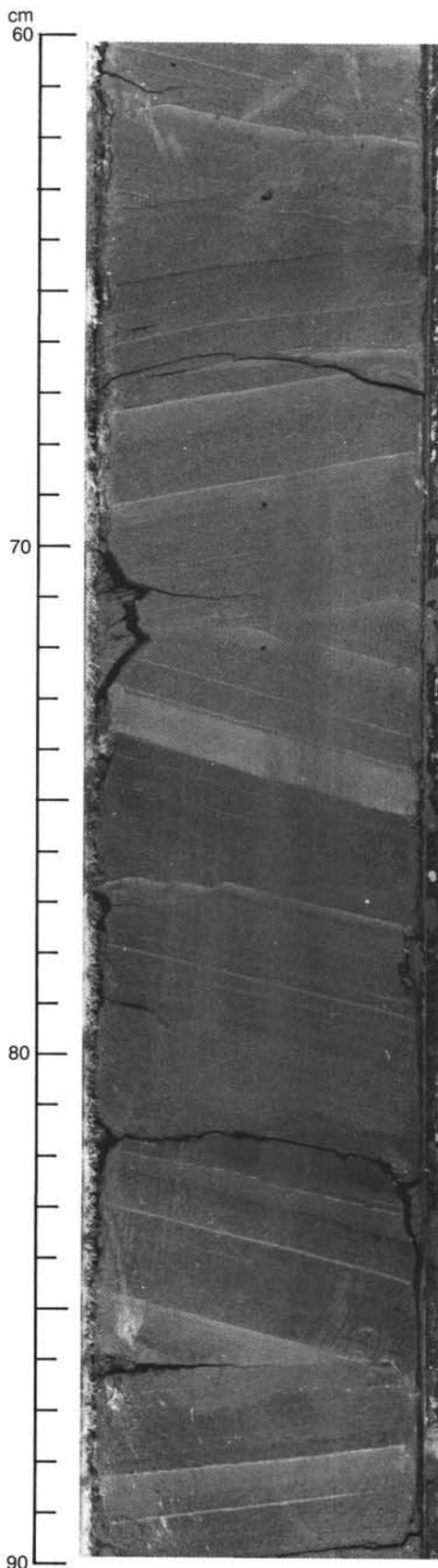


Figure 7. Sequence of centimeter-thick claystone/marlstone turbidites, typical of Subunit IIA (Sample 103-638B-21R-3, 60–90 cm).

**Subunit IIB (212.6–298.4 m; Samples 103-638B-23R-3, 27 cm, through 103-638B-32R-2, 95 cm)**

Subunit IIB is 86 m thick and is of Hauterivian to early Barremian age (nannofossils) or of Valanginian to late Hauterivian age (foraminifers). The upper boundary of Subunit IIB is placed at the top of a disturbed zone (see Subunit IIA). The lower boundary is gradational and corresponds to the change from dominantly pelagic sedimentation in Subunit IIB to turbidite sedimentation in lithologic Unit III. Owing to poor core recovery, the details of the transition are unknown. We arbitrarily placed the boundary at the lowermost occurrence of white nannofossil limestone (Sample 103-638B-32R-2, 95 cm).

Subunit IIB consists of a monotonous succession of approximately 50-cm-thick intervals of dominantly gray to light-gray (N/5, N/6) and light greenish gray (5Y 5/1 through 7/1, 5GY 5/1 through 7/1) bioturbated nannofossil marlstone that alternate with 10- to 15-cm-thick bands of darker gray (5Y 4/1, 5Y 5/1) more clay-rich nannofossil marlstone. In places, the latter are faintly banded and laminated.

The light-gray nannofossil marlstone contains from 30% to 50% clay and less than a few percent terrigenous, silt-sized material. Very finely divided framboidal pyrite, concentrated in dark-gray specks and blebs, is present.

The dark-gray clay-rich marlstone contains up to 10% terrestrial plant debris and a few percent of terrigenous silt-sized material (quartz, feldspar, mica including biotite, and trace amounts of volcanic glass). As much as 5% zeolites are present, as well as chlorite and glauconite in trace amounts. The carbonate content is typically less than 50%.

The darker gray, clay-rich marlstone beds have an average thickness of 10 to 15 cm, whereas the lighter nannofossil marlstone beds range from 30 to 70 cm. The rhythmic repetition of these sediment types is evident in less disturbed intervals (e.g., Cores 103-638B-24R and 103-638B-25R), but this pattern is mostly masked by either intense drilling disturbance or syn-sedimentary soft-sediment deformation or both. In many places, convolute bedding and plastic deformation of the marlstone layers, as well as crenulated geometry of bedding surfaces, are interpreted as being related to slumping or downslope sediment creep. Slumped beds occur at different intervals in the subunit, but their recognition is difficult because of the intense drilling disturbance. Since a slumped bed is at the top of the subunit (Section 103-638B-23R-3) and sediment deformation is visible throughout the subunit, all Subunit IIB conceivably could have been involved in a single, downslope movement.

Although the sediment in most of Subunit IIB is soft, an increase in lithification of more calcareous beds is noticeable in Cores 103-638B-31R and 103-638B-32R.

**Lithologic Unit III (298.4–547.2; Samples 103-638B-32R-2, 95 cm, through 103-638B-45R, CC, 25 cm, and Samples 103-638C-1R-1, 0 cm, through 103-638C-14R, CC, 30 cm)**

Unit III, distinguished by the occurrence of abundant terrigenous turbidites, is late Valanginian–Hauterivian in age, according to the study of nannofossils. This unit is divided into two subunits (Table 2). The upper subunit, IIIA, consists of alternating, thin-bedded claystone and marlstone. The lower subunit, IIIB, is characterized by thick beds of terrigenous sandstone.

**Subunit IIIA (298.4–329.9 m; Samples 103-638B-32R-2, 95 cm, through 103-638B-35R-4, 55 cm)**

The upper boundary of Subunit IIIA is probably gradational and has been highly disturbed by drilling (see Subunit IIB). The lower boundary, which is probably also gradational, corresponds

to the lithologic change from dominantly claystone to a sequence containing thick sandstone beds. Arbitrarily, the boundary is placed at Sample 103-638B-35R-4, 55 cm, corresponding to the top of the uppermost thick (i.e., >25 cm) sandstone bed.

Subunit IIIA is 31.5 m thick and consists of irregular, centimeter-scale alternations of thin-bedded, dark-gray (N/4) to gray (5Y 5/1) calcareous silty claystone and greenish (5Y 4/1) to light greenish (5Y 6/1) and olive-gray (5Y 6/2) nannofossil marlstone. The laminae are irregular and wavy. Some are lensoid. The lamination could have been distorted by drilling, which produced intense "biscuiting" and pervasive microfaulting (Fig. 8), or by syn-sedimentary slumping (e.g., Sample 103-638B-33R-2, 30–70 cm). The crenulated geometry of the claystone layers may be the result of shear stress along bedding planes produced by slow, downslope creep or mass sliding. In the less disturbed sections, the dark-gray silty claystone layers have sharp boundaries and locally show faint, normal size grading, more evident where siltstone laminae occur at their base (e.g., Samples 103-638B-34R-2, 40–55 cm, and 103-638B-34R-2, 120–125 cm).

The calcareous claystone generally contains <10%–15% quartz, micas, opaque minerals, and heavy minerals, 10%–25% nannofossils, and trace amounts of zeolites, Fe-oxides, and pyrite, the remainder being clay.

The marlstone comprises nannofossils and clay minerals in approximately equal percentages and trace amounts of coarser terrigenous material.

Several layers, as much as 10 cm thick, of medium- to fine-grained sandstone, are present. The layers have normal size grading, parallel and ripple-oblique laminae, and resemble Bouma  $T_{a-e}$ ,  $T_{b-e}$ , and  $T_{c-e}$  sequences (e.g., Samples 103-638B-33R-4, 80–95 cm, 103-638B-34R-3, 35–50 cm, and 103-638B-34R-3, 57–62 cm). These are similar in composition to those in Subunit IIIB; they are described in detail in the following text.

**Subunit IIIB (329.9–547.2 m; Samples 103-638B-35R-4, 55 cm, through 103-638B-45R, CC, 25 cm, and Samples 103-638C-1R-1, 0 cm, through 103-638C-14, CC, 30 cm)**

Subunit IIIB was encountered in Hole 638B at a sub-bottom depth of from 329.9 to 431.1 m, and in Hole 638C, at a sub-bottom depth of from 411.9 to 547.2 m.

The upper boundary of Subunit IIIB, described previously, corresponds to the lithologic change from dominantly mudstone (above) to sandstone (below). At Site 638, 217.3 m of Subunit IIIB were cored, but the lower boundary was not reached. Core recovery was poor (<20%; Table 1). The recovered sediments are dominantly medium- to coarse-grained sandstone, interbedded with minor siltstone/claystone and marlstone turbidites.

The sandstone is medium to coarse grained, becoming very coarse grained to granule sized in Cores 103-638B-43R through 103-638B-45R and in the lowermost cores of Hole 638C. The sandstone is poorly sorted, and the grains are mostly angular. The composition is arkosic (quartz, 30%–40%; feldspar [microcline, orthoclase, and plagioclase], 15%–30%; and micas [including biotite and chlorite], 5%–15%). Chlorite typically occurs as an alteration product of biotite. Rock fragments, generally present in amounts of as much as 15%, are from felsic plutonic and metamorphic rocks (granite, quartzite, sericite-schist, biotite-chlorite-schist, and slightly metamorphosed sandstones). Micritic carbonate grains and micritized fragments of shallow-water fossils also occur in trace amounts. Accessory minerals include apatite, Fe-oxides, opaques, and other heavy minerals (zircon and rare epidote). Plant material comprises 3%–5% of the coarse-grained sandstone beds but increases to as much as 20% in the fine-grained sandstone and in the siltstone.

The sandstones are cemented by a crystalline mosaic of sparry carbonate, generally present in amounts ranging from 15%

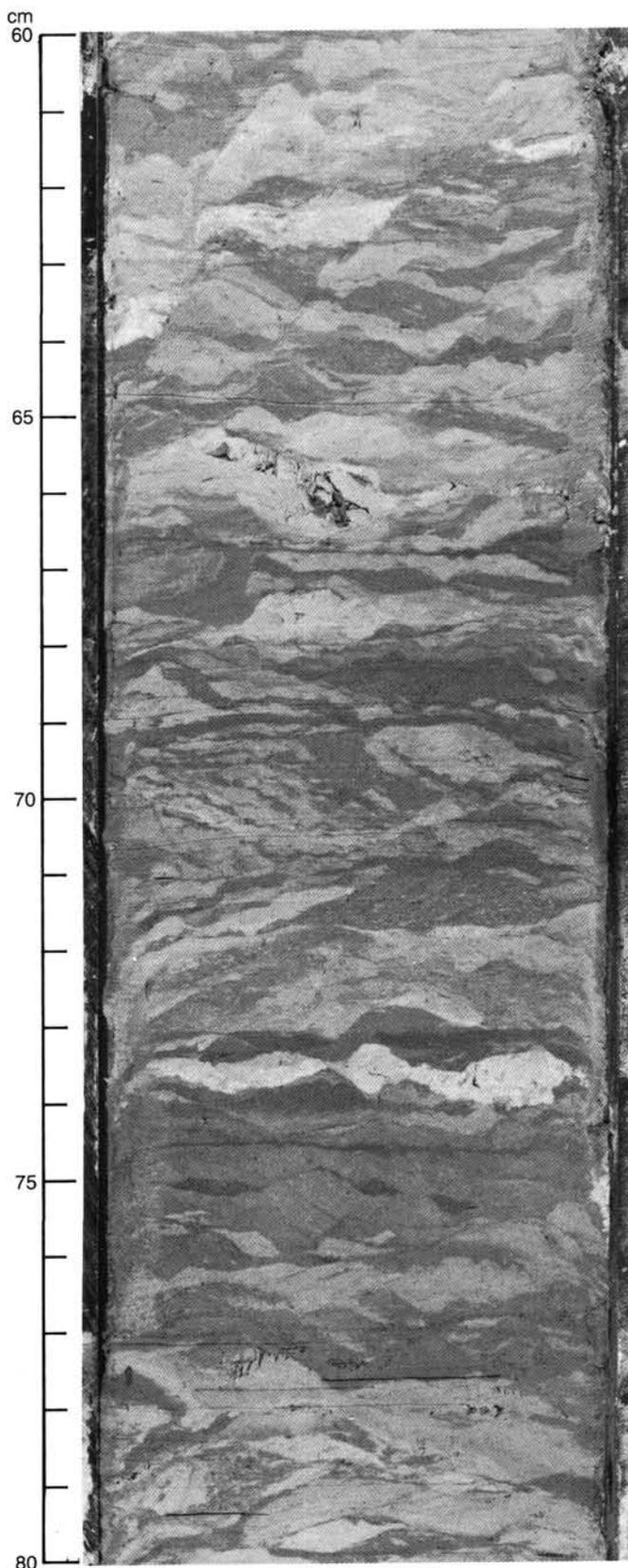


Figure 8. Alternating centimeter-thick layers of dark-gray to gray claystone and silty claystone and light greenish and olive-gray nannofossil marlstone of Subunit IIIA, disrupted and deformed (Sample 103-638B-33R-1, 60–80 cm).

to 25%. Based on microscopic examination of stained thin sections and on preliminary x-ray diffraction analyses, the carbonate is tentatively interpreted to be ferroan calcite, ferroan dolomite, dolomite, possibly siderite, and minor calcite. Displacive precipitation is observed; biotite grains are ruptured by carbonate crystallization along cleavage planes, and quartz and feldspar grains, where fractured, are displaced by carbonate cement (Fig. 9). Both feldspar and quartz grains are replaced to varying degrees along grain boundaries by ferroan sparry calcite (Fig. 10),

indicating that Subunit IIIB sandstones have attained the locomorphic stage in their diagenetic evolution (Dapples, 1962).

Most of the sandstone beds, interpreted as being the coarse part of turbidites, range from 30 to 50 cm in thickness and are normally graded. In Cores 103-638C-1R through 103-638C-9R, the sandstone beds are evenly spaced and occur at a frequency of one to three per section. They are commonly massive at the base and/or parallel laminated (divisions  $T_a$  and  $T_b$  of the Bouma sequence). Thinner layers of fine sandstone, typically 4-7 cm

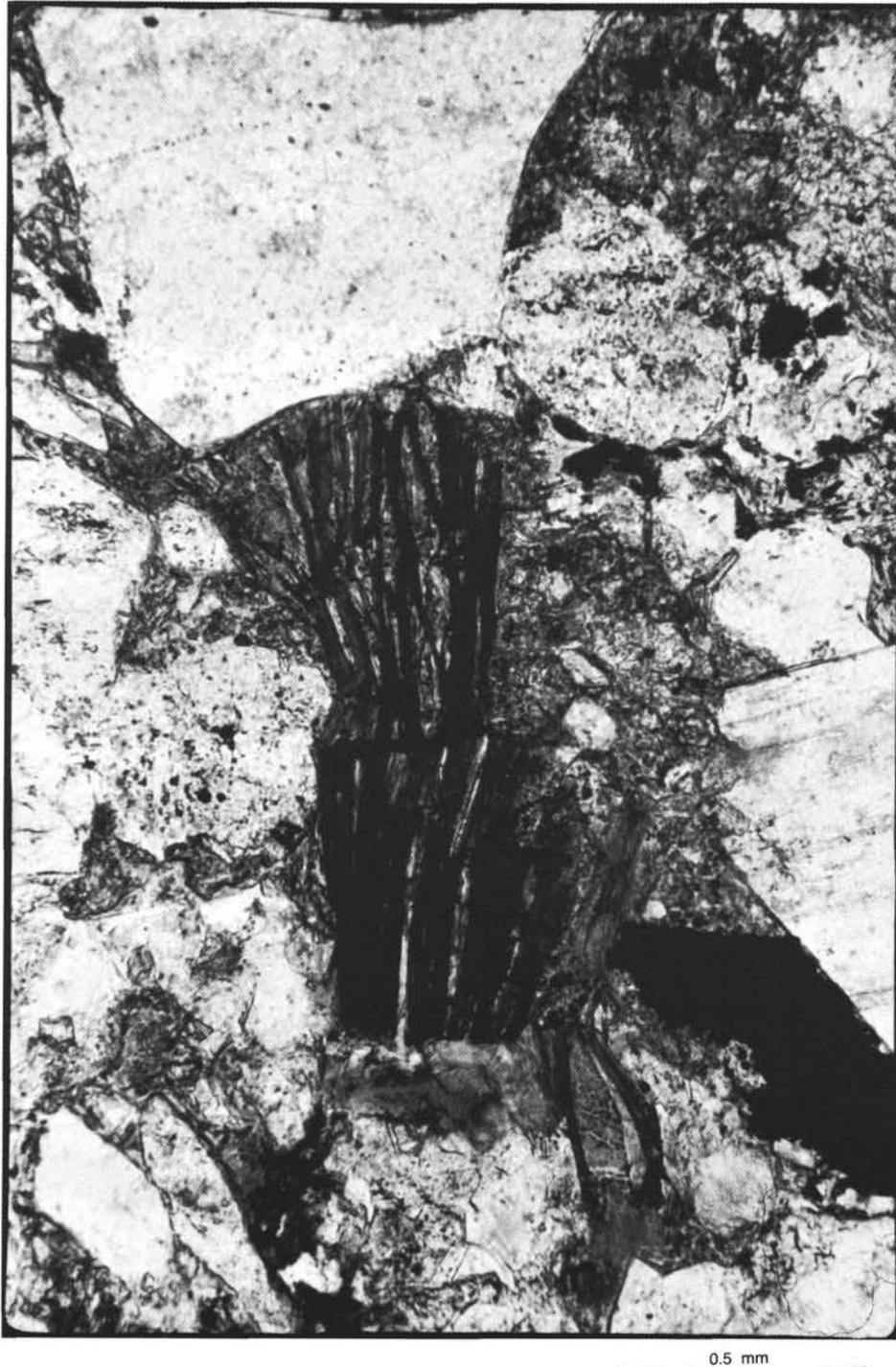


Figure 9. Detrital biotite split along cleavages by growth of calcite (Sample 103-638B-39R-1, 14-23 cm). Bar scale, 0.5 mm. Plane light.

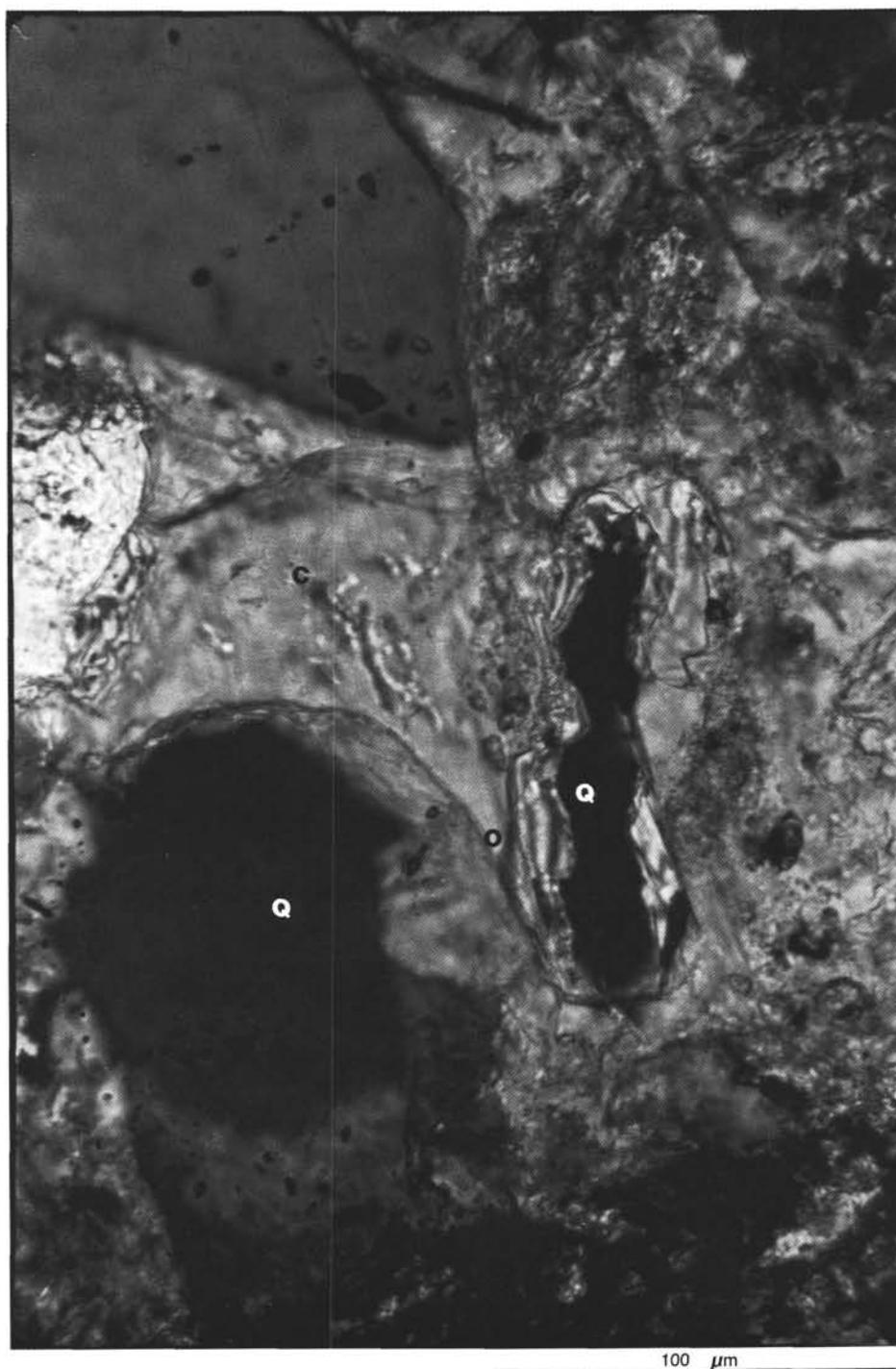


Figure 10. Carbonate replacement (C) of detrital quartz (Q). The outline of original quartz grains (O) suggests significant replacement (Sample 103-639B-41R, CC, 10–13 cm). Bar scale, 100  $\mu\text{m}$ . Crossed nicols.

thick, display ripple-oblique and convolute laminated bedding (Bouma division  $T_c$ ; Fig. 11). Dewatering structures (“dish” structures and water-escape pipes) are observed in Samples 103-638C-3R-2, 95 cm, and 103-638C-9R-2, 116–117 cm (Fig. 12). Some sandstone beds enclose rip-up clasts either in the massive sandstone of the Bouma  $T_a$  sequence (e.g., Sample 103-638B-41R-2, 40–45 cm) or at the boundary between  $T_a$  and the ripple-laminated  $T_c$  division (Sample 103-638C-8R-2, 11–22 cm; Fig. 13). At several levels (e.g., Section 103-638C-10R-1) thin, sharply

bounded, ripple-laminated 1- to 2-cm-thick sandstone layers occur. They may be related to the action of bottom currents or, more likely, to the tails of the turbidity currents. High-angle, oblique laminae in coarse-grained sands, seen in Sample 103-638C-3R-1, 130–140 cm, might be related to the same processes.

Owing to <20% recovery in cores from this subunit, we suspect that finer grained, uncemented parts of turbidite beds were largely lost during drilling. Another explanation is that the coarsest parts of the sandstone beds are poorly cemented and thus

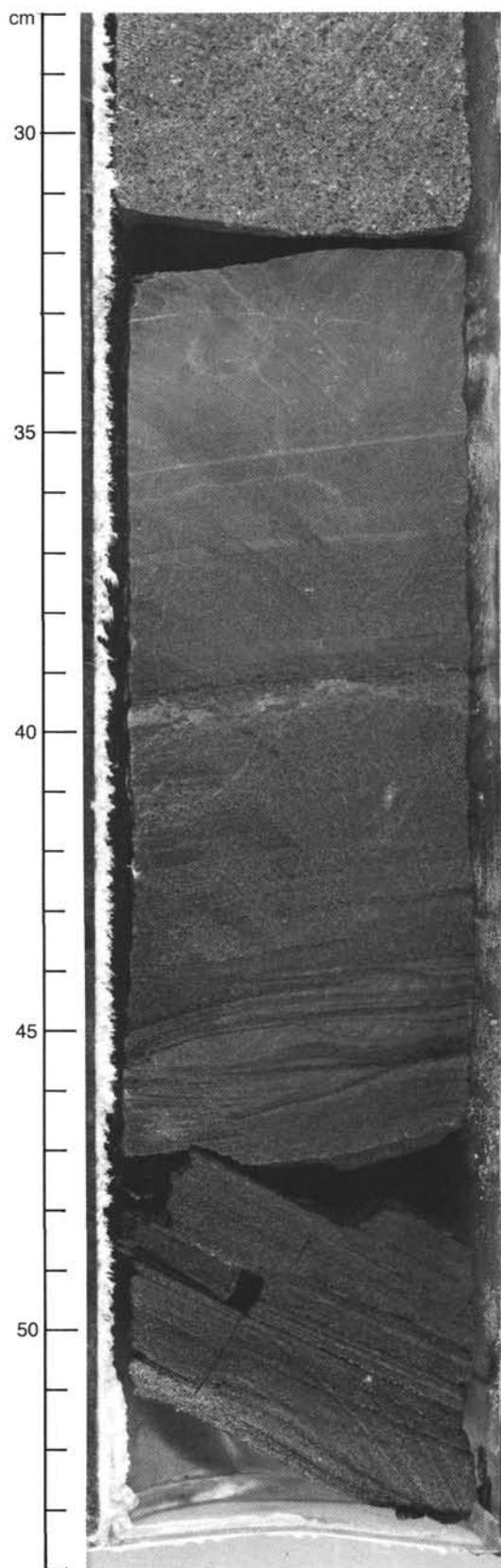


Figure 11. Fine-grained sandstone to claystone turbidite bed. Note the rippled  $T_c$  interval between the parallel-laminated  $T_b$  and  $T_d$  divisions and the massive claystone  $T_c$  at the top (Sample 103-638B-40R-1, 28–54 cm).

were not recovered. Little can be inferred about the vertical organization of the subunit.

Gray (5Y 5/1) mudstone, rich in plant debris, and dark-gray (5GY 4/1) claystone, alternating at a centimeter scale with light greenish gray (5Y 5/2) laminated nannofossil marlstone, are interbedded with the sandstone beds (Fig. 14). The claystone layers are typically less than 10 cm thick; in places they reach thicknesses of 20–30 cm (Core 103-638C-10R). They are silty at the base, faintly parallel laminated or massive, and resemble  $T_d$  and  $T_e$  of the Bouma sequence. Bioturbation, light to moderate throughout, is restricted to the upper part of some claystone units and is absent from others.

The marlstone occurs at the top of the claystone layers, in laminae or thin beds up to as thick as 1 cm. The boundary with the underlying claystone varies from sharp to gradational. Overall, marlstone makes up from 5% to 20% of the section in Cores 103-638C-1R through 103-638C-10R.

The claystone layers are interpreted as being turbidites and the marlstone as being the background pelagic deposit. This lithofacies is well developed in Cores 103-638B-42R, 103-638B-45R, and 103-638C-1R through 103-638C-10R.

Syn-sedimentary deformation (microfaults and slump structures) occurs in Samples 103-638C-4R-1, 120–130 cm, and 103-638C-8R-1, 50–130 cm (Fig. 15). In one place (Sample 103-638C-9R-3, 28–40 cm), calcite-filled veins are associated with faults (Fig. 16).

#### Diagenesis of Lower Cretaceous Carbonates at Site 638

The marl and calcareous clay of Subunit IIIB also contain other authigenic carbonates, including siderite, dolomite, and probably ferroan calcite and ankerite. Many of these crystals show a dark nucleus and zoned growth patterns. From Section 103-638C-7R-1 downward, siderite-rich carbonate occurs as discrete yellowish or brownish gray wavy laminae (Sample 103-638C-7R-2, 96 cm), thin beds less than 1 cm thick, or nodules. Siderite is generally localized between relatively clayey layers rich in coaly plant debris and pyrite, similar to those found near Vigo Seamount (Site 398, Basov et al., 1979). Siderite is a diagenetic mineral, diagnostic of highly reducing conditions, high partial pressure of  $CO_2$ , and a low carbonate content (Basov et al., 1979). Detrital, siderite-rich carbonate is also concentrated in the lower part of the dark-gray claystone layers (e.g., Samples 103-638C-1R-1, 56–60 cm, 103-638C-3R-1, 26–29 cm, and 103-638C-4R-1, 48–52 cm).

#### Preliminary Interpretation of the Mesozoic Succession

In summary, the Lower Cretaceous succession at Site 638 records the following sequence of events:

1. Deposition of terrigenous turbidite sand and mud during the late Valanginian–Hauterivian (Unit III).
2. Accumulation in the Hauterivian and perhaps the early Barremian (Subunit IIB) of a cyclically alternating sequence of pelagic marlstone and calcareous claystone, deformed in places by slumping and mass sliding.
3. Deposition of calcareous claystone turbidites in the late Barremian (Subunit IIA). These sediments are only 29 m thick and are truncated at the top by an unconformity.

The Valanginian(?)–Hauterivian sandstone contains abundant feldspar. Sand composition indicates derivation from a granitic or granodioritic terrain having minor amounts of schist and perhaps low-grade metamorphosed sandstone. The angular shape of the grains suggests little reworking and a relatively nearby source. The precise sources of the sand cannot be established, although the material ultimately could have been derived from the granites of the northern Spanish Meseta. Thick sequences of marginal-marine sediments of similar composition are known from wells drilled into the Lower Cretaceous offshore from Portugal (L. Jansa, pers. comm., 1985).

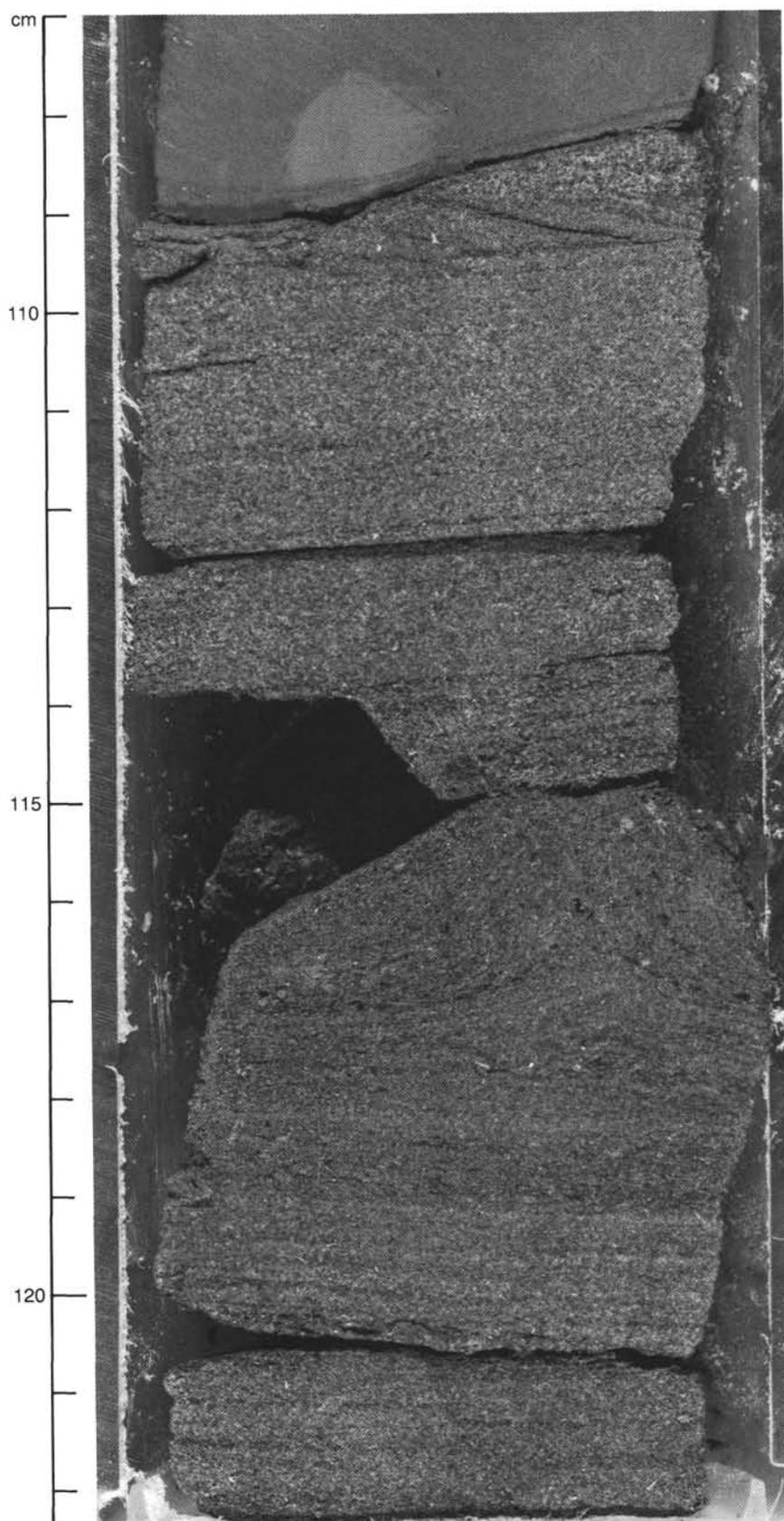


Figure 12. Water-escape pipe (at 116–117 cm) in  $T_{b-c}$  turbidite bed (Sample 103-638C-9R-2, 107–122 cm).

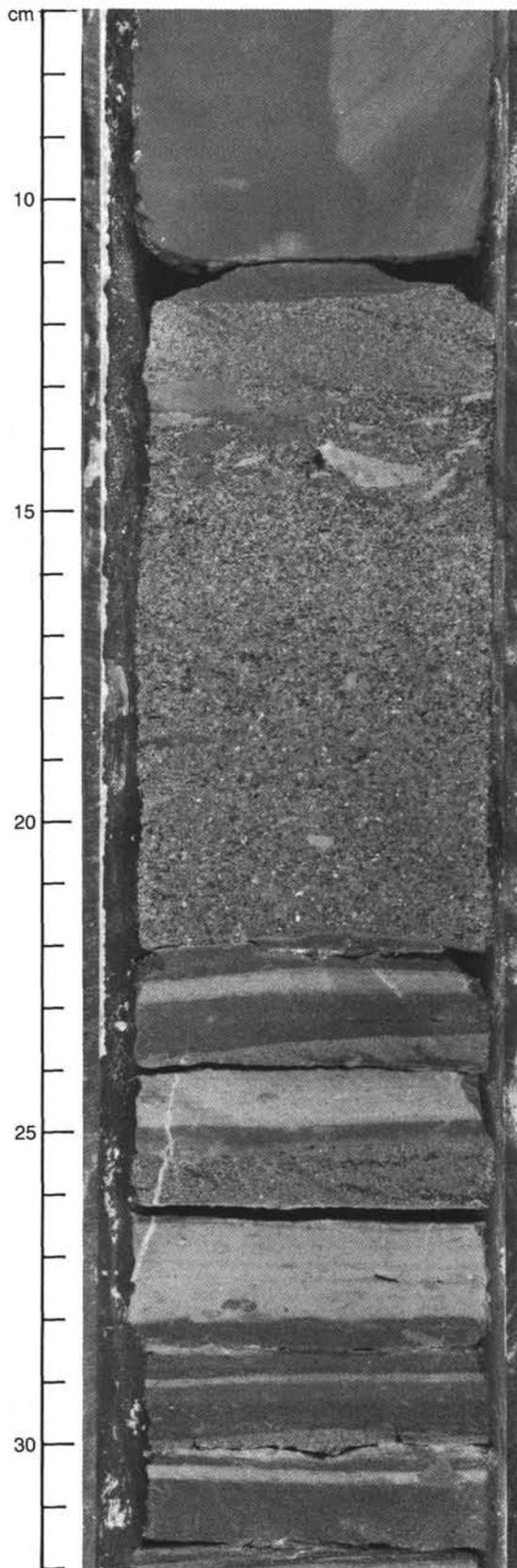


Figure 13. Turbidite bed ( $T_{a-d}$ ; at 12–22 cm) showing a shale-clast-rich layer (at 13–18 cm) at the boundary between massive sandstone division  $T_a$  and ripple-laminated division  $T_c$  of the Bouma sequence (Sample 103-638C-8R-2, 7–32 cm).

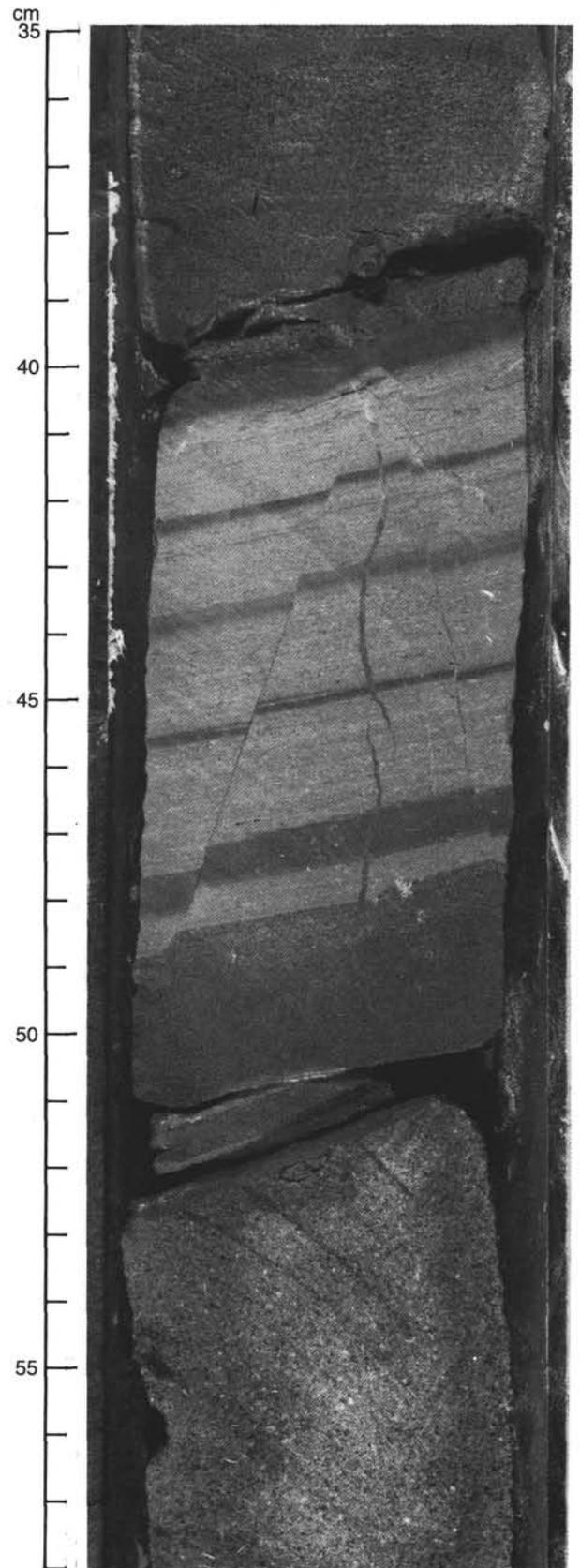


Figure 14. Millimeter-thick, dark claystone siltstone turbidites (40.5–51 cm), interbedded with light-colored, pelagic nanofossil marlstone and enclosed between two massive sandstone turbidites. Note normal fault and vertical, calcite-filled fracture (Sample 103-638B-42R-1, 35–58 cm).

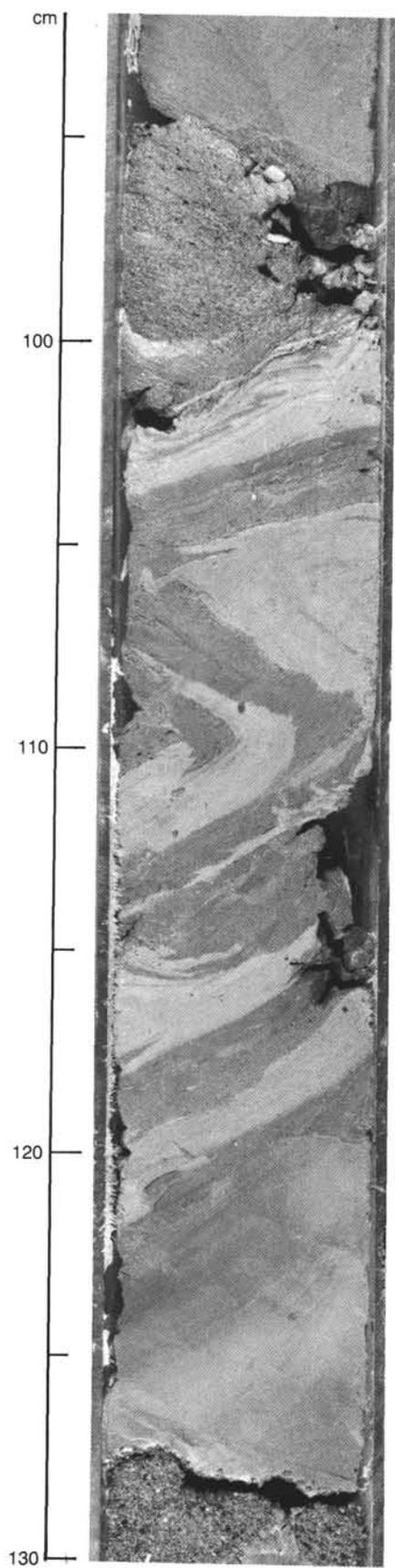


Figure 15. Syn-sedimentary slump-fold in claystone/marlstone of Subunit IIIB (Sample 103-638C-8R-1, 92-130 cm).

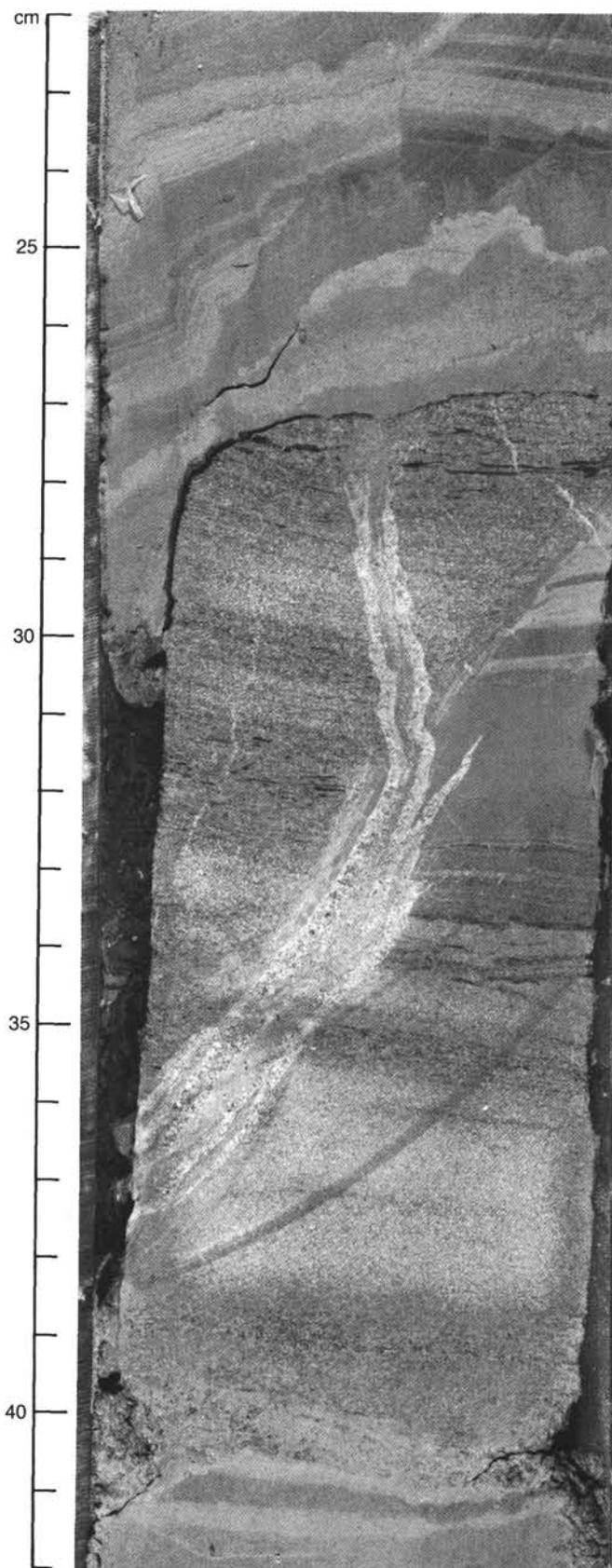


Figure 16. Microfault in sandstone of Subunit IIIB, sutured by calcite cement and cut by calcite-filled veins (Sample 103-638C-9R-3, 22-42 cm).

Terrigenous shelf deposits were widespread during the Early Cretaceous in most of Europe, along the eastern side of the Atlantic Ocean (i.e., northeastern Spain, Lusitanian Basin, Cantabrian Trough, Aquitaine Basin, and Wealden of southeast England; Anderton et al., 1979; von Rad and Arthur, 1979; Emery and Uchupi, 1984), as well as in the western Atlantic margin (eastern U.S. and Canada; Jansa and Wiedmann, 1982). Turbidites related to this period have been identified in the deep Atlantic Basin (Fuerteventura and northwest African turbidite basins; von Rad and Arthur, 1979; Robertson and Bernoulli, 1982), Moroccan Basin (Lancelot, Winterer, et al., 1980), and offshore New Jersey (Site 603; Sarti and von Rad, in press). The turbidites of Unit III clearly indicate that Site 638 is yet another locus of Early Cretaceous sand accumulation.

The turbidite sandstone beds of lithologic Unit III become finer grained and thinner upward, and the sequence gradually passes into a carbonate-rich pelagic marlstone unit (Subunit IIB). The change from terrigenous clastic sedimentation in Unit III to pelagic carbonates in Subunit IIB might be related to (1) a Hauterivian phase of tectonism and block tilting, which temporarily isolated the site from turbidity currents, or (2) a reduced clastic supply, either owing to reduced uplift and erosion or to trapping of sediments onshore because of a transgression.

Turbidite sedimentation resumed in late Barremian time and is characterized by very thin-bedded layers interbedded with pelagic deposits that are similar to those of the previous unit (Subunit IIB). The extent of late Barremian resedimentation cannot be established at Site 638, as Subunit IIA is largely eroded.

Subunit IIA is tentatively correlated with the carbonate-poor Subunit 4C of DSDP Site 398, in the Vigo Seamount area, which contains a wide variety of turbidite beds and debris-flow deposits (Sibuet, Ryan, et al., 1979). Subunit IIB may correlate with the carbonate-rich, cyclic Unit 5 at the same site.

### BIOSTRATIGRAPHY

Foraminifers, nannofossils, and radiolarians were examined from core catchers and core-section intervals to provide a biostratigraphic framework for the sediments recovered from the three holes drilled at Site 638.

Hole 638A, drilled as a jet-in test for reentry operations (see "Operations" section, this chapter), provided a sample dated as early Pleistocene from nannofossil evidence. A single-bit pilot Hole 638B was drilled to a depth of 431.1 m. An upper sequence of calcareous ooze in this hole (0–184 m sub-bottom) is assigned a Neogene–Quaternary age based on both a well-preserved planktonic foraminiferal fauna and a similarly preserved nannofossil flora. The oldest Cenozoic sediments recovered from Hole 638B are late Miocene in age. Radiolarians are absent from the Cenozoic sequence of Hole 638B.

Unconformably underlying the Neogene–Quaternary sequence of Hole 638B are marly and sandy sediments of Early Cretaceous age. On the basis of foraminifer, nannofossil, and radiolarian content, these sediments are of Barremian to Valanginian age. Foraminifers are poorly to moderately well preserved and are of rare occurrence or absent from many samples, making some age assignments uncertain. Despite this, sediments of late Barremian age are indicated in Samples 103-638B-20R, CC, to 103-638B-24R, CC, by the presence of diagnostic planktonic forms. Nannofossil preservation and abundance is variable throughout Hole 638B and is lithology-dependent, though nannofossils are consistently more abundant than are foraminifers. Nannofossil assemblages allow determination of late Barremian to late Valanginian ages for the recovered sediments. Radiolarian assemblages occur throughout the Mesozoic sequence of Hole 638B but are generally poorly preserved. Pyrite replacements and overgrowths are common. Barremian-, Hauterivian-, and Valanginian-type radiolarian assemblages are observed.

A multiple reentry hole (Hole 638C) was drilled to 547.2 m at Site 638 to recover sediments as old as pre-rift and basement-rock age. Unfortunately, drilling problems forced abandonment of the hole while still in sediments of Valanginian age. Foraminifers, nannofossils, and radiolarians all indicate that the oldest sediments recovered at the bottom of Hole 638C are of the same age as the oldest sediments of Hole 638B, indicating very high sediment-accumulation rates during Valanginian time (see "Age-vs.-Depth-Curve" section, this chapter).

### Foraminifers

#### Cenozoic

A 184-m-thick sequence of Neogene–Quaternary calcareous ooze was continuously cored in Hole 638B. Twenty-four samples (mostly core catchers) were examined for foraminiferal content to determine a biostratigraphic scheme. Planktonic foraminiferal assemblages recovered are generally well preserved, abundant, and moderately diverse. Samples from three levels (Samples 103-638B-10R-2, 149–150 cm, and 103-638B-14R, CC, and Core 103-638B-18R) contain a rare and very poorly preserved microfauna. The relative proportion of benthic foraminifers in these samples is greater than that in the others and may be a result of stronger dissolution of planktonic tests concomitant with several glacial events in the North Atlantic realm (Moullade, in press). Foraminifers at several levels indicate a trend toward a warmer-water-type assemblage, though most of the samples contain dominantly cold-water forms and lack most of the common tropical markers. Figure 17 summarizes the main observations and interpretations based on the planktonic foraminifers.

An earliest Pleistocene age is assigned to the uppermost 3 m of Core 103-638B-1R and is based on the simultaneous occurrence of *Globorotalia truncatulinoides*, *G. tosaensis*, and *Globigerinoides obliquus*. As at Site 637, Hole 638B appears to lack the latest Pleistocene.

The interval comprising the lower part of Core 103-638B-1R and Cores 103-638B-2R and 103-638B-3R is assigned a late Pliocene age (Zones PL4 to PL6) on the basis of the occurrence of *Globorotalia tosaensis*, *G. inflata*, *G. hirsuta*, and *Sphaeroidinella dehiscentes* and the absence of *G. truncatulinoides*. The lack of such tropical markers as *G. miocenica* and *Globoquadrina altispira* precludes precise determination of Pliocene Zones PL4, PL5, and PL6.

Cores 103-638B-4R to 103-638B-9R, approximately of middle Pliocene age, proved difficult to interpret, partly because of the lack of recovery in Core 103-638B-5R. In addition, Sample 103-638B-4R-1, 149–150 cm, reveals a simultaneous highest occurrence of *Globorotalia praehirsuta* (known to range up to the PL4 Zone), *G. puncticulata* (which became extinct at the PL2/3 boundary; Moullade, in press; Ma'alouleh and Moullade, in press), and *G. margaritae* (the last occurrence of which is used to determine the PL2/3 boundary; Berggren, 1977). These abnormally simultaneous highest occurrences may be explained by a small amount of reworking or a hiatus that eliminates Zone PL3 and perhaps part of PL4. The lowermost part of the interval (Core 103-638B-9R) is thought to be no younger than Zone PL1c. This inference is based on the presence of *G. crassaformis*, the first occurrence of which defines the lower limit of this zone. Core 103-638B-10R is assigned to Zone PL1b owing to the occurrence of *G. puncticulata* and the absence of *G. crassaformis*. Sample 103-638B-11R, CC, is assigned an earliest Pliocene age (PL1a) as indicated by the presence of *G. margaritae* and *G. gr. cibaoensis-juanai* together with *G. plesiotumida* and *G. conoidea* (both of which straddle the Miocene/Pliocene boundary; Berggren et al., 1983) and the absence of distinctive Miocene markers. The Miocene/Pliocene boundary, therefore, is placed between Cores 103-638B-11R and 103-638B-12R.

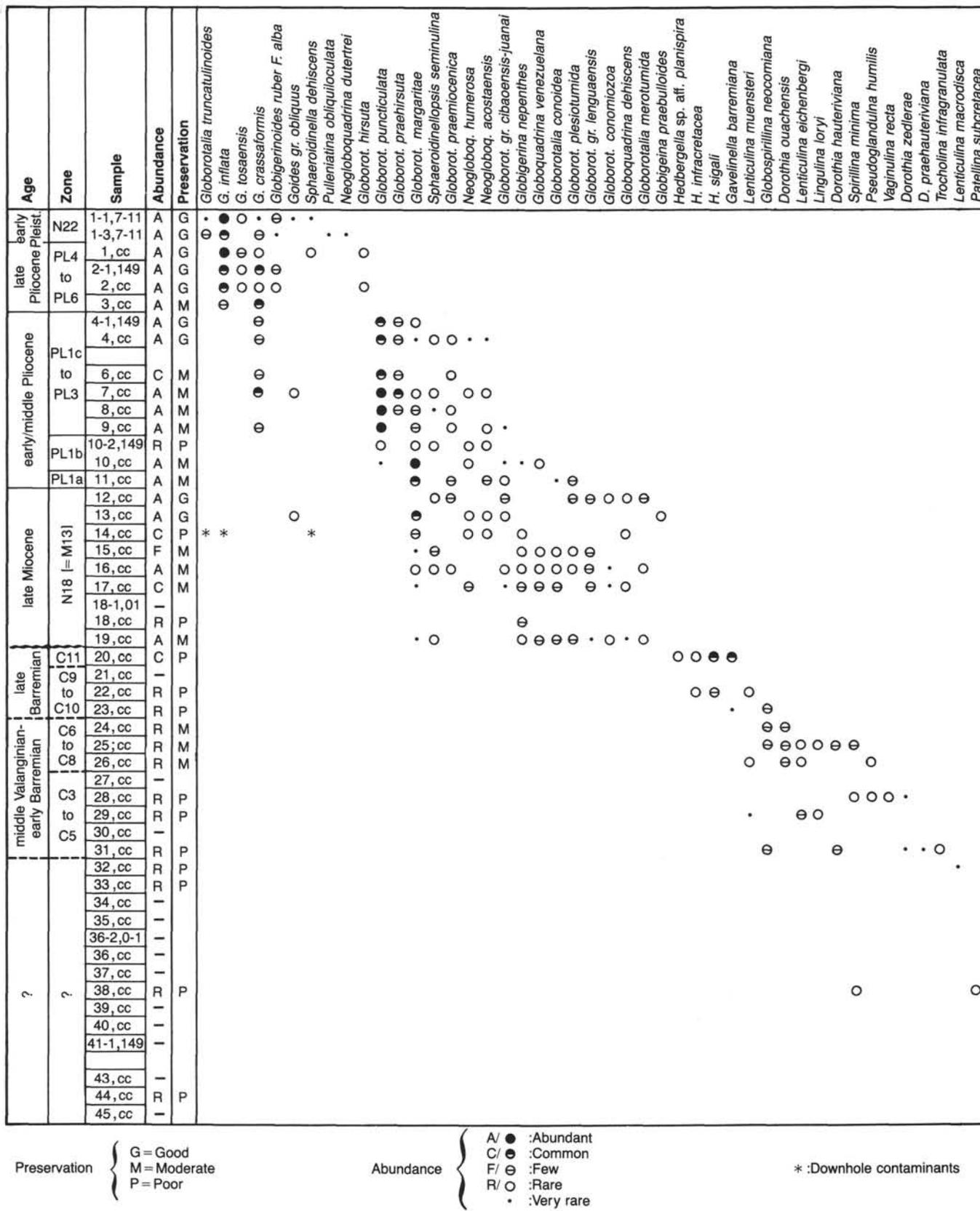


Figure 17. Vertical distribution of selected Cenozoic planktonic and Mesozoic benthic and planktonic foraminifers in Hole 638B.

The underlying Neogene interval, including Cores 103-638B-12R to 103-638B-19R and the first 3 m of Core 103-638B-20R is assigned a latest Miocene age (late Messinian), based on the consistent co-occurrence of *G. margaritae*, *G. conomiozoa*, *G. merotumida*, *Globoquadrina dehiscentis*, and *G. linguaensis-paralineaensis*. The species *Neogloboquadrina humerosa* and *G. gr. cibaoensis* are restricted to the upper part of this interval. The co-occurrence of *G. margaritae* and *Globoquadrina dehiscentis* has been shown to define Zone M13 (uppermost Miocene = late Messinian; Berggren et al., 1983) and is equivalent to Zone 18 described by Blow (1969).

Many Neogene samples in Hole 683B contain small amounts of reworked planktonic foraminifers of middle Cretaceous, Late Cretaceous, and Paleocene-Eocene age. This indicates that strata of these ages were eroded during the Miocene, Pliocene, and early Quaternary. A few errant occurrences of late Pliocene-Pleistocene forms in the middle Pliocene (Sample 103-638B-6R, CC) and the Miocene (Samples 103-638B-14R, CC, and 103-638B-16R, CC) are thought to be the result of downhole contamination.

### Mesozoic

#### Hole 638B

Some 247 m of marly and sandy deposits of Early Cretaceous age, recovered from Hole 638B, unconformably underlie sediments of Neogene age. Core-catcher samples examined for foraminiferal content reveal rare, very small and poorly preserved specimens. A few planktonic species accompanied by a minor benthic component occur in the uppermost part of the Cretaceous section (i.e., Cores 103-638B-20R to 103-638B-22R). From Core 103-638B-23R down to Core 103-638B-44R, however, only benthic foraminifers were recovered.

Foraminiferal zonation schemes developed by Moullade (1966, 1974, 1983) and Magniez-Jannin et al. (1984) (mainly established in the Tethyan realm) were used to interpret these Early Cretaceous assemblages. The vertical distribution of planktonic and selected benthic species in Hole 638B is shown in Figure 17.

Lithologic Subunit IIA (see "Sediment Lithology" section, this chapter), comprising the lowermost part of Core 103-638B-20R, Cores 103-638B-21R, and 103-638B-22R, and the upper part of Core 103-638B-23R, is tentatively assigned a late Barremian (Zones C9-12) age on the basis of the following criteria:

1. The occurrence of rare specimens of *Hedbergella* sp. aff. *planispira* (sensu Moullade, 1966; non *similis* Longoria) in Samples 103-638B-20R, 13-17 cm, and 103-638B-20R, CC. This taxon is known to occur first in the latest Barremian.

2. The occurrence of *Gavelinella barremiana* in Samples 103-638B-20R, CC (as common) and 103-638B-23R, CC (as a single specimen only). This taxon first appears in the Tethyan domain at the early/late Barremian boundary.

On the other hand, both of these two markers are known to range up into the early Aptian. The presence of *H. sigali* and *H. infracretacea*, which are found to be relatively common in Samples 103-638B-20R, CC, and 103-638B-22R, CC, do not help solve this problem because they are both long-ranging species. Both taxa first appeared in the late Hauterivian and became extinct either in the earliest Gargasian (*sigali*) or in the middle Albian (*infracretacea*). That the sediments involved are Barremian age is indicated by the presence of one orbitolinid specimen attributed to *Paleodictyoconus barremianus* (a shallow-water early-middle Barremian species). This neritic form was identified in a thin section made from Sample 103-638B-22R-3, 126-128 cm, for which the paleoenvironmental interpretation indicates contemporaneous redeposition rather than reworking from older horizons.

Dating of lithologic Subunit IIB (Sections 103-638B-23R-3 to 103-638B-32R-2) on the basis of its foraminiferal content is

more difficult, owing to the sporadic occurrence of assemblages of low diversity composed of small, mostly bathyal calcareous specimens. Furthermore, ample sedimentologic evidence ("Sediment Lithology" section, this chapter) indicates that most if not all these microfaunas (sometimes enriched by rare shallow-water components) were transported to greater depths by turbidity currents and quickly buried to depths where they were well protected from dissolution below the CCD. As a result, it is practically impossible to discern whether the lowest and highest foraminiferal occurrences observed in Hole 638B truly represent first and last appearances as used in the current zonal schemes. Therefore, Subunit IIB can be only tentatively assigned a middle Valanginian to early Barremian(?) age. The following is evidence for this:

1. Specimens of *Dorothia ouachensis*, a species that first occurred in the middle Hauterivian, were recovered from Samples 103-638B-24R, CC, 103-638B-25R, CC, and 103-638B-26R, CC.

2. Specimens of *D. hauteriviana* and *D. zedlerae*, taxa that first occurred in the middle Valanginian and whose last occurrences are recorded at the Hauterivian/Barremian boundary, were recovered in Samples 103-638B-25R, CC, 103-638B-29R, CC, and 103-638B-31R, CC.

3. Very rare specimens of *D. praeauteriviana*, a middle Valanginian marker, occur in Sample 103-638B-31R, CC.

From the late Barremian age of Subunit IIA and the age of Sample 103-638B-25R, CC, which cannot be younger than the Hauterivian/Barremian boundary, it appears that only Core 103-638B-24R and part of Core 103-638B-25R might belong to the early Barremian (i.e., in Hole 638B, this substage is either condensed or missing). Cores 103-638B-25R and 103-638B-26R are definitely Hauterivian according to their foraminiferal content. A late Valanginian age is not fully demonstrated for the lower part of Subunit IIB.

Lithologic Unit III cannot be dated using foraminifers, owing to the recovery of only extremely rare and non-age diagnostic forms such as small nodosariids, *Ammodiscus-Spirillina*-like pyritized tests, and primitive tiny agglutinated forms from below Core 103-638B-32R. The general paucity of foraminifers in this unit is due either to an extreme dilution of the specimens with rapidly sedimented terrigenous deposits and/or a depositional environment near or below the CCD.

#### Hole 638C

The 135-m-thick silty clay and sandstone sequence cored in Hole 638C is almost completely devoid of foraminifers. Only extremely rare, relatively well-preserved benthic species (mostly lenticulinids) were found in Samples 103-638C-1R, CC, 103-638C-4R, CC, 103-638C-9R, CC, and 103-638C-14, CC. Almost all these lenticulinids (*Lenticulina macrodisca*, *L. subangulata*, *L. subalata*, *L. crassa*, and *L. roemeri*) are long-ranging species, encountered mainly in sediments deposited in outer-shelf and bathyal (upper- to mid-slope) environments from the Lower Cretaceous in the Tethyan realm (Bartenstein and Bettenstaedt, 1962; Moullade, 1966; Neagu, 1972, 1975; Guerin, 1981). A rare occurrence of *Lenticulina nodosa*, the acme of which defines the early Valanginian (Zone C2) (Moullade, 1979, 1984, in press), occurs in Sample 103-638C-4R, CC, though the few specimens are not sufficient to determine a precise age.

The lenticulinid microfauna occurs only rarely in Hole 638C and perhaps represents elements of an autochthonous foraminiferal benthos.

Samples 103-638C-1R, CC, and 103-638C-4R, CC, also reveal very rare, small, and poorly preserved trocholinids (*Trocholina paucigranulata* and *T. infragranulata*). These shallow-water specimens were probably displaced from the inner shelf and redeposited by turbidites.

A few aptychi (Ammonites operculae) are also common in the washed residues that contain foraminifers. One belemnite

specimen (*Pseudobelus bipartitus*, determ. J. Wiedmann) was observed in Sample 103-638C-4R-2, 65 cm. The occurrence of such macrofossils is consistent with our interpretation of deposition of Hole 638C sediments in an outer-shelf or upper- to mid-slope environment.

## Nannofossils

### Cenozoic

#### Hole 638B

Late Miocene through early Pleistocene nannofossil assemblages were recovered from 184 m of nannofossil and clayey nannofossil oozes at this site. Late Miocene assemblages indicative of the *Discoaster neohamatus* Zone (CN-8) unconformably overlie Cretaceous strata in Section 103-638B-20R-3. Nannofossils are abundant throughout the Cenozoic section; preservation is moderate to good in Pliocene/Pleistocene assemblages, but poor to moderate in late Miocene assemblages. Core recoveries, although low in many cores, were better than those at Site 637. However, a large percentage of the section was highly disturbed by drilling. The absence of *Discoaster berggrenii* and *D. quinqueramus* and the genus *Ceratolithus* (except for isolated specimens in two samples) greatly reduce biostratigraphic resolution in upper Miocene and lower Pliocene sediments.

Two hiatuses were recognized in the Cenozoic section at this site. The first occurs between Samples 103-638B-2R-1, 34–35 cm, and 103-638B-2R-1, 125–126 cm, where a large part of the upper Pliocene and possibly part of the early Pleistocene are absent. Core 103-638B-1R and the top part of Section 103-638B-2R-1 contain *Gephyrocapsa oceanica*, *Helicosphaera sellii*, and *Calcidiscus macintyreii*. *G. oceanica* first occurs at the base of the *Helicosphaera sellii* Zone at Site 637, suggesting that the lowermost Pleistocene *Calcidiscus macintyreii* Zone is absent at this site. Samples 103-638B-2R-1, 125–126 cm, through 103-638B-4R-7, 11–12 cm, contain *Discoaster tamalis*, *D. surculus*, *D. pentaradiatus*, *D. asymmetricus*, and *D. brouweri* and are assigned to the *Discoaster tamalis* Subzone (CN-12A) of early-late Pliocene age. A second hiatus is recognized below this. Sample 103-638B-4R, CC, contains *Amaurolithus delicatus*, *A. primus*, and *Reticulofenestra pseudoumbilica* and is dated in the early Pliocene *Amaurolithus tricorniculatus* Zone (CN-10).

Division of the *Amaurolithus tricorniculatus* Zone (CN-10) into subzones and subsequent determination of the Miocene/Pliocene boundary is based on species of the genus *Ceratolithus*. Isolated specimens of *Ceratolithus rugosus* in Samples 103-638B-8R-7, 45–46 cm, and 103-638B-8R-5, 76–77 cm, were the only ceratoliths observed in this section and indicate an early Pliocene age (*Ceratolithus rugosus* Subzone CN-10C) or younger for the bottom of Core 103-638B-8R. The presence of *Discoaster tamalis* and *D. asymmetricus* in Sections 103-638B-8R-5 and 103-638B-8R-6, respectively, confirms an early Pliocene age for this core. These two species, for which first occurrences are generally reported above the extinction level of the genus *Amaurolithus* in the *Reticulofenestra pseudoumbilica* Zone (CN-11), overlap in occurrence with the amauroliths at both Sites 637 and 638.

The next reliable datum downcore is the lowest occurrence of the genus *Amaurolithus* in Sample 103-638B-17R-1, 20–21 cm, which defines the base of the late Miocene *Amaurolithus primus* Subzone (CN-9B). Thus, Cores 103-638B-9R through 638B-17R-1 cannot be precisely zoned and are considered undifferentiated upper Miocene to lower Pliocene. The highest consistent occurrence of *Triquetrorhabdulus rugosus* in Sample 103-638B-11R-3, 25–26 cm, is weak evidence of Miocene below that sample, although the last occurrence of this species has been used to approximate the Miocene/Pliocene boundary. The rare and sporadic

occurrences of this species further uphole and in lower Pliocene sediments at Site 637 and other deep-sea sections is reason for caution. Samples 103-638B-17R, CC, through 103-638B-18R-5, 67–68 cm, contain *Discoaster surculus* but no amauroliths, and the late Miocene *Discoaster berggrenii* Subzone (CN-9A) is determined for that interval. Both *D. loeblichii* and *Minyolitha convallis* have their highest occurrences in Sample 103-638B-18R-3, 57–58 cm. The former species has a reported first occurrence at the base of the *Discoaster neohamatus* Zone (CN-8) (Perch-Nielsen, 1985). Its presence in samples without *D. surculus* below Sample 103-638-18R-5, 67–68 cm, dates the base of the Cenozoic section at this site in the *Discoaster neohamatus* Zone (CN-8).

### Mesozoic

#### Hole 638B

Late-Barremian- through late-Valanginian-age nannofossil assemblages are present in Section 103-638B-20R-3 through Core 103-638B-45R (lithologic Units II and III; see "Sediment Lithology" section, this chapter). An unconformity is recognized between lithologic Subunits IIA and IIB in Section 103-638B-23R-3, 27 cm; the lower Barremian and part of the upper Hauterivian are missing. Below this unconformity and down to the bottom of the hole, the section appears continuous and contains nannofossil assemblages of late Valanginian to late Hauterivian age. Age determinations for the Mesozoic section in Hole 638B are based on Thierstein (1971, 1973, 1976), Sissingh (1977), Perch-Nielsen (1979), and Roth (1983).

Nannofossils are generally common to abundant in both claystone and marlstone from Unit II and Subunit IIIA. Assemblages are moderately well preserved in the claystone and poor to moderately preserved in the marlstone. The limestones restricted to Subunit IIA contain few to common, poorly preserved nannofossils. Abundance and preservation quality of assemblages decrease in Subunit IIB compared with younger strata. The decrease in abundance may be due to dilution by terrigenous material.

Lithologic Subunit IIA (103-638B-20R-3, 3 cm, to 103-638B-23R-3, 27 cm) is assigned to the *M. hoschulzii* Zone (CC-6), late Barremian in age (Sissingh, 1977). The absence of *Rucinolithus irregularis*, which has its first occurrence at the Barremian/Aptian boundary (Thierstein, 1973; Perch-Nielsen, 1979), and the occurrence of *Chiastozygus tenuis* and *Haysites radiatus* are evidence of an age no younger than late Barremian for Subunit IIA. The boundary between Subunit IIA and Subunit IIB (Sample 103-638B-23R-3, 27 cm) marks the highest occurrence of both *Lithraphidites bollii* and *Calcicalathina oblongata*. These two species became extinct in the early Barremian, and the last occurrence of *Calcicalathina oblongata* is often utilized as a datum for the top of the lower Barremian (Thierstein, 1976; Sissingh, 1977; Perch-Nielsen, 1979). *Speetonia colligata*, a species having its last-occurrence datum in the late Hauterivian, occurs in this hole one core section below the top of Subunit IIB in Sample 103-638B-23R-4, 55–56 cm. Thus, the interval from the highest *Speetonia colligata* to the highest *Calcicalathina oblongata* (late Hauterivian to early Barremian) is represented by only one core section (103-638B-23R-3); evidently, part of the upper Hauterivian and all of the lower Barremian are missing at the lithologic boundary between Subunits IIA and IIB.

Samples 103-638B-23R-4, 55–56 cm, through 103-638B-24R, CC, contain *Lithraphidites bollii* and *Speetonia colligata* but not *Crucellipsis cuvillieri*. A late Hauterivian age is assigned to this interval. Samples 103-638B-25R-1, 86–87 cm, through 103-638B-29R, CC, contain both *Crucellipsis cuvillieri* and *Lithraphidites bollii* and are dated as early to late Hauterivian. The interval including Samples 103-638B-23R-3, 27 cm, through 103-

638B-29R, CC, is assigned to the *Cretarhabdus loriei* Zone (CC-4b; Sissingh, 1977).

A relationship exists between lithology and species composition in Unit II. Above Section 103-638B-26R-1, nannoconids are abundant in both marlstone and limestone, whereas few are found in the claystone. The only exception to this is a single sample of claystone in Subunit IIA that contains abundant nannoconids; a microthin layer of calcareous-rich material was possibly included in this sample. Below Section 103-638B-26R-1, nannoconids are not abundant in any lithology. Conversely, *Tubodiscus verena* and *Diadorhombus rectus* occur preferentially in claystone. Both species are found much higher in the section than expected. Their presence may be due to reworking, though other species that normally occur with them in Valanginian sediments at other localities do not appear in the younger horizons together with (or above) these species.

The placement of the Hauterivian/Valanginian boundary in the interval from Cores 103-638B-30R through 103-638B-45R, CC, is difficult for several reasons. *Tubodiscus verena* and *Diadorhombus rectus*, which are thought to be restricted to the Valanginian and are used by some (Thierstein, 1973; Roth, 1983) to delineate the Valanginian/Hauterivian boundary, occur in many samples from this interval. *Tubodiscus verena* occurs consistently up to Sample 103-638B-24R-4, 55–56 cm (above the first occurrence datum of *Lithraphidites bollii*), and *Diadorhombus rectus* occurs sporadically up to the top of the Lower Cretaceous part of the section. The first occurrence of *Cretarhabdus loriei*, which is used by Sissingh (1977) to delineate this stage boundary, resembles older forms and is difficult to use. The first occurrence of *Nannococcus bucheri* cannot be used because of the absence of nannoconids in the sand turbidite sequence. The lowest occurrence of *Chiastozygus striatus*, used by Perch-Nielsen (1979) to delineate this boundary, is also difficult to use because of its rare occurrence downhole and its close resemblance to a smaller form described at Site 397 (Wind and Cepek, 1979) as *Eiffellithus* sp. Transitional forms between the two are observed in Cores 103-638B-31R-1 through 103-638B-44R-1. This smaller species has also been observed in Valanginian-age sediments from the Angles section in France. The lowest occurrence of *Chiastozygus striatus* (sensu stricto) is placed in Sample 103-638B-33R-1, 135–136 cm, whereas the lowest occurrence of *Eiffellithus* sp. is in Sample 103-638B-44R-1, 38–39 cm. Whether or not this smaller form is an ecologic variant of *C. striatus* is unclear. For these reasons, we do not now attempt to place a Hauterivian/Valanginian boundary.

The occurrence of *Parhabdololithus infinitus* and *Calcicalathina oblongata* to the bottom of the hole is evidence of an age no older than late Valanginian. The interval between Samples 103-638B-30R-1 to 103-638B-45R, CC, is placed in the *Calcicalathina oblongata/Cretarhabdus loriei* Zones (CC3/CC4a) of a late Valanginian to early Hauterivian age (Thierstein, 1971; Sissingh, 1977).

#### Hole 638C

Nannofossils are rare to common in fine-grained sediment recovered from Hole 638C. Because of dilution by terrigenous material, nannofossils are rare or absent in siltstone and sandstone. Assemblages in the layers of light-colored, fine-grained sediment are moderately well preserved. The persistent occurrence of *Speetonia colligata* and *Cruciellipsis cuvillieri* in the absence of *Lithraphidites bollii*, a species that occurs higher up-hole in Hole 638B, indicates an age no younger than early Hauterivian for sediments recovered from Hole 638C. The occurrence of *Parhabdololithus infinitus* in all samples examined from Hole 638C is evidence of an age no older than late Valanginian (Thierstein, 1976; Wind and Cepek, 1979; Roth, 1983). The absence of *Rucinolithus wisei* (late Berriasian to early Valangini-

an) is also noted. *Diadorhombus rectus*, *Tubodiscus verena*, and *Calcicalathina oblongata* are present in almost all samples. These three species are known to have their earliest occurrences near the base of the Valanginian. The entire section recovered from Hole 638C is assigned to the *Calcicalathina oblongata/Cretarhabdus loriei* Zones (CC3/CC4a), late Valanginian to early Hauterivian in age.

## Radiolarians

### Cenozoic

Radiolarian preparations were made for all core-catcher samples from the Cenozoic section recovered from Hole 638B and for an additional 60 samples from Cores 103-638B-1R to 103-638B-20R. The noncalcareous fraction (> 62  $\mu\text{m}$ ) is dominated by small amounts of detrital mineral grains, mainly mica and quartz, and rare lithic grains. Samples 103-638B-7R, CC, to 103-638B-18R, CC, contain pyrite.

Radiolarians and other siliceous microfossils are absent in Samples 103-638B-1R-2 to 103-638B-20R, CC, although spherical aggregates of pyrite in Samples 103-638B-12R, CC, 103-638B-16R, CC, and 103-638B-17R, CC, may be the remains of radiolarians.

### Mesozoic

All core-catcher samples together with an additional 150 samples from Cores 103-638B-20R to 103-638B-45R (except 103-638B-45R, where the core catcher contained only massive sandstone) were examined for radiolarians.

Well-preserved radiolarians were obtained from Core 103-638B-21R-1 down to Core 103-638B-25R, CC. Radiolarians recovered from marly or limestone intervals are preserved in silica, whereas radiolarians recovered from the clayey and organic-rich intervals are preserved in pyrite. Additional, poorly preserved radiolarian assemblages (usually pyritized) are scattered throughout the sequence cored at this site (Fig. 18).

Radiolarian occurrences and mode of preservation permit recognition of two intervals within the Cretaceous sedimentary section of Hole 638B.

1. In Cores 103-638B-20R to 103-638B-31R (lithologic Unit II), radiolarians are common both in the bioturbated marlstone as well as in the silty detrital layers enriched in terrestrial plant material and mica. The preservation of the taxa is not uniform. In Samples 103-638B-21R-1, 4–6 cm and 103-638B-22R-1, 94–96 cm, the radiolarians are replaced by calcite (Fig. 19A); only a small amount of the specimens remain preserved in silica as quartz recrystallized from biogenic opal (Fig. 19B). The ratio between spumellarians and nassellarians is approximately 1:1. Sample 103-638B-21R, CC, also contains siliceous radiolarians, but here spumellarians dominate strongly over nassellarians, and taxa belonging to the Hagiastriidae and Patulibracchidae form the largest part of the preserved fauna. All specimens show extensive dissolution patterns on the surface of the tests (Fig. 19C).

Sample 103-638B-25R, CC, where radiolarians are also common and well preserved, represents the third type of preservation observed in this interval. The original tests were replaced by pyrite without destruction of the fine patterns of the skeletons (Fig. 19D).

In some samples, internal molds of zeolites and framboidal pyrite occur (Sample 103-638B-22R, CC; Figs. 19E and 19F).

2. In Cores 103-638B-32R to 103-638B-45R (lithologic Unit III), radiolarians are confined to silty-sandy layers and are scarce (except for Samples 103-638B-35R-1, 148–150 cm, 103-638B-43R-1, 148–150 cm, and 103-638B-45R-1, 146–150 cm, where radiolarians are common but mainly recrystallized). Many internal molds of pyrite (with or without the original skeleton) are also observed (Fig. 19G). This recrystallization, together with

| Sample           | Abundance   |                |               | Preservation | Determinable | <i>Archaeospongoporum cortinaensis</i> | <i>Cecrops septemporatus</i> | <i>Pseudodictyonitra liliyae</i> | <i>Sethocapsa trachyostraca</i> | <i>Sethocapsa uterulus</i> | <i>Siphocampium(?) davidi</i> | <i>Thanaria pulchra</i> | <i>Theocorys renzae</i> | <i>Triactoma hybum</i> | <i>Tritrabs ewingi</i> | <i>Pantanellium lanceola</i> | Age                    | Lithologic units           | Preservation of radiolarians      | Lithologies having radiolarians |
|------------------|-------------|----------------|---------------|--------------|--------------|----------------------------------------|------------------------------|----------------------------------|---------------------------------|----------------------------|-------------------------------|-------------------------|-------------------------|------------------------|------------------------|------------------------------|------------------------|----------------------------|-----------------------------------|---------------------------------|
|                  | ○ Rare/poor | ◐ Few/moderate | ● Common/good |              |              |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-21R, CC | ●           | ◐              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              | Barremian/early Aptian | Silica                     | Bioturbated marlstone             |                                 |
| 103-638B-22R, CC | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              | Lithologic Unit II     | Silica + zeolites + pyrite |                                   |                                 |
| 103-638B-23R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-24R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-25R, CC | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-26R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-27R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-28R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-29R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-30R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-31R, CC | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-32R, CC | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     | Mud, silt, fine-grained sandstone |                                 |
| 103-638B-33R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-34R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-35R - 1 | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-36R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-37R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-38R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-39R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-40R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-41R - 1 | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-42R, CC | ○           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        |                            |                                   |                                 |
| 103-638B-43R - 1 | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-44R - 1 | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |
| 103-638B-45R, CC | ●           | ○              | ○             | ○            | ○            |                                        |                              |                                  |                                 |                            |                               |                         |                         |                        |                        |                              |                        | Pyrite                     |                                   |                                 |

Figure 18. Radiolarian distribution, Hole 638B.

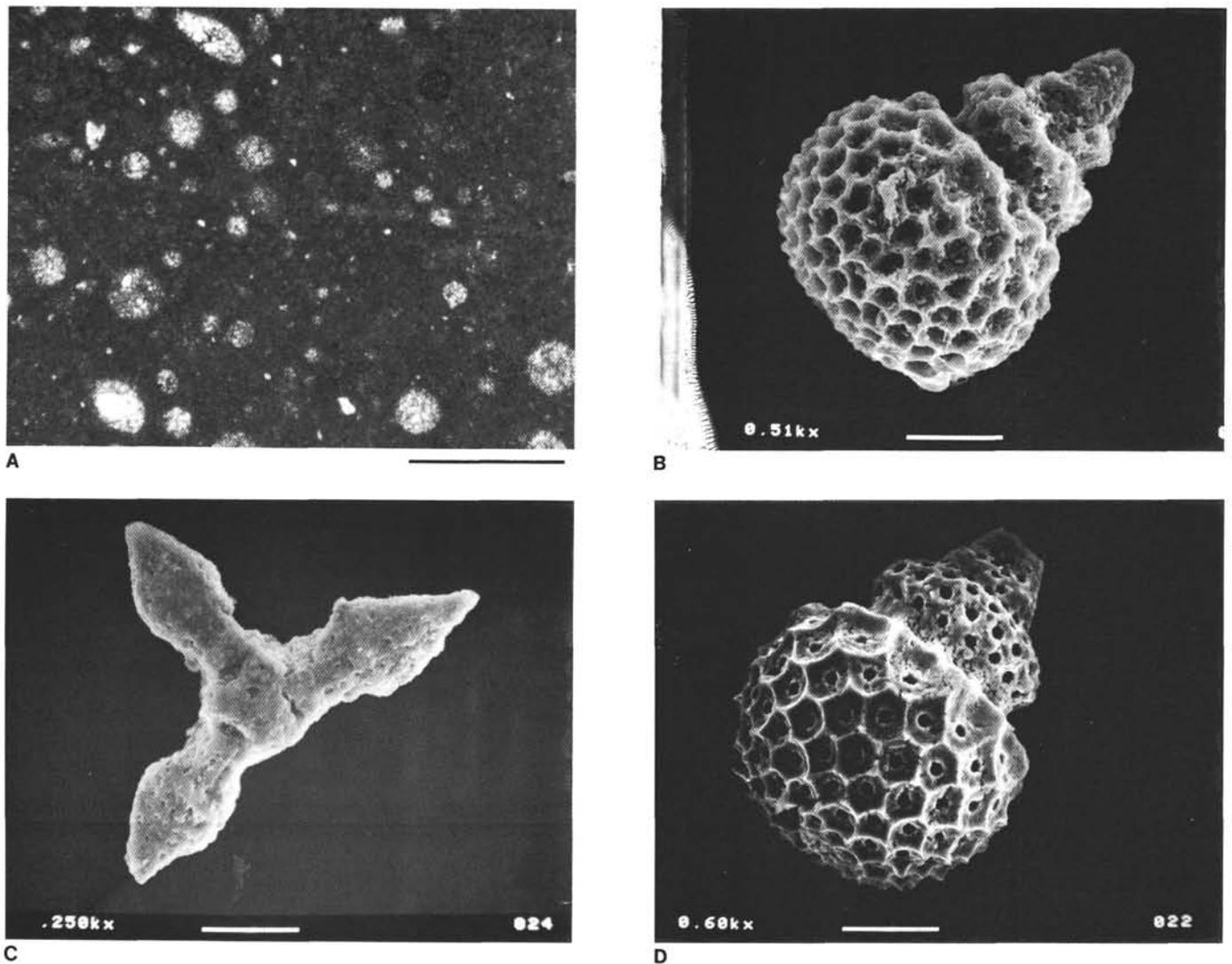


Figure 19. Preservation of radiolarians from the Hauterivian-Barremian interval of Hole 638B. A. Bioturbated marlstone with calcite-replaced radiolarians. (Thin-section of Sample 103-638B-22R-1, 94–96 cm.) Scale bar, 500  $\mu\text{m}$ . B. Quartz recrystallization of radiolarian test (*Sethocapsa uterculus*). Scale bar, 40  $\mu\text{m}$ . (Sample 638B-21R-1, 4–6 cm.) C. Dissolution pattern of radiolarian test recrystallized in quartz. Scale bar is 80  $\mu\text{m}$ . (Sample 103-638B-21R, CC.) D. Pyrite recrystallization of radiolarian test. Scale bar, 35  $\mu\text{m}$ . (Sample 103-638B-25R, CC.) E. Mold of radiolarian test (*Pseudodictyomitra* sp.) Scale bar, 45  $\mu\text{m}$ . (Sample 638B-22R, CC.) F. Close up of E, with zeolite crystals. Scale bar, 10  $\mu\text{m}$ . G. Pyrite mold of radiolarians with pyrite overgrowth. Scale bar, 50  $\mu\text{m}$ . (Sample 103-638B-31R, CC.) H. Pyrite crystals growing from radiolarian test that is recrystallized in pyrite (*Archaeodictyomitra*). Scale bar, 40  $\mu\text{m}$ . (Sample 103-638B-31R, CC.)

crystal overgrowth by pyrite, masks specimens and does not allow the determination of significant taxa (Fig. 19H).

The zonation established by Schaaf (1984) for the Lower Cretaceous could not be used owing to the lack of the marker species in Hole 638B. However, use of his range chart and the detailed description of characteristic short-ranging taxa enabled the time interval drilled to be fixed. Results correspond to the data for nanofossils and foraminifera (Fig. 18). All samples with well-preserved radiolarians contain some elements in common, although not all the distinctive species are present in all the samples. The rich assemblage in Sample 103-638B-21R-1, 4–6 cm, contains numerous taxa that indicate a Hauterivian/Barremian age. More precisely, the co-occurrence of *Siphocampium*(?) *davidi*, *Theocorys renzae*, *Cecrops septemporatus*, *Sethocapsa uterculus*, and *Pseudodictyomitra lilyae* indicates a middle Hauterivian to middle Barremian age. A few specimens of *Archaeospongoprimum cortinaensis* and *Triactoma hybum*, known to

have their lowest occurrence at the base of the Barremian, suggests early to middle Barremian age. Sample 103-638B-21R-5, 52–54 cm (dissolved limestone), contains *Grolanium pythiae*, the marker species for late Barremian/early Aptian, and restricts Core 103-638B-21R to this age. The equally rich fauna in Sample 103-638B-25R, CC, contains almost the same assemblage, except that the occurrence of *Tritrabs ewingi* and taxa similar to *Sethocapsa trachyostraca* restrict the age to Hauterivian-earliest Barremian. The poor preservation in Samples 103-638B-31R, CC, 103-638B-41R-1, 148–150 cm, and 103-638B-44R, CC, prevents a precise age assignment, although the occurrence of *Sethocapsa uterculus* and *Sethocapsa* cf. *trachyostraca* makes a Hauterivian age reasonable. Moreover, this is supported by Sample 103-638B-31R-2, 34–38 cm, which contains *Dibolachras tythopora*(?), *Sethocapsa leiostraca*, and *S. trachyostraca*. The co-occurrence of these forms indicate an Hauterivian age for this sample.

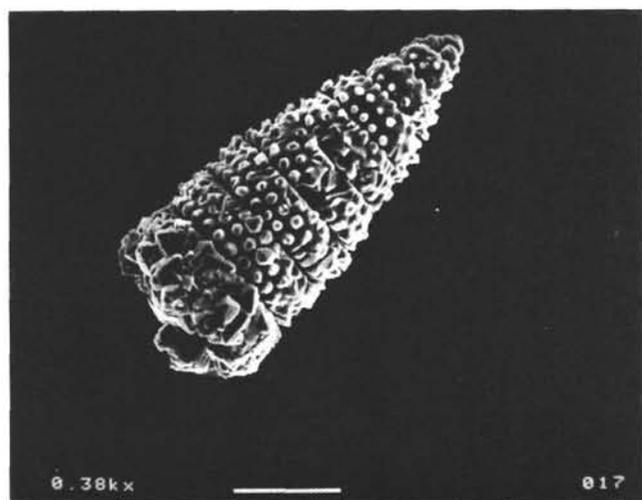
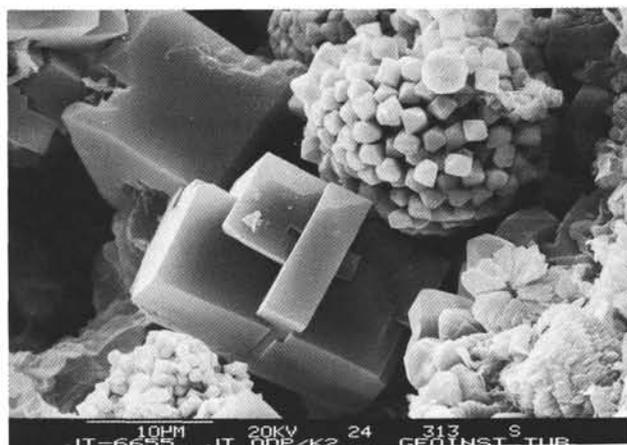
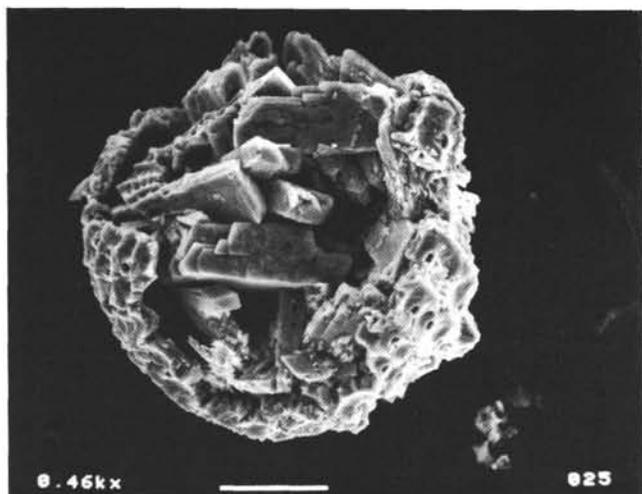


Figure 19 (continued).

### Hole 638C

Radiolarians are generally common in Hole 638C. All faunas are recrystallized in pyrite having strong crystal overgrowth. Except in only a few specimens, pyrite molds are preserved.

Sample 103-638C-5R, CC, contains *Podocapsa* cf. *amphitreptera*, a taxon having its latest occurrence in the middle Berriasian of the Tethys region (Baumgartner, 1984) and in the middle Valanginian of the Pacific Ocean (Schaaf, 1984). The co-occurrence of the nannofossil *Calcicalathina oblongata* supports a middle Valanginian age for this sample.

### Summary

1. Site 638, drilled on the Iberian margin, recovered sediments ranging in age from Valanginian to Quaternary.
2. Foraminifers and nannofossils are generally well preserved and abundant in the Neogene-Quaternary sequence of calcareous ooze.
3. The oldest Neogene sediments recovered are late Miocene in age.
4. The upper Miocene is unconformably underlain by Lower Cretaceous sediments of late Barremian age.
5. Foraminifers are rare or absent in all Lower Cretaceous sediments of Hole 638B and 638C. Nannofossils are generally

more abundant and better preserved. Radiolarians are present but generally poorly preserved and mainly pyritized.

6. Foraminiferal, nannofossil, and radiolarian evidence indicates the presence of upper Barremian, Hauterivian, and Valanginian sediments.

Figure 20 summarizes the biostratigraphic conclusions derived through examination of foraminifers, nannofossils, and radiolarians present in sediment recovered from Hole 638B.

### PALEOMAGNETICS

The shipboard paleomagnetism program at Site 638 consisted entirely of sampling for magnetostratigraphy after it became apparent that rust-flake contamination rendered whole-round rotary-core analysis useless (as explained in the "Explanatory Notes" chapter, this volume). None of the discrete samples were analyzed aboard ship, owing to their weak intensities (generally only slightly above the background noise related to the roll of the ship) and the lack of thermal-demagnetization equipment.

Forty-one oriented cubes (6 cm<sup>3</sup>) were collected from the Neogene nannofossil ooze of Cores 103-638B-7R through 103-638B-20R, and 202 oriented minicores and cubes were taken from the Lower Cretaceous limestone and turbidites of Cores 103-638B-20R through 103-638B-45R and Cores 103-638C-1R through 103-638C-14R. Intervals in the Lower Cretaceous that are unaf-

| Core catcher | Foraminiferal age                  | Nannofossil age   | Radiolarian age  |             |
|--------------|------------------------------------|-------------------|------------------|-------------|
| 1R           | early Pleistocene                  | early Pleistocene |                  |             |
| 2R           | late Pliocene                      | late Pliocene     |                  |             |
| 3R           |                                    |                   |                  |             |
| 4R           | early-mid-Pliocene                 | early Pliocene    |                  |             |
| 5R           |                                    |                   |                  |             |
| 6R           |                                    |                   |                  |             |
| 7R           |                                    |                   |                  |             |
| 8R           |                                    |                   |                  |             |
| 9R           |                                    |                   |                  |             |
| 10R          |                                    |                   |                  |             |
| 11R          | late Miocene                       | late Miocene      |                  |             |
| 12R          |                                    |                   |                  |             |
| 13R          |                                    |                   |                  |             |
| 14R          |                                    |                   |                  |             |
| 15R          |                                    |                   |                  |             |
| 16R          |                                    |                   |                  |             |
| 17R          |                                    |                   |                  |             |
| 18R          |                                    |                   |                  |             |
| 19R          |                                    |                   |                  |             |
| 20R          | late Barremian                     | late Barremian    | Barremian        |             |
| 21R          |                                    |                   |                  |             |
| 22R          |                                    |                   |                  |             |
| 23R          |                                    |                   |                  |             |
| 24R          | mid-Valanginian to early Barremian |                   |                  |             |
| 25R          |                                    |                   |                  |             |
| 26R          |                                    |                   |                  |             |
| 27R          |                                    |                   |                  |             |
| 28R          |                                    |                   |                  |             |
| 29R          |                                    |                   |                  |             |
| 30R          |                                    |                   |                  |             |
| 31R          | No age-diagnostic fossils          |                   |                  |             |
| 32R          |                                    |                   |                  |             |
| 33R          |                                    |                   | Hauterivian      | Hauterivian |
| 34R          |                                    |                   |                  |             |
| 35R          |                                    |                   | late Valanginian |             |
| 36R          |                                    |                   |                  |             |
| 37R          |                                    |                   |                  |             |
| 38R          |                                    |                   |                  |             |
| 39R          |                                    |                   |                  |             |
| 40R          |                                    |                   |                  |             |
| 41R          |                                    |                   |                  |             |
| 42R          |                                    |                   |                  |             |
| 43R          |                                    |                   |                  |             |
| 44R          |                                    |                   |                  |             |
| 45R          |                                    |                   |                  |             |

Figure 20. Biostratigraphic summary of Hole 638B.

ected by slumping have an apparent dip of 19° to 23° in Hole 638B and 10° to 15° in Hole 638C (the difference is thought to be caused by the greater deviation from vertical of Hole 638B). The relative declination of the paleomagnetic samples with respect to this dip direction was recorded for use in declination control during later analysis. Pelagic sediment (bioturbated limestone/chalk or laminated marlstone) was sampled preferentially, though several samples were taken in the finer grained clastic turbidites of Hauterivian-Valanginian age.

**Shore-Based Analysis Procedure**

A detailed description of the paleomagnetic sample measurement and data analysis procedures is given by Ogg (in press) and in the paleomagnetism chapters that will be published in the Leg 103 Part B volume. These procedures are summarized as follows:

The samples were analyzed with a two-axis cryogenic magnetometer at the paleomagnetism laboratory of the University of Wyoming. Progressive thermal demagnetization was the main technique for determining the characteristic magnetization, but alternating field (AF) demagnetization was applied to those samples contained in plastic cubes (the Neogene-ooze suite and 40 cubes from the Lower Cretaceous of Hole 638B). Magnetic polarity was determined from the plots of the magnetic vectors during demagnetization. Least-squares line fit of the removed vectors (Kirschvink, 1980) yielded the characteristic direction of magnetization for samples having straight-forward demagnetization behavior. Samples that (1) displayed unstable endpoints, (2) became magnetically viscous upon demagnetization, or (3) gave unusual directions were assigned indeterminate or uncertain polarity.

**Neogene Ooze (Middle Pliocene-Late Miocene; Cores 103-638B-7R through 103-638B-20R)**

Recovery of the Neogene sediment was generally less than 50%, and much of this recovered material was heavily disturbed; as a result, the samples taken of undisturbed intervals are too sparse for deriving a magnetostratigraphic pattern (Fig. 21). The tentative assignments of standard polarity chrons are based entirely on the foraminiferal ages of the polarity zones and the biostratigraphy-magnetic polarity time scale of Berggren et al. (in press). These assignments are not considered to be reliable.

**Lower Cretaceous Limestone and Turbidites (Barremian-Late Valanginian; Cores 103-638B-20R to 103-638B-45R and 103-638C-1R to 103-638C-14R)**

The intensity of magnetization of Lower Cretaceous limestones at Site 638 and other sites are generally weak, commonly less than  $5 \times 10^{-8}$  emu/cm<sup>3</sup> ( $= 5 \times 10^{-5}$  A/m). Nearly two-thirds of the samples yielded reliable polarity determinations.

The correlation of magnetic polarity chrons to biostratigraphy is not yet known in precise detail. The Early Cretaceous magnetic polarity time scale compiled by Ogg (in press) is based primarily on magnetostratigraphy, dinoflagellate zonations, and nannofossil datums from DSDP sites in the western Central Atlantic. The dinoflagellate biostratigraphy of the Leg 103 sites was not yet complete at the time of this writing; therefore, the nannofossil datums were used to assign tentative polarity chrons to the observed magnetic polarity zones. Several of the nannofossil datums occur in a slightly different sequence than at other sites, and the occurrence of different species enabled the use of a Boreal zonation rather than the central Atlantic zonation. A more accurate assignment of polarity chrons will be possible when the dinoflagellate biostratigraphy is available. The polarity pattern by itself is too vague or too distorted by variations in sedimentation rate to enable direct matching of magnetostratig-

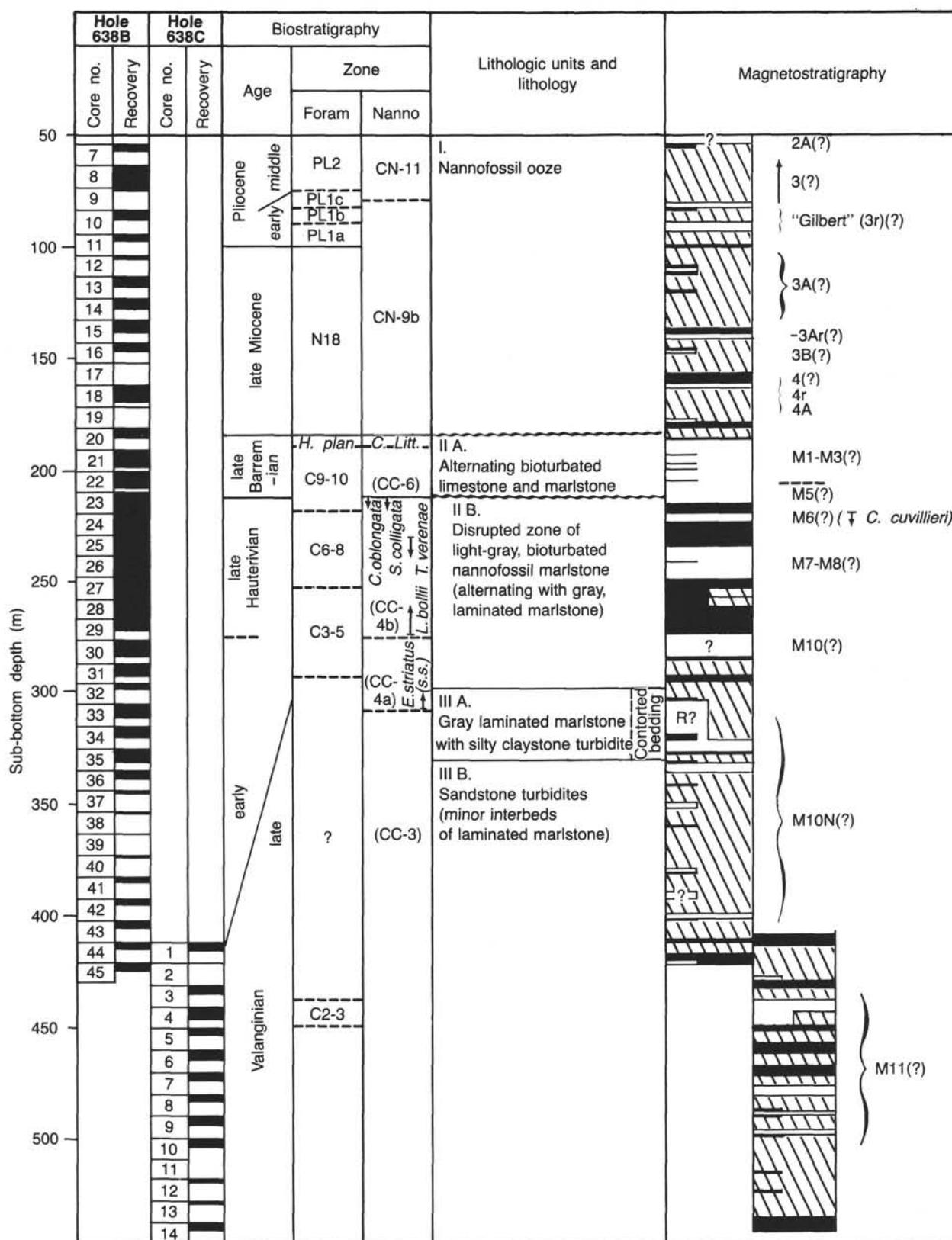


Figure 21. Magnetostratigraphy with tentative assignment of polarity chrons of Holes 638B and 638C. Black shading is normal polarity zones, and white is reversed polarity. Diagonal pattern indicates gaps in recovery or intervals of indeterminate or unreliable polarity. A half bar represents a single sample having a polarity interpretation opposite the adjacent samples or indicates that only one sample was available for the core. Assignment of magnetic polarity chrons is the best current guess based upon the biostratigraphy given in this site chapter and upon published magnetic polarity time scales. Complete tables of the paleomagnetic data and polarity interpretations will be given in the Leg 103 Part B volume.

raphy to the magnetic polarity time scale without accurate biostratigraphic age control.

The middle-late Barremian (*M. hoschulzii* nannofossil zone, basal Core 103-638B-20R to middle of Core 103-638B-23R) yielded predominantly reversed polarity; this zone may correspond to polarity chrons M1 and/or upper M3 of similar age. The early Barremian and latest Hauterivian is not present at this site.

The underlying disrupted (slumped?) limestone of late Hauterivian age (lithologic Subunit IIB) has the last occurrence of *C. cuvillieri* just below a narrow reversed polarity zone in Core 103-638B-24R; this nannofossil datum occurs below polarity chron M6 in the western central Atlantic. The last occurrence of *T. verena* is not a useful datum, and the first occurrence of *L. bollii* has not been previously correlated to magnetic polarity chrons because it does not occur in the western central Atlantic. According to the shipboard age determinations, the other reversed polarity zones in this unit may represent M9 through M5, but exact assignment is not possible at this time. Overturned strata may be within this disrupted unit (and the underlying contorted bedding of lithologic Subunit IIIA), which cause misleading polarity identifications.

The late Valanginian-earliest Hauterivian is dominated by clastic turbidites. Core recovery was generally poor, but the rapid

rate of sedimentation enables recognition of at least three normal polarity zones within a predominantly reversed polarity interval. The first occurrence of *C. striatus* (sensu stricto) was noted in Core 103-638B-33R, which was used as a marker for the Valanginian/Hauterivian boundary. If this proves to correspond to the Valanginian/Hauterivian boundary, as defined by dinoflagellate biostratigraphy, then the reversed polarity dominating Cores 103-638B-33R to 103-638B-43R includes polarity chron M10N. Polarity chron M11 could be present in Hole 638C. No early Valanginian was penetrated; therefore, the oldest possible polarity chron present is M12. We hope that a correction for turbidite expansion and a dinoflagellate-age control will improve these tentative guesses of polarity chrons.

## ORGANIC GEOCHEMISTRY

### Organic Carbon Analysis

Seventy-seven sediment samples were taken at Site 638 for organic carbon and nitrogen determination, using the Perkin-Elmer elemental analyzer. Results of the organic carbon percentage on a dry-sediment weight basis and percentage carbonate are plotted vs. depth in Figure 22. Because of technical problems, reliable determination of elemental nitrogen was impossible. Since

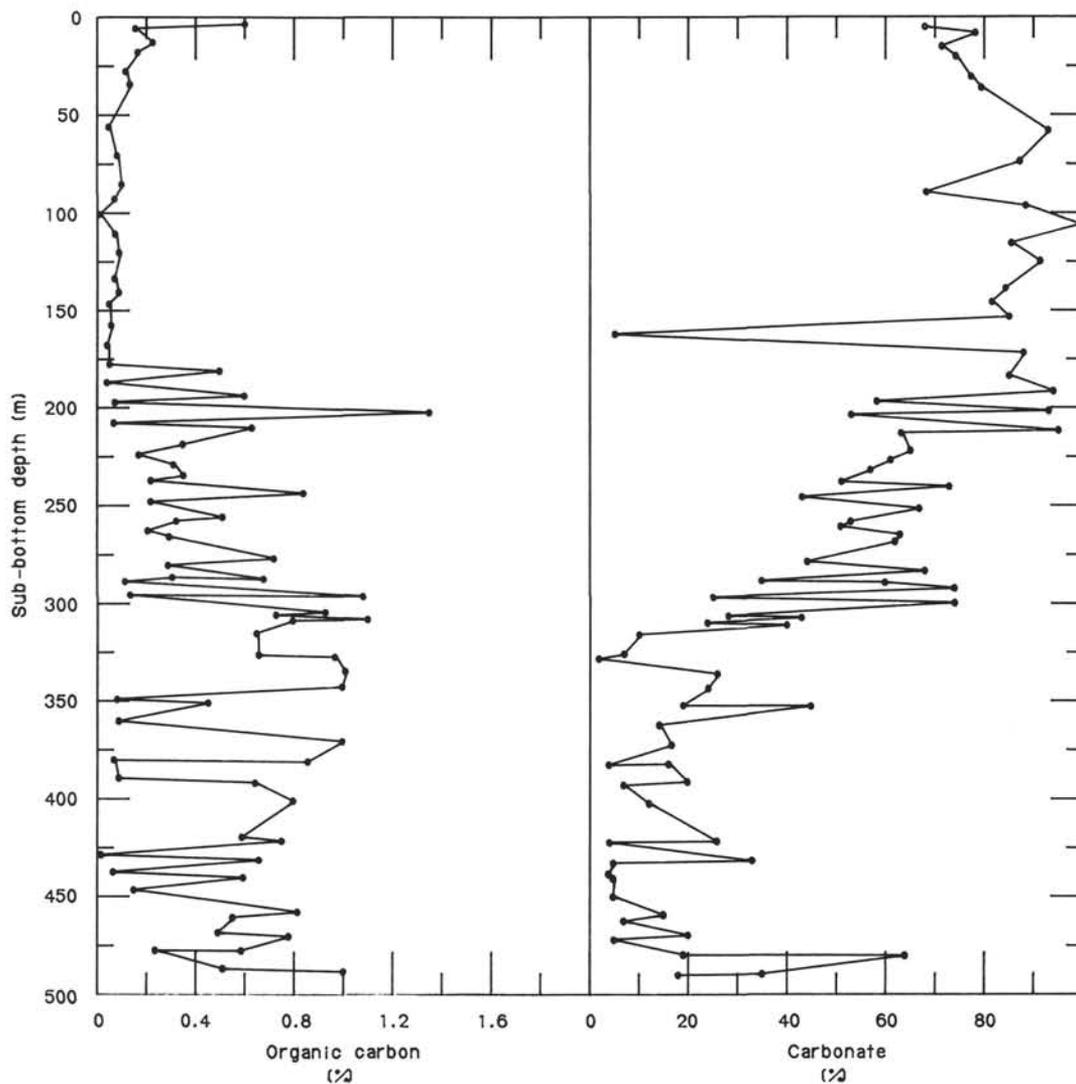


Figure 22. Organic carbon and carbonate percentage vs. sub-bottom depth (m).

atomic carbon-to-nitrogen ratios were not available, the type of organic matter (marine vs. terrestrial) was based solely on Rock-Eval interpretation.

The amount of organic matter preserved in deep-ocean sediments is a small fraction of the material originally available from continental runoff and marine productivity. Microbial and oxidative processes degrade sinking organic matter, losses being greatest during the early stages of burial. High sedimentation rates decrease the sediment/water interface time and tend to enhance preservation. Still higher sedimentation rates, however, act to dilute organic matter. In general, preservation of organic matter at Site 638 is closely related to lithology and depositional setting.

From 0 to 180 m sub-bottom depth, preservation of organic matter is poor, averaging 0.11%, which is below the 0.3% average for ancient deep-ocean sediments (McIver, 1975). This 180 m of organic-lean sediment corresponds to lithologic Unit I (see "Sediment Lithology" section, this chapter). Below 180 m sub-bottom depth, organic carbon concentrations become cyclic, exhibiting alternating organic-carbon-rich and -lean layers. Within lithologic Subunit IIA, organic-carbon-lean layers are bioturbated limestones, whereas organic-carbon-rich layers are marlstones. Organic matter is moderately well preserved from 213 to 298 m sub-bottom (Subunit IIB), averaging 0.40%.

In Subunit IIIA organic matter is well preserved, averaging 0.86%. In Subunit IIIB, from 330 m sub-bottom to the total depth of Hole 638C (547 m), organic carbon concentrations vary with the three major lithologies. Organic-rich layers (about 1.0%) are associated with the claystone, moderate organic-rich layers (about 0.6%) with marlstone, and organic-carbon-lean layers (about 0.1%) with sandstone. Preservation of organic carbon within Subunit IIIB is directly related to grain size: clay-size particles show very good preservation, silt moderate preservation, and sand poor preservation.

### Rock-Eval Analysis

Ten samples representing all the various sediment types recovered at Site 638 were analyzed using the Rock-Eval. Results are shown in Figure 23, using a modified van Krevelen diagram. The organic matter at Site 638 is composed mostly of terrigenous (Type III) kerogen. The hydrogen index (HI) and oxygen index (OI) average 158 and 295, respectively. High OI values such as these may indicate highly oxidized reworked organic matter. Such high oxidation or reworking may obscure the original character of the organic matter by diagenetic alterations. The temperature of the S2 peak maximum ( $T_{max}$ ) is an indicator of the maturation of the organic matter (Espitalie et al., 1977);  $T_{max}$  values for the ten samples average 409°C. This low value indicates a low thermal history for the preserved kerogen.

### Organic Carbon Isotope Analyses

Organic carbon isotope values are listed in Table 3. Isotope interpretation will be discussed in the Leg 103 Part B volume.

### Summary

The preservation of organic matter in lithologic Unit I is poor and indicates normal degradation of deep-ocean organic matter. The layers rich in terrestrial organic matter in lithologic Units II and III must have originally been deposited in a shallow-water nearshore environment. In such a location, preservation is enhanced by higher sedimentation rates and shorter water-column residence times.

## INORGANIC GEOCHEMISTRY

### Interstitial-Water Chemistry

Eighteen whole-round sediment samples were taken from the rotary-drilled cores recovered at Site 638. The sampling strategy

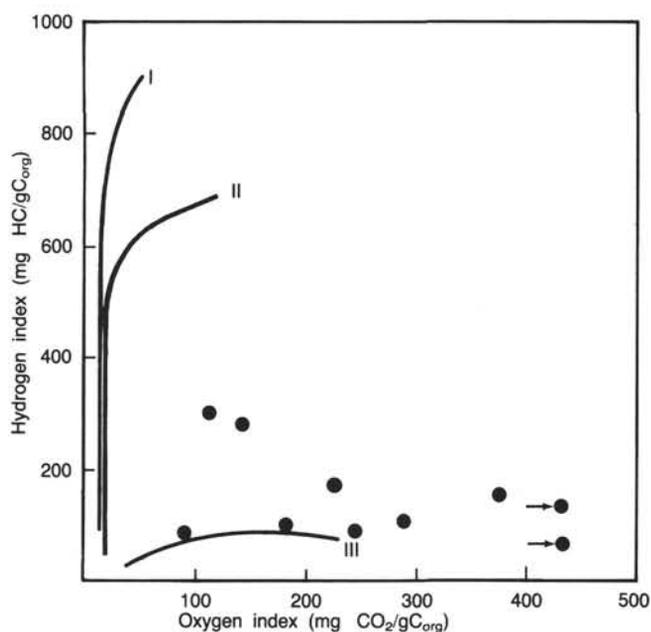


Figure 23. Modified van Krevelen plot of Rock-Eval results from Site 638. Arrows beside samples indicate oxygen index values greater than 400.

was to obtain one sample from each of the cores in the upper 50 m of the sediment column and two samples from the subsequent 40 m of cored sediment. Below 90 m sub-bottom depth, a sediment sample was taken every third core for interstitial-water analysis. This strategy was followed where sufficient sediment (i.e., at least 1.5 m) was recovered in the designated core. These samples were squeezed aboard ship to obtain the interstitial waters from the sediment. The water samples were analyzed for pH, alkalinity, chlorinity, salinity, calcium, and magnesium. The same methods used at Site 637 were employed for the samples recovered at Site 638. Once again, the primary standard used for calibration of the water analysis is IAPSO standard seawater, and a surface-seawater sample retrieved by a bucket overboard was used for comparison with the interstitial waters.

The results, listed in Table 4 and graphed in Figure 24, show some variation in the parameters with increasing depth. Alkalinity increases to a weak maximum in the upper 168 m of the sediment column, except for an abrupt decrease in one sample at 126 m sub-bottom depth (Sample 103-638B-14R-2, 140-150 cm). This trend toward increasing alkalinity values occurs in lithologic Unit I, which is composed primarily of nannofossil ooze.

The abrupt drop in alkalinity at 126 m may be attributed to drilling contamination by surface seawater having a much lower alkalinity value of 2.07 meq/kg. Discussion with Lamar Hayes, ODP Operations Superintendent, supports this theory because, if contamination were to occur, it would be with seawater from 20 ft below sea level, which is pumped down the hole as a circulating fluid. The sample taken at 126 m sub-bottom depth may have been contaminated with this surface seawater during drilling, as indicated by the soupy nature and slurry of sediment revealed in the split core (Fig. 25).

Below Sample 103-638B-18R-4, 140-150 cm, at 168 m sub-bottom depth, alkalinity progressively decreases to Sample 103-638B-29R-2, 140-150 cm, at 270 m sub-bottom depth. The beginning of this decrease in alkalinity roughly corresponds to the lithologic change from late Miocene nannofossil ooze (Unit I) to Barremian marlstone and limestone (Unit II); it continues through most of lithologic Unit II. This progressive decrease in alkalinity is not interpreted as being the result of surface-seawa-

**Table 3. Organic carbon isotope values, Site 638. HI = hydrogen index; OI = oxygen index.**

| Sample<br>(interval in cm) | Sub-bottom<br>depth<br>(m) | Age         | Organic<br>carbon<br>(%) | CaCO <sub>3</sub><br>(%) | $\delta^{13}\text{C}$ | HI  | OI  |
|----------------------------|----------------------------|-------------|--------------------------|--------------------------|-----------------------|-----|-----|
| 103-638B 20R-2, 143-147    | 183.53                     | Barremian   | 0.05                     | 88                       | -24.7                 | 260 | 640 |
| 103-638B 20R-3, 4-9        | 183.64                     | Barremian   | 0.91                     | 49                       | -26.2                 | 60  | 46  |
| 103-638B 21R-2, 94-100     | 192.54                     | Barremian   | 0.37                     | 76                       | -26.2                 | 27  | 48  |
| 103-638B 21R-3, 78-84      | 193.88                     | Barremian   | 2.0                      | 32                       | -28.3                 | 216 | 35  |
| 103-638B 21R-6, 67-73      | 198.27                     | Barremian   | 1.63                     | 41                       | -27.7                 | 221 | 47  |
| 103-638B 23R-2, 19-25      | 210.99                     | Barremian   | 2.03                     | 30                       | -26.7                 | 158 | 46  |
| 103-638B 23R-2, 139-145    | 212.19                     | Barremian   | 0.16                     | 79                       | -26.7                 | 81  | 93  |
| 103-638B 23R-3, 20-26      | 212.50                     | Barremian   | 2.39                     | 28                       | -26.8                 | 111 | 47  |
| 103-638B 25R-2, 20-24      | 230.10                     | Hauterivian | 1.44                     | 33                       | -29.4                 | 3   | 0   |
| 103-638B-25R-2, 28-35      | 230.18                     | Hauterivian | 0.18                     | 57                       | -26.6                 | 138 | 333 |
| 103-638B 26R-1, 14-19      | 238.24                     | Hauterivian | 1.46                     | 41                       | -26.5                 | 80  | 43  |
| 103-638B 35R-4, 86-91      | 330.26                     | Hauterivian | 3.0                      | 5                        | -25.8                 | 18  | 11  |
| 103-638B 41R-1, 19-21      | 383.99                     | Hauterivian | 0.85                     | 7                        | -25.3                 | 87  | 36  |
| 103-638B-41R-1, 37-43      | 384.17                     | Hauterivian | 0.71                     | 26                       | -25.1                 | 47  | 19  |
| 103-638C 1R-2, 94-96       | 412.84                     | Valanginian | <sup>a</sup> na          | na                       | -24.9                 | na  | na  |
| 103-638C 3R-2, 118-120     | 433.88                     | Valanginian | 0.66                     | 5                        | -26.4                 | na  | na  |
| 103-638C 5R-1, 98-100      | 451.48                     | Valanginian | 0.15                     | 5                        | -28.5                 | na  | na  |
| 103-638C 9R-1, 120-122     | 490.40                     | Valanginian | na                       | na                       | -25.7                 | na  | na  |
| 103-638C 9R-2, 77-79       | 491.47                     | Valanginian | 1.0                      | 18                       | -27.3                 | na  | na  |

<sup>a</sup> na = not available.**Table 4. Shipboard interstitial-water analyses, Site 638.**

| Sample<br>(interval in cm) | Sub-bottom<br>depth<br>(m) | pH   | Alkalinity<br>meq/kg | Salinity<br>‰ | Chlorinity<br>‰ | Ca <sup>++</sup><br>mmol/L | Mg <sup>++</sup><br>mmol/L |
|----------------------------|----------------------------|------|----------------------|---------------|-----------------|----------------------------|----------------------------|
| 103-638B-1R-2, 140-150     | 2.9-3.0                    | 7.62 | 3.25                 | 33.8          | 18.67           | 10.51                      | 50.96                      |
| 103-638B-2R-4, 140-150     | 12.3-12.4                  | 7.50 | 3.40                 | 34.5          | 19.57           | 10.86                      | 51.89                      |
| 103-638B-3R-1, 140-150     | 17.4-17.5                  | 7.25 | 3.31                 | 35.3          | 19.87           | 10.83                      | 51.04                      |
| 103-638B-4R-4, 140-150     | 31.4-31.5                  | 7.33 | 3.77                 | 35.0          | 19.68           | 10.89                      | 50.19                      |
| 103-638B-7R-1, 140-150     | 55.8-55.9                  | 7.28 | 4.02                 | 36.3          | 19.87           | 11.19                      | 51.08                      |
| 103-638B-11R-2, 140-150    | 96.6-96.7                  | 7.32 | 4.40                 | 34.7          | 19.77           | 12.47                      | 48.05                      |
| 103-638B-14R-2, 140-150    | 125.8-125.9                | 7.62 | 3.28                 | 35.0          | 19.40           | 12.06                      | 48.62                      |
| 103-638B-18R-4, 140-150    | 167.4-168.5                | 7.55 | 4.55                 | 34.3          | 18.92           | 14.03                      | 44.50                      |
| 103-638B-21R-3, 140-150    | 194.5-194.6                | 7.43 | 3.78                 | 34.1          | 17.41           | 13.61                      | 47.47                      |
| 103-638B-24R-5, 140-150    | 226.2-226.3                | 7.52 | 3.13                 | 34.3          | 18.75           | 13.65                      | 45.59                      |
| 103-638B-26R-5, 140-150    | 245.5-245.6                | 7.50 | 2.77                 | 36.0          | 19.41           | 13.12                      | 44.93                      |
| 103-638B-29R-2, 140-150    | 269.9-270.0                | 7.48 | 2.25                 | 34.1          | 17.13           | 12.83                      | 46.10                      |
| 103-638B-32R-1, 140-150    | 297.4-297.5                | 7.73 | 2.43                 | 35.0          | 19.60           | 13.42                      | 46.42                      |
| 103-638B-35R-3, 140-150    | 329.3-329.4                | 7.50 | 2.61                 | 34.9          | 18.57           | 14.52                      | 45.44                      |
| 103-638B-45R-2, 140-150    | 424.4-424.5                | 7.53 | 3.87                 | 34.7          | 17.93           | 17.34                      | 43.82                      |
| 103-638C-4R-2, 140-150     | 443.8-443.9                | 7.63 | 4.99                 | 35.2          | 20.12           | 17.23                      | 45.00                      |
| 103-638C-7R-2, 140-150     | 472.8-472.9                | 7.43 | 3.77                 | 35.3          | 20.17           | 18.53                      | 43.86                      |
| 103-638C-10R-1, 140-150    | 500.3-500.4                | 7.53 | 3.42                 | 35.5          | 20.19           | 18.06                      | 45.18                      |

ter contamination because a progressive increase in drilling disturbance from Core 103-638B-18R through Core 103-638B-29R is not apparent and the difference in the degree of drilling disturbance in Core 103-638B-29R from that in Core 103-638B-28R or Core 103-638B-30R, both of which have higher alkalinity values, is not significant.

Near the base of Unit II, (Sample 103-638B-32R-1, 140-150 cm; 297 m sub-bottom depth), the alkalinity values begin to rise and continue gradually to increase to the bottom of Hole 638B (Sample 103-638B-45R-2, 140-150 cm, at 424 m sub-bottom depth). The alkalinity values continue to increase at deeper sub-bottom depths (443.8-500.3 m sub-bottom depth) in Unit III from Hole 638C. The gradual increase in alkalinity may be a result of high sedimentation rates and high organic carbon contents associated with the terrigenous turbidites in Unit III.

Total dissolved solids were measured using a Goldberg refractometer and are listed under salinity in Table 4 (as has been the convention with previous DSDP and ODP interstitial-water data). In Hole 638B, "salinity" and chlorinity values show no significant downhole trends of a progressive increase or decrease. A consistent and distinct shift is in both the chlorinity and salini-

ty values in lithologic Unit II, specifically in Subunit IIB, which may relate to the lithologies generated from slumping and down-slope sediment creep. In Hole 638C, salinity and chlorinity values are greater than those of interstitial waters from all the Hole 638B samples (Table 4). These samples from Unit III of Hole 638C are from deeper sub-bottom depths (443.8-500.3 m sub-bottom depth) than are the samples from Unit III from Hole 638B. This trend of higher values in Hole 638C is real and not due to differences in the operator's titration technique because the IAPSO seawater standard was re-run for calibration between samples from Hole 638B and 638C. Additionally, the difference between 17.93‰ chlorinity (Sample 103-638B-45R-2, 140-150 cm; 424.4 m sub-bottom depth) and 20.12‰ chlorinity (Sample 103-638C-4R-2, 140-150 cm; 443.8 m sub-bottom depth) is significantly greater than the common margin of error for these chlorinity titrations. The same operator can achieve accuracies better than 0.5% (Gieskes and Peretsman, 1986). The increase in the salinity and especially the chlorinity values may be interpreted in several ways. They may be the result of a small, nearby occurrence of gypsum rather than the dissolution of a large-scale deposit of evaporites because the diffusional gradi-

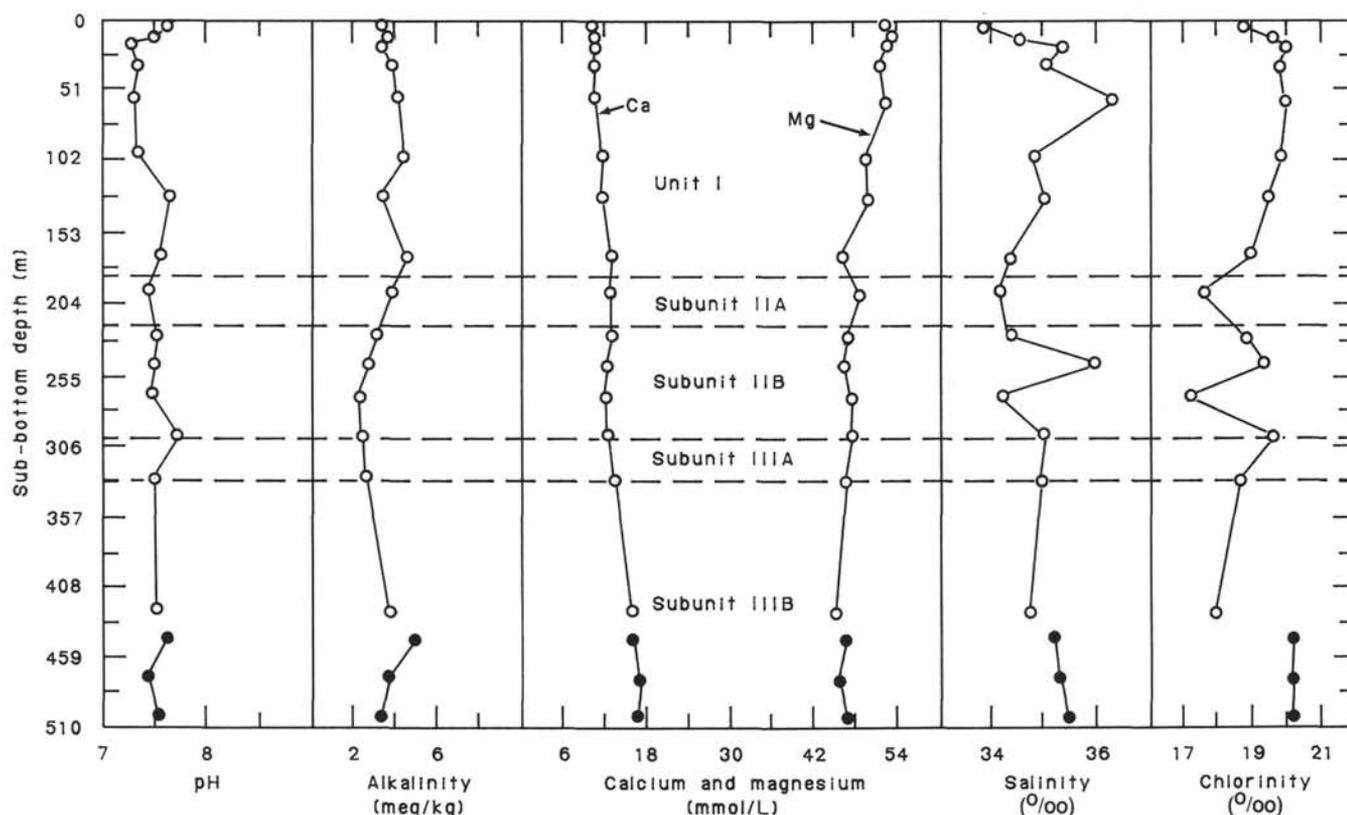


Figure 24. Summary of interstitial-water data from Site 638 and depth boundaries of the lithologic units. Data are given in Table 4. Data from Hole 638B are plotted as open symbols, whereas data from Hole 638C are plotted as solid symbols.

ent should be much higher. Another interpretation is that a highly porous nearby bed may be acting as an open system, owing to a seafloor outcrop and coincident contact and mixing with seawater at a location distant from Site 638.

The calcium and magnesium concentrations in the interstitial waters at Site 638 show distinct trends downhole. The calcium values gradually increase, whereas the magnesium values decrease with increasing sub-bottom depth (Fig. 26). A one-to-one relationship does not exist because the decrease in the magnesium concentration is not equal to the increase in the calcium concentration. The changes in the calcium values may be related to calcium carbonate dissolution or to release of calcium during dissolution of some silicates and reprecipitation as calcite cements or as zeolites. The decrease in magnesium downhole may be due to uptake in the detrital clay minerals such as chlorite. Much of the biotite in lithologic Unit III has been chloritized.

### Calcium Carbonate

Approximately 150 dried sediment samples were analyzed for percentage carbonate, and the results are listed in Table 5 and graphed with respect to depth in Figure 27. These results yield a representative picture of the various lithologies recovered. Several distinct patterns appear in Figure 27, superimposed on the overall decrease in percentage carbonate from the top of the sedimentary column to the lowermost sample. Lithologic Unit I consists of nannofossil ooze having high carbonate contents (62%–99%). The single sample that is low in carbonate at 161.8 m sub-bottom depth was collected from an anomalous red-brown claystone in Section 103-638B-18R-1. Subunit IIA consists of bioturbated limestone, marlstone, and claystone/marlstone couplets. The overall high carbonate content (44%–95%) and the variation of the marlstone and limestone can be readily seen in Figure 27. Subunit IIB consists of light-gray, bio-

turbated nannofossil marlstone with cyclic clay-rich layers. The cyclicity of the increase in clays (or decrease in carbonate) is easily seen in Figure 27 by the rapid oscillations in carbonate content. Subunit IIIA appears on Figure 27 as a transition from Subunit IIB to Subunit IIIB and shows decreasing but still cyclic carbonate values. Subunit IIIA consists of turbidite claystone/marlstone couplets. The carbonate contents of samples from lithologic Subunit IIIB are typically much lower (2%–43%) than in the overlying strata because of the low percentage of carbonate in the coarse-grained turbidite sandstones in that subunit.

### PHYSICAL PROPERTIES

Physical property measurements were made on sediments and sedimentary rocks from Cores 103-638B-1R through 103-638B-45R and Cores 103-638C-1R through 103-638C-14R. As at the previous site, unsplit cores were analyzed on the shipboard Gamma Ray Attenuation Porosity Evaluator (GRAPE), allowed to warm to room temperature for 4 hr, measured for thermal conductivity, and then split. After being split, sediments from the upper part of Hole 638B (Cores 103-638B-1R through 103-638B-18R) were analyzed on the vane-shear-strength apparatus; sediments and sedimentary rocks from throughout Holes 638B and 638C were measured for compressional seismic velocity on the Hamilton Frame velocimeter. Index properties (bulk and grain density, water content, and porosity) as calculated on the basis of weights obtained from a triple-beam balance and volumes obtained using the shipboard Penta-Pycnometer were performed on the same samples measured for seismic velocity. Index-property samples were also analyzed for carbonate content using the carbonate-bomb method (Müller and Gastner, 1971). Two-minute GRAPE wet-bulk density measurements were also made on the same sediment and sedimentary rock samples

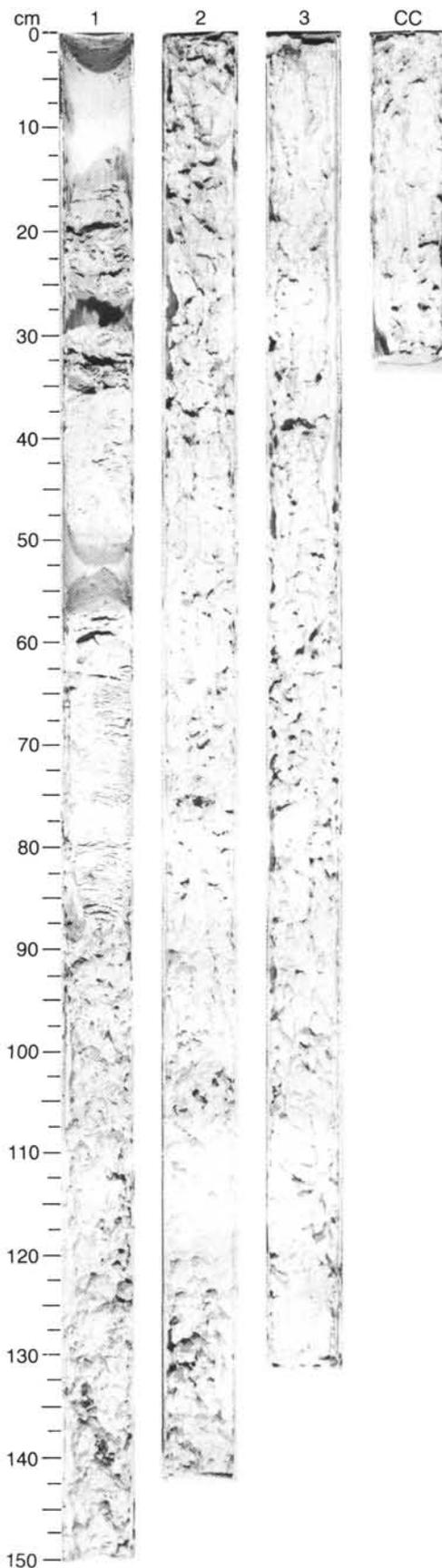


Figure 25. Core 103-638B-14R.

from Cores 103-638C-1R through 103-638C-13R as were used for Hamilton Frame velocimetry and index-property measurement.

### Thermal Conductivity

Thermal-conductivity measurements were made on unlithified sediment from Cores 103-638B-1R through 103-638B-45R (0–431 m sub-bottom; Fig. 28A). Values increase slightly but steadily with increasing sub-bottom depth from about  $2.4 \times 10^{-3} \text{ cal} \times \text{°C}^{-1} \times \text{cm}^{-1} \times \text{s}^{-1}$  (calories/degree Celsius-centimeter-second). Thermal conductivity is fairly constant with depth only in the nannofossil marl of lithologic Subunit IIB (Cores 103-638B-23R through 103-638B-32R; 213–298 m sub-bottom; see “Sediment Lithology” section, this chapter); values in Subunit IIB range from about  $2.9$  to  $3.5 \times 10^{-3} \text{ cal} \times \text{°C}^{-1} \times \text{cm}^{-1} \times \text{s}^{-1}$ .

We continued to measure thermal conductivity in Hole 638C from Core 103-638C-3R through 103-638C-14R (431–547 m sub-bottom). Values increase with depth from slightly less than the values obtained from greatest depths in Hole 638B; starting around  $3.4 \times 10^{-3} \text{ cal} \times \text{°C}^{-1} \times \text{cm}^{-1} \times \text{s}^{-1}$  in Core 103-638C-3R (431–441 m sub-bottom), thermal conductivity increases to around  $4.3 \times 10^{-3} \text{ cal} \times \text{°C}^{-1} \times \text{cm}^{-1} \times \text{s}^{-1}$  in Cores 103-638C-10R through 103-638C-13R (499–538 m sub-bottom) and decreases to  $3.5 \times 10^{-3} \text{ cal} \times \text{°C}^{-1} \times \text{cm}^{-1} \times \text{s}^{-1}$  in Core 103-638C-14R (538–547 m sub-bottom).

### Vane Shear

Vane-shear-strength measurements were made only on sediments from lithologic Unit I (see “Sediment Lithology” section, this chapter). Nannofossil ooze from Cores 103-638B-1R through 103-638B-17R (0–161.5 m sub-bottom) shows undrained shear-strength values ranging from 2 to 28 kPa (kiloPascals; Fig. 28B). Drilling disturbance is moderate to soupy in these cores, and measured shear strength is probably only a conservative indicator of *in-situ* shear strength.

In Section 103-638B-18R-1 (161.5–163.0 m sub-bottom), measured shear strength increases abruptly to 72 kPa in a stiff brown mud that occurs in this section. Although the rest of Core 103-638B-18R contains nannofossil ooze that has been disrupted to a soupy state by drilling, the shear strength is still high (as much as 46 kPa in Sample 103-638B-18R-5, 99 cm; 168.49 m sub-bottom). Rather than damage the blades of the vane, we ceased measuring undrained shear strength at this depth in Hole 638B.

### Compressional Seismic Velocities

Seismic velocities were measured on sediments and sedimentary rocks over the entire depth of Holes 638B and 638C (Fig. 28C). The upper six cores of Hole 638B (0–54 m sub-bottom) show velocities averaging about 1.25 km/s. Such low values probably reflect the great degree of drilling disturbance at the top of Hole 638B, and have a precision of  $\pm 0.04 \text{ km/s}$ ; velocity values below this interval have a precision of  $\pm 0.02 \text{ km/s}$ . Below about 54 m and excluding the soupy sediment of Core 103-638B-18R, velocities measured in the nannofossil ooze range from about 1.60 to about 1.75 km/s; average velocity for this lithologic unit below the most drilling-disturbed upper cores is about 1.65 km/s.

The base of lithologic Unit I in Core 103-638B-20R (184 m sub-bottom; see “Sediment Lithology” section, this chapter) corresponds well to a change in the nature of measured velocities that begins below Core 103-638B-20R and continues through Core 103-638B-23R (190–219 m sub-bottom). This interval is roughly that ascribed to Subunit IIA (see “Sediment Lithology” section, this chapter) and is distinguished here by the higher velocities measured in the limestone beds of the unit. Although the velocities in nannofossil marl are about the same as those

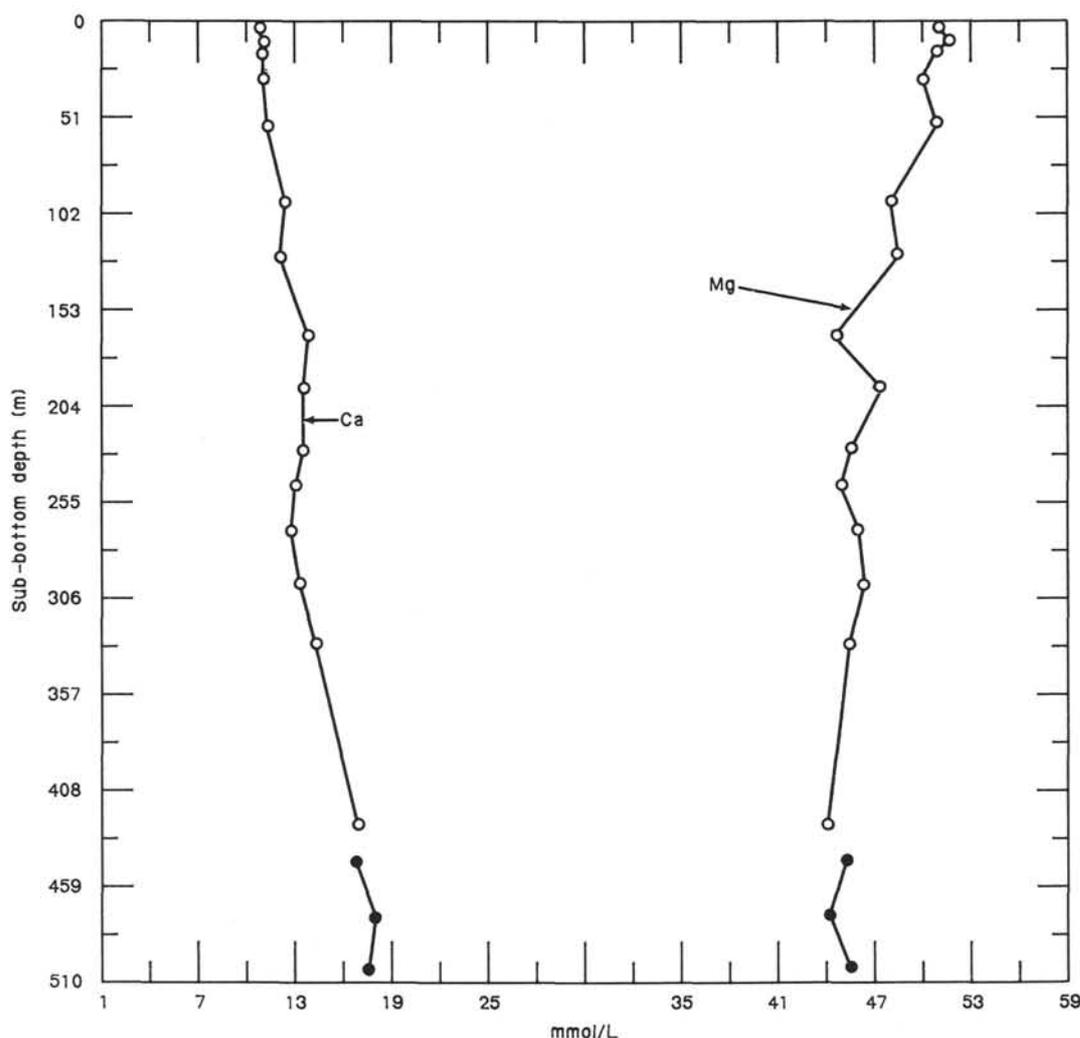


Figure 26. Calcium and magnesium cation concentrations in interstitial-water samples from Site 638. Data are given in Table 4. Data from Hole 638B are plotted as open symbols, whereas data from Hole 638C are plotted as solid symbols.

measured on the nannofossil ooze of Unit I, the limestone layers have seismic velocities of 3.0 to 3.7 km/s. We used the ship-board visual core-description forms to tabulate the thickness of limestone layers; by attributing a marl composition and velocity to the unrecovered part of the cores, we calculated an average seismic velocity on a core-by-core basis (Fig. 29). The average of mean velocities so obtained for the three cores of lithologic Subunit IIA is 1.76 km/s.

From about 219 to 344 m sub-bottom (Cores 103-638B-24R through 103-638B-36R), the seismic velocity of the marl remains fairly constant, averaging about 1.69 km/s. A few limestone layers (measured in Cores 103-638B-26R, 103-638B-29R, and 103-638B-32R) have seismic velocities of about 3.0 to 3.6 km/s. The boundary between Subunits IIIA and IIIB at 330 m sub-bottom (Core 103-638B-35R) is defined by the first appearance of a cemented sandstone layer more than 20 cm thick (see "Sediment Lithology" section, this chapter), but this boundary is not marked by a great change in seismic velocity. Cemented sandstone layers first occur in Core 103-638B-34R.

A velocity contrast is observed at the top of Core 103-638B-37R (344 m sub-bottom). Below this depth, some 15% of the section is composed of mostly well-cemented sandstone beds (estimated by tabulation of visual core-description occurrences as described in previous text) with velocities ranging from 3.2 to

5.3 km/s and averaging about 4.2 km/s. Unlithified marl in this unit yields a seismic velocity range of 1.65–21.3 km/s and an average velocity of 1.77 km/s. A core-by-core average seismic velocity of this unit was calculated by tabulating lithologies from the visual core descriptions as described previously, assuming all unrecovered material consists of marl having a velocity of 1.77 km/s; results are illustrated in Figure 29A. Averaging the core-by-core velocities so obtained yields a mean velocity below 344 m sub-bottom in Hole 638B of about 1.92 km/s.

The average velocity measured in the marl of Cores 103-638C-1R through 103-638C-14R (412–547 m sub-bottom) is 1.83 km/s. This velocity shows a slight increase with depth. Sandstone velocities range from 3.1 to 5.1 km/s; coarser grained, less completely cemented sandstone velocities fall in the lower part of the range. Although we made velocity measurements on water-saturated samples as a matter of standard procedure, the importance of this practice became apparent when we measured the same coarse-grained sandstone saturated with seawater and again when it was dry; compressional seismic velocity of the dry sample was 1–1.5 km/s greater than the same sample when water saturated.

Less sandstone was recovered in the cores of Hole 638C (412–547 m sub-bottom) than in the basal parts of lithologic Subunit IIIB recovered from Hole 638B (330–432 m sub-bot-

Table 5. Carbonate-bomb data, Site 638.

| Sample<br>(interval in cm) | Sub-bottom<br>depth<br>(m) | Carbonate<br>(%) | Lithology <sup>a</sup>                        |
|----------------------------|----------------------------|------------------|-----------------------------------------------|
| 103-638B-1R-2, 120         | 2.7                        | 68               | Clayey nannofossil ooze                       |
| 103-638B-1R-4, 70          | 5.2                        | 78               | Clayey nannofossil ooze                       |
| 103-638B-2R-1, 100         | 7.4                        | 79               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-2R-2, 100         | 8.9                        | 72               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-2R-4, 100         | 11.9                       | 71               | Clayey nannofossil ooze                       |
| 103-638B-2R-5, 100         | 13.4                       | 71               | Clayey nannofossil ooze                       |
| 103-638B-3R-1, 30-32       | 16.3                       | 76               | Foraminiferal clayey nannofossil ooze         |
| 103-638B-3R-2, 10-12       | 17.6                       | 74               | Foraminiferal clayey nannofossil ooze         |
| 103-638B-4R-2, 10-12       | 27.1                       | 77               | Clayey nannofossil ooze                       |
| 103-638B-4R-4, 10-12       | 30.1                       | 75               | Clayey nannofossil ooze                       |
| 103-638B-4R-6, 45-47       | 33.45                      | 79               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-7R-1, 100-102     | 55.4                       | 82               | Clayey nannofossil ooze                       |
| 103-638B-7R-2, 30-32       | 56.2                       | 93               | Foraminifer nannofossil ooze                  |
| 103-638B-7R-2, 61-63       | 56.51                      | 70               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-7R-2, 100-102     | 58.4                       | 85               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-8R-5, 87-89       | 70.97                      | 87               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-8R-6, 110-112     | 72.7                       | 83               | Foraminiferal-rich clayey nannofossil ooze    |
| 103-638B-10R-1, 95-97      | 85.05                      | 79               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-10R-2, 130-132    | 86.9                       | 68               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-10R-3, 30-32      | 87.4                       | 77               | Foraminiferal-bearing clayey nannofossil ooze |
| 103-638B-11R-1, 130-132    | 95.0                       | 88               | Foraminiferal-rich clayey nannofossil ooze    |
| 103-638B-11R-2, 130-132    | 96.5                       | 89               | Foraminiferal-rich clayey nannofossil ooze    |
| 103-638B-12R-1, 106-108    | 104.46                     | 99               | Foraminiferal-bearing nannofossil ooze        |
| 103-638B-13R-1, 79-81      | 113.89                     | 85               | Clayey nannofossil ooze                       |
| 103-638B-14R-1, 39-41      | 123.29                     | 91               | Foraminiferal-rich nannofossil ooze           |
| 103-638B-15R-4, 80-82      | 137.9                      | 84               | Clayey nannofossil ooze                       |
| 103-638B-16R-2, 81-83      | 144.51                     | 81               | Clayey nannofossil ooze                       |
| 103-638B-17R-1, 20-22      | 152.0                      | 85               | Clayey nannofossil ooze                       |
| 103-638B-18R-1, 30-32      | 161.8                      | 5                | Red-brown claystone                           |
| 103-638B-18R-1, 120-122    | 162.7                      | 83               | Clayey nannofossil ooze                       |
| 103-638B-18R-2, 120-122    | 164.2                      | 88               | Clayey nannofossil ooze                       |
| 103-638B-18R-3, 120-122    | 165.7                      | 84               | Clayey nannofossil ooze                       |
| 103-638B-18R-4, 120-122    | 167.2                      | 87               | Foraminiferal-rich clayey nannofossil ooze    |
| 103-638B-18R-5, 120-122    | 168.7                      | 84               | Foraminiferal-rich clayey nannofossil ooze    |
| 103-638B-19R-1, 12-14      | 171.22                     | 88               | Clayey nannofossil chalk                      |
| 103-638B-20R-1, 55-56      | 181.15                     | 85               | Clayey nannofossil chalk                      |
| 103-638B-20R-2, 108-110    | 183.18                     | 88               | Clayey nannofossil chalk                      |
| 103-638B-20R-3, 38-40      | 183.22                     | 62               | Marl                                          |
| 103-638B-21R-1, 84-86      | 190.94                     | 94               | Micritic limestone                            |
| 103-638B-21R-3, 118-120    | 194.28                     | 44               | Marlstone                                     |
| 103-638B-21R-4, 53-55      | 195.13                     | 91               | Micritic limestone                            |
| 103-638B-21R-4, 115-117    | 195.75                     | 58               | Marlstone                                     |
| 103-638B-22R-1, 112-114    | 200.82                     | 93               | Radiolarian micritic limestone                |
| 103-638B-22R-3, 56-58      | 203.26                     | 53               | Marlstone                                     |
| 103-638B-22R-3, 134-136    | 204.04                     | 93               | Radiolarian micritic limestone                |
| 103-638B-23R-2, 52-54      | 211.32                     | 95               | Radiolarian micritic limestone                |
| 103-638B-23R-2, 92-98      | 211.72                     | 63               | Marlstone                                     |
| 103-638B-24R-2, 69-71      | 220.99                     | 65               | Marlstone                                     |
| 103-638B-24R-4, 105-107    | 224.35                     | 62               | Marlstone                                     |
| 103-638B-24R-6, 33-35      | 226.63                     | 61               | Marlstone                                     |
| 103-638B-25R-2, 111-113    | 231.01                     | 57               | Nannofossil marlstone                         |
| 103-638B-25R-4, 95-97      | 233.85                     | 64               | Nannofossil marlstone                         |
| 103-638B-25R-6, 83-85      | 236.73                     | 51               | Nannofossil marlstone                         |
| 103-638B-26R-1, 100-102    | 239.10                     | 73               | Nannofossil marlstone                         |
| 103-638B-26R-2, 106-108    | 240.66                     | 49               | Nannofossil marlstone                         |
| 103-638B-26R-3, 97-99      | 242.07                     | 40               | Nannofossil marlstone                         |
| 103-638B-26R-4, 100-102    | 243.6                      | 52               | Nannofossil marlstone                         |
| 103-638B-26R-5, 100-102    | 245.1                      | 43               | Nannofossil marlstone                         |
| 103-638B-26R-6, 50-52      | 246.1                      | 57               | Nannofossil marlstone                         |
| 103-638B-27R-2, 98-100     | 250.18                     | 67               | Nannofossil marlstone                         |
| 103-638B-27R-4, 98-100     | 253.18                     | 49               | Nannofossil marlstone                         |
| 103-638B-28R-1, 131-135    | 258.61                     | 44               | Nannofossil marlstone                         |
| 103-638B-28R-2, 131-135    | 260.11                     | 51               | Nannofossil marlstone                         |
| 103-638B-28R-3, 140-142    | 261.7                      | 49               | Nannofossil marlstone                         |
| 103-638B-28R-4, 140-142    | 263.2                      | 58               | Nannofossil marlstone                         |
| 103-638B-28R-5, 140-142    | 264.7                      | 63               | Nannofossil marlstone                         |
| 103-638B-29R-1, 42-44      | 267.42                     | 62               | Nannofossil marlstone                         |
| 103-639B-29R-2, 106        | 269.56                     | 76               | Clayey limestone                              |
| 103-639B-30R-2, 67-69      | 278.87                     | 44               | Nannofossil marlstone                         |
| 103-638B-30R-4, 31-33      | 281.57                     | 48               | Nannofossil marlstone                         |
| 103-638B-30R-4, 144        | 282.64                     | 68               | Nannofossil marlstone                         |
| 103-638B-31R-2, 42-44      | 288.22                     | 35               | Nannofossil marlstone                         |
| 103-638B-31R-2, 122-124    | 289.02                     | 60               | Nannofossil marlstone                         |
| 103-638B-31R-3, 47-49      | 289.77                     | 65               | Nannofossil marlstone                         |
| 103-638B-31R-4, 94-96      | 291.74                     | 74               | Clayey limestone                              |

Table 5 (continued).

| Sample<br>(interval in cm) | Sub-bottom<br>depth<br>(m) | Carbonate<br>(%) | Lithology <sup>a</sup>              |
|----------------------------|----------------------------|------------------|-------------------------------------|
| 103-638B-32R-1, 77-79      | 296.77                     | 25               | Calcareous clay                     |
| 103-638B-32R-2, 77-79      | 298.27                     | 74               | Clayey limestone                    |
| 103-638B-33R-1, 90-92      | 306.5                      | 28               | Calcareous clay                     |
| 103-638B-33R-2, 90-92      | 308.0                      | 43               | Marl                                |
| 103-638B-33R-3, 90-92      | 309.5                      | 24               | Calcareous clay                     |
| 103-638B-33R-4, 125-127    | 311.35                     | 40               | Marl                                |
| 103-638B-34R-1, 114-117    | 316.44                     | 11               | Calcareous claystone                |
| 103-638B-34R-2, 46-48      | 317.26                     | 10               | Silty claystone                     |
| 103-638B-34R-2, 145-147    | 318.25                     | 24               | Carbonate-cemented sandstone        |
| 103-638B-35R-1, 128-130    | 326.18                     | 4                | Silty claystone                     |
| 103-638B-35R-2, 123-124    | 327.63                     | 7                | Silty claystone                     |
| 103-638B-35R-4, 57-58      | 329.97                     | 2                | Claystone                           |
| 103-638B-36R-1, 98-99      | 335.48                     | 6                | Silty claystone                     |
| 103-638B-36R-2, 110-112    | 337.1                      | 26               | Calcareous claystone                |
| 103-638B-37R-1, 22-24      | 344.42                     | 24               | Carbonate-cemented sandstone        |
| 103-638B-38R-1, 29-31      | 354.09                     | 19               | Carbonate-cemented sandstone        |
| 103-638B-38R-1, 32-34      | 354.12                     | 45               | Marlstone                           |
| 103-638B-39R-1, 34-36      | 363.84                     | 14               | Carbonate-cemented sandstone        |
| 103-638B-40R-1, 52-54      | 373.62                     | 17               | Carbonate-cemented sandstone        |
| 103-638B-41R-1, 70-72      | 383.5                      | 19               | Carbonate-cemented sandstone        |
| 103-638B-41R-1, 134        | 384.14                     | 4                | Claystone                           |
| 103-638B-41R-2, 4-6        | 384.34                     | 16               | Carbonate-cemented silty sandstone  |
| 103-638B-41R-2, 27-30      | 384.57                     | 24               | Carbonate-cemented coarse sandstone |
| 103-638B-42R-1, 62-64      | 393.12                     | 20               | Carbonate-cemented coarse sandstone |
| 103-638B-42R-2, 26-28      | 394.26                     | 7                | Claystone                           |
| 103-638B-43R-1, 130-132    | 403.5                      | 12               | Calcareous claystone                |
| 103-638B-44R-1, 110-112    | 413.0                      | 7                | Carbonate-cemented sandstone        |
| 103-638B-45R-1, 115-117    | 422.65                     | 26               | Calcareous claystone                |
| 103-638B-45R-2, 74-76      | 423.75                     | 4                | Claystone                           |
| 103-638C-1R-1, 37-39       | 412.27                     | 43               | Nannofossil marlstone               |
| 103-638C-1R-1, 68-70       | 412.58                     | 26               | Coarse-grained sandstone            |
| 103-638C-1R-1, 92-94       | 412.82                     | 17               | Silty claystone                     |
| 103-638C-1R-2, 53-55       | 413.93                     | 5                | Silty claystone                     |
| 103-638C-1R-2, 94-96       | 414.34                     | 25               | Coarse-grained sandstone            |
| 103-638C-3R-1, 98-100      | 432.18                     | 7                | Silty claystone                     |
| 103-638C-3R-1, 118-120     | 433.38                     | 33               | Medium-grained sandstone            |
| 103-639C-3R-2, 97-99       | 433.67                     | 29               | Medium-grained sandstone            |
| 103-638C-3R-2, 118-120     | 433.88                     | 5                | Silty claystone                     |
| 103-638C-4R-1, 10-12       | 441.0                      | 25               | Medium-grained sandstone            |
| 103-638C-4R-1, 68-70       | 441.58                     | 7                | Silty claystone                     |
| 103-638C-4R-2, 77-79       | 443.17                     | 5                | Silty claystone                     |
| 103-638C-4R-3, 46-48       | 444.36                     | 25               | Medium-grained sandstone            |
| 103-638C-5R-1, 54-56       | 451.04                     | 5                | Silty claystone                     |
| 103-638C-5R-1, 98-100      | 451.48                     | 28               | Coarse-grained sandstone            |
| 103-638C-5R-2, 50-52       | 452.50                     | 31               | Calcareous clay                     |
| 103-638C-5R-2, 75-77       | 452.75                     | 21               | Coarse-grained sandstone            |
| 103-638C-6R-1, 44-46       | 460.64                     | 33               | Medium-grained sandstone            |
| 103-638C-6R-1, 82-84       | 461.02                     | 15               | Nannofossil claystone               |
| 103-638C-6R-2, 3-4         | 461.73                     | 20               | Coarse-grained sandstone            |
| 103-638C-6R-2, 133-135     | 463.03                     | 5                | Clay                                |
| 103-638C-6R-3, 66          | 463.86                     | 7                | Clay                                |
| 103-638C-7R-1, 127-128     | 471.17                     | 20               | Nannofossil claystone               |
| 103-638C-7R-2, 125-127     | 472.65                     | 5                | Medium-grained sandstone            |
| 103-638C-7R-3, 9-11        | 472.99                     | 5                | Claystone                           |
| 103-638C-7R-CC, 6-8        | 473.35                     | 22               | Medium- to fine-grained sandstone   |
| 103-638C-8R-1, 141-142     | 480.91                     | 19               | Claystone                           |
| 103-638C-8R-2, 26-28       | 481.26                     | 64               | Nannofossil marlstone               |
| 103-638C-8R-CC, 8-10       | 482.04                     | 16               | Granule conglomerate                |
| 103-638C-9R-1, 35-36       | 489.55                     | 10               | Silty claystone                     |
| 103-638C-9R-1, 120-122     | 490.4                      | 31               | Medium-grained sandstone            |
| 103-638C-9R-1, 133-135     | 490.53                     | 35               | Fine-grained sandstone              |
| 103-638C-9R-2, 73-75       | 491.43                     | 22               | Nannofossil marlstone               |
| 103-638C-9R-2, 77-79       | 491.47                     | 18               | Calcareous claystone                |
| 103-638C-10R-1, 129-131    | 500.19                     | 11               | Calcareous claystone                |
| 103-638C-10R-2, 117-119    | 501.57                     | 5                | Claystone                           |
| 103-638C-12R-1, 90-92      | 519.1                      | 11               | Silty clay                          |
| 103-638C-13R-1, 35-38      | 528.25                     | 5                | Clay                                |
| 103-638C-14R-1, 118-120    | 538.68                     | 10               | Claystone                           |
| 103-638C-14R-2, 4-6        | 539.04                     | 28               | Medium-grained sandstone            |
| 103-638C-14R-2, 47-49      | 539.47                     | 5                | Claystone                           |

<sup>a</sup> Lithologic names are those used on the barrel sheets.

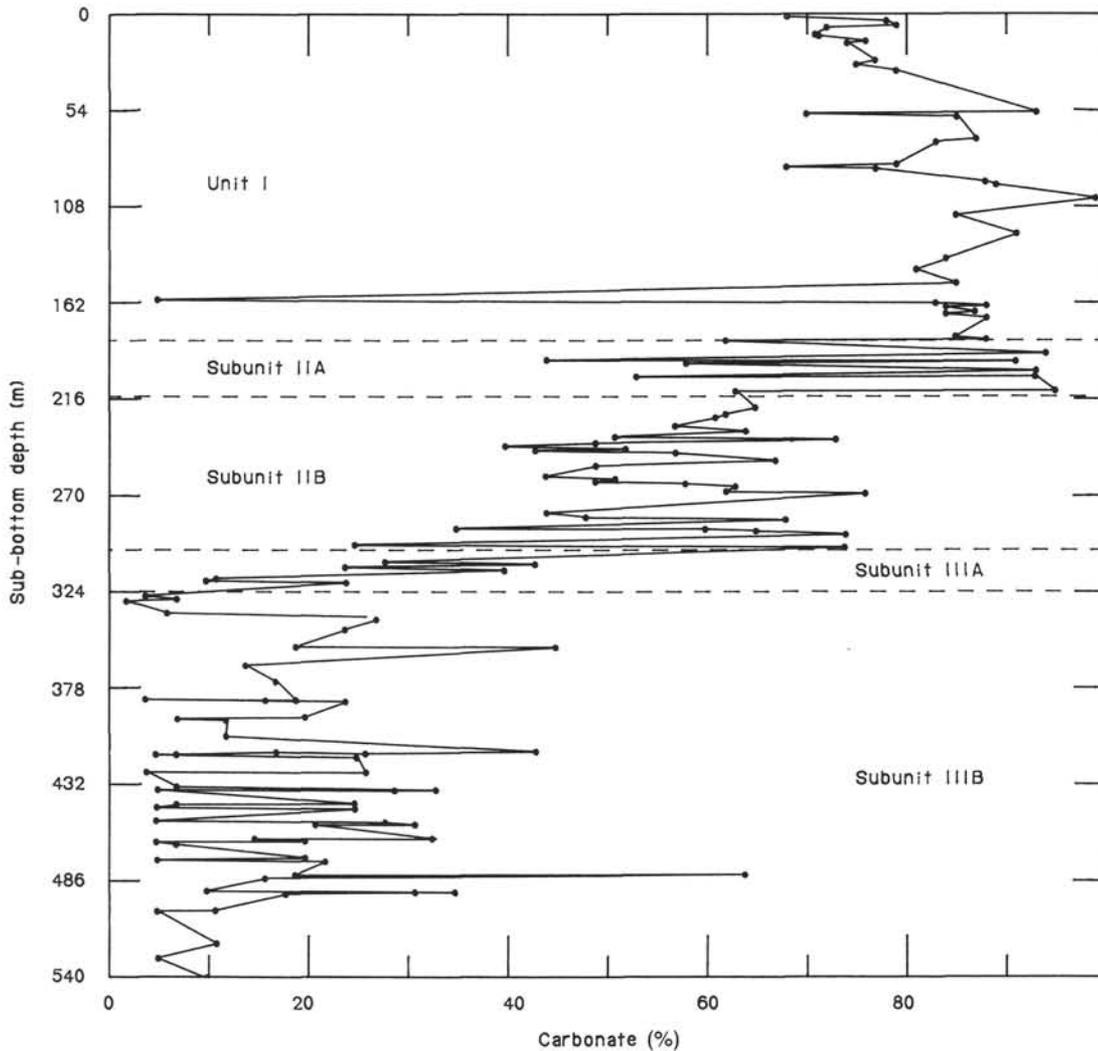


Figure 27. Percentage carbonate in dried-sediment samples from Site 638. Boundaries of the lithologic units are superimposed. Data are given in Table 5.

tom). Tabulation of sandstone occurrences documented in the visual core descriptions, assuming the unrecovered material consists of marl having a velocity of 1.83 km/s, results in a calculated average velocity of 2.0 km/s for Hole 638C. Figure 29B illustrates average core-by-core velocity plotted against depth in Hole 638C. We observed that hard, coarse-grained sandstone that was slow to cut under the saws of the core laboratory, nevertheless, tended to crumble at the edges more severely than did fine sandstone. That the broken bits of sandstone were washed away during drilling may account for low sediment recovery. If this is true, then the velocity averages of Figure 29 must be considered to be highly conservative estimates.

In general, laboratory-based measurements of compressional velocity yield lower velocities than expected and lower velocities than those measured *in situ* during logging of the Cenozoic (see "Logging Results" section, this chapter). One reason for this may be a phenomenon described by Hamilton (1976) as "porosity rebound." The term refers to the expansion of compressible sediments upon release of confining pressure, resulting in an increase in sediment porosity when the sediment is removed from overburden pressures. Although the effect is less pronounced in calcareous sediments, empirical curves for fine-grained terrigenous sediment show an increase in porosity of from 0% to 8% after removal of 0 to 500 m overburden; for terrigenous sedi-

ment, the relationship is nearly linear. Other empirical relationships discussed by Hamilton (1974) relate porosity or density to seismic velocity. For turbidites, his equation is

$$V_p = 1669.1 - 1.85(P); s = 19.2\%$$

where  $V_p$  is compressional seismic velocity,  $P$  is porosity, and  $s$  is the standard deviation. Factoring in the effect of porosity rebound and applying the resulting porosity value to this linear relationship results in higher *in-situ* velocities proportional to the amount of overburden. At Site 638, the expected velocity correction is 0% at the sediment/water interface and is about 9% at 530 m sub-bottom. However, even after increasing laboratory velocities linearly with depth from 0% at the sediment surface to about 9% at the bottom of Hole 638C, the porosity rebound corrections are still not great enough to reconcile the 0.2–0.4 km/s discrepancy between laboratory-measured velocities and logging velocities in the upper 200 m of Hole 638B; porosity rebound correction for 0–200 m sub-bottom is only 0–3.5% (Hamilton, 1976). The discrepancy may be resolved through a further correction for the release of overburden pressure in the water column as well as in the sedimentary column.

In a series of seismic-velocity measurements on calcareous sediments from the Rio Grande Rise, Carlson and Christensen

(1983) showed a velocity increase from 2.7 to 2.9 km/s on sediments subjected to 600 bars pressure (6000 m depth equivalent) and observed some 7%–14% increase in velocity. In similar experiments monitoring density and velocity changes under a pressure of 500 bars, Carlson and Christensen (1983) found an increase in velocity of 0.2–0.3 km/s over a density range of from 1.8 to 2.3 g/cm<sup>3</sup>, which falls within that of sediments of Site 638. The velocity-lowering effect of pore pressure may counter the consequent velocity increase of high confining pressure (Wyllie et al., 1958).

Changes in sediment volume and porosity with release of overburden pressure may be especially evident in unlithified sediments; the correspondence of core diameter to lithology may yield some indication of the volume expansion that occurs in unlithified sediment. Owing to vibration of the coring bit, cores are slightly reduced in diameter as they pass through the throat of the bit. Lithified sediment and hard-rock cores are generally about 58 mm in diameter; by contrast, unlithified sediment completely fills the core liner to its inner diameter of 64 mm. Assuming that the unlithified sediment also entered the core liner at a diameter of 58 mm, a volumetric expansion of about 20% resulting from overburden pressure release is implied. Depending on the depth interval sampled, this is two to four times greater than the porosity or volumetric difference predicted by Hamilton (1976) and may account for the low laboratory-measured velocities. Alternatively, because of the up and down heave of the tool string, much of the unlithified sediment was compressed into drilling “biscuits” or “cakes,” which fill the core liner to 64 mm. The weight on the bit is commonly 10,000–20,000 lb, and if all this weight is applied to the core surface, such localized compression might damage the sediment fabric, creating a lower velocity. However, the velocity of “biscuited” sediment is generally not less than expected in these intervals. The unusually low velocities occur closer to the sediment/water interface and may also be attributed to drilling disturbance and biogenic gas expansion as discussed in the summary of this section.

Note that the synthetic seismogram constructed for Hole 638C used laboratory velocity and density values that are uncorrected for porosity rebound from sediment overburden or hydrostatic pressure.

### Index Properties

Figures 28D and 28E illustrate the values obtained for bulk density and porosity plotted against depth in Holes 638B and 638C. Bulk-density values increase steadily from about 1.6 g/cm<sup>3</sup> in the soupy, drilling-disturbed nannofossil ooze at the top of lithologic Unit I to about 2.0 g/cm<sup>3</sup> at the base of Unit I (Section 103-638B-20R-3; 184 m sub-bottom), hold steady at about 2.0 g/cm<sup>3</sup> throughout the mud and marl of lithologic Unit II and the upper part of Unit III (i.e., down to the base of Core 103-638B-36R; 344 m sub-bottom), and increase to a steady value of about 2.1 g/cm<sup>3</sup> in the marl below (Cores 103-638B-37R through 103-638B-45R; 344–431 m sub-bottom). Limestone layers in lithologic Subunit IIA yield bulk-density values of from 2.38 to 2.76 g/cm<sup>3</sup>, averaging 2.56 g/cm<sup>3</sup>; well-cemented sandstone layers of lithologic Unit III yield values of 2.62–2.75 g/cm<sup>3</sup>, averaging 2.68 g/cm<sup>3</sup>.

Two-minute GRAPE wet-bulk-density values are comparable to those acquired by gravimetric technique. Generally, the difference in values obtained on the same sample is less than 5%.

Porosity values predictably mirror the trends observed in bulk density, steadily decreasing from a high value of 71% in the nannofossil ooze of Core 103-638B-1R at the top of lithologic Unit I to about 59% in Core 103-638B-8R (74 m sub-bottom). Drilling disturbance may account for the scatter of porosity values observed in Core 103-638B-10R (84–94 m sub-bot-

tom; 34%–74%). Below Core 103-638B-10R, porosity resumes its steady decrease with depth to a value of about 50% at the base of lithologic Unit I (Section 103-638B-20R-3; 184 m sub-bottom). Marl, mud, and clay of lithologic Units II and III vary within a range of about 27%–57%; values cluster between 45% and 50% in Hole 638B and between 35% and 40% in Hole 638C. As expected, the porosity of limestone layers in lithologic Subunit IIA is low (21%–27%). Low porosity values (3%–15%) in sandstone layers in lithologic Unit III indicate extensive cementation.

Grain-density values are consistent with those expected of sediment composed predominantly of felsic silicates and carbonates. Most measured values fall within a range of 2.65–2.80 g/cm<sup>3</sup>.

Figure 30 illustrates the positive correlation between bulk density and compressional velocity as a function of decreasing porosity downhole. The set of data points within area A corresponds to unlithified sediments, which show a slight increase in seismic velocity and bulk density with greater burial depth. The set of points in area B corresponds to cemented sandstone and limestone.

### Acoustic Impedances and Predicted Reflectors

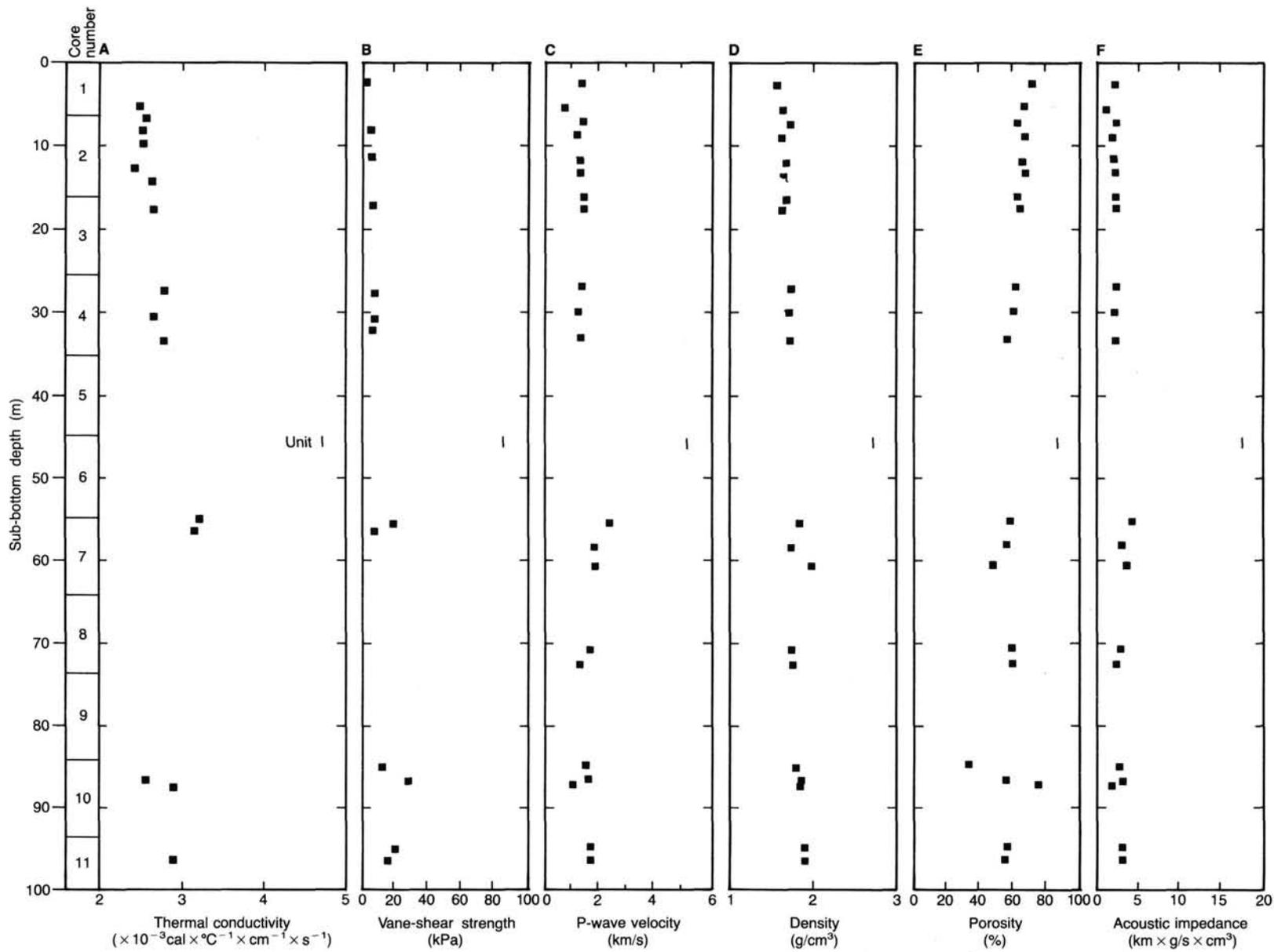
At several depths in Hole 638B, the average density and velocity of the recovered material changes over a small interval. We calculated the reflectivity of these interfaces to help interpret the seismic profiles available from earlier site surveys (see “Seismic Stratigraphy” section, this chapter). Figure 28F shows acoustic impedance (the product of compressional velocity and bulk density) plotted against sub-bottom depth. As annotated in the figure, three depths occur at which average impedance of an interval changes significantly. Such contrasts in acoustic impedance could generate a seismic reflection. We calculated the reflectivity *R* between adjacent layers 1 and 2 at these sub-bottom depths by using the equation:

$$R = \frac{V_{p1}\rho_{b1} - V_{p2}\rho_{b2}}{V_{p1}\rho_{b1} + V_{p2}\rho_{b2}}$$

where  $V_p$  = compressional seismic velocity (km/s) and  $\rho_b$  = bulk density (g/cm<sup>3</sup>).

The first depth at which we expect a reflector is about 190 m sub-bottom between the Cenozoic lithologic Unit I and the late Barremian lithologic Subunit IIA; a second possible reflector may occur at about 212 m sub-bottom between lithologic Subunits IIA and IIB (Hauterivian to possible late Valanginian); the third reflector may exist at about 344 m sub-bottom, where sandstone beds occur in significant thickness at the top of Core 103-638B-37R (still in the Hauterivian to possible late Valanginian; see “Biostratigraphy” section, this chapter). Table 6 shows the average velocities and bulk densities for each of the lithologic units used to calculate impedances and reflectivities at Hole 638B. The resulting reflection coefficients (*R*) are conservative estimates made assuming that Subunit IIA contains only 10% limestone and Subunit IIB contains only 15% sandstone.

Coring data support the existence of two of the possible reflectors. In Figure 31, core number and sub-bottom depth are plotted against the length of time necessary to drill the core. Abrupt breaks both in drilling time and in trend of change in drilling time with depth occur at the depths of the two deeper reflectors conjectured to occur at about 212 and 344 m sub-bottom. Caution must be used in interpreting these data because changes in the drilling time may reflect changes in the weight applied to the drill bit, in the number of revolutions per minute (RPM) of the bit, and in the pressures and volumes of water pumped through the bit, rather than changes in lithology. Although the possible reflector at 212 m sub-bottom is suggested



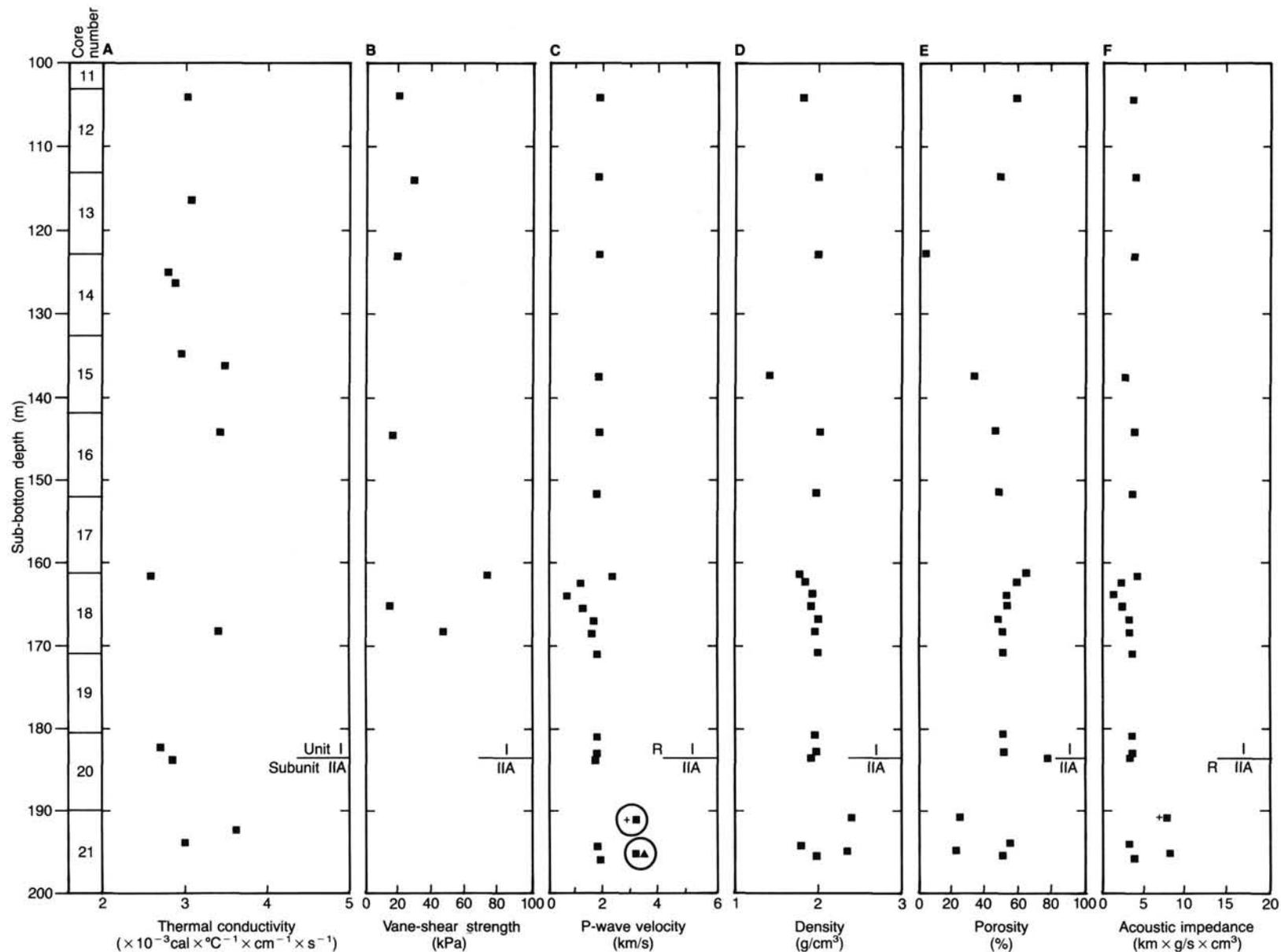
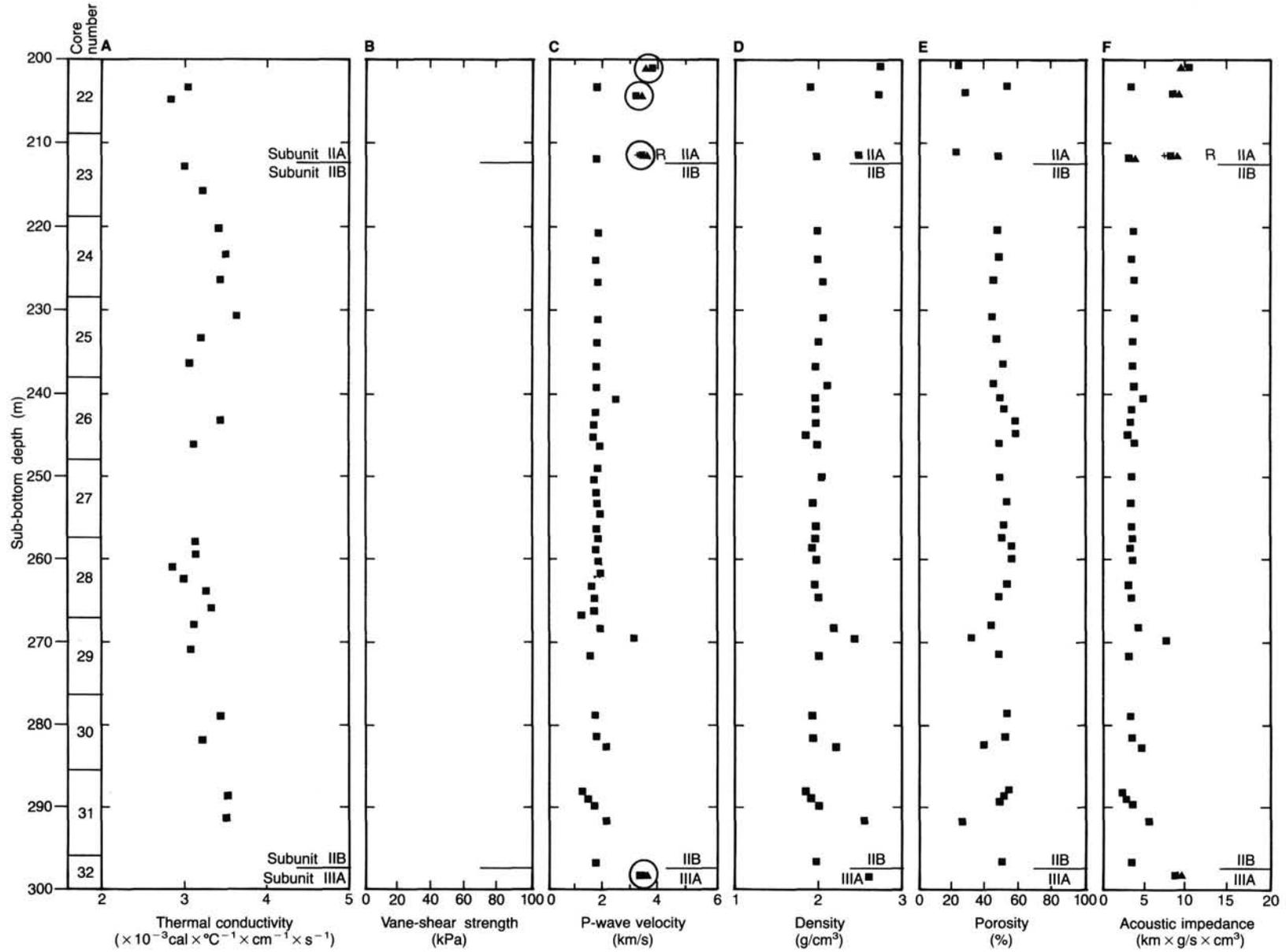


Figure 28. Physical-property measurements on sediments and sedimentary rocks from Holes 638B and 638C plotted against sub-bottom depth. Lithologic units as described in the "Sediment Lithology" section (this chapter) are indicated on the right side of the columns. A. Thermal-conductivity values ( $\times 10^{-3} \text{ cal} \times \text{°C}^{-1} \times \text{cm}^{-1} \times \text{s}^{-1}$ ). B. Vane-shear strength (kiloPascals). C. Compressional seismic velocity (kilometers per second). Square data points indicate velocities measured in the plane of the core diameter and parallel to the cut face of the core (c-direction), triangular data points indicate velocities measured in the plane of the core diameter and parallel to the cut face of the core (b-direction), and crosses indicate velocities measured perpendicular to the plane of the core diameter (a-direction). Cemented-rock data points (limestone and sandstone) are encircled. D. Bulk density (grams per cubic centimeter). E. Porosity (percent). F. Acoustic impedance (compressional velocity  $\times$  bulk density,  $\text{km} \times \text{g/s} \times \text{cm}^3$ ).



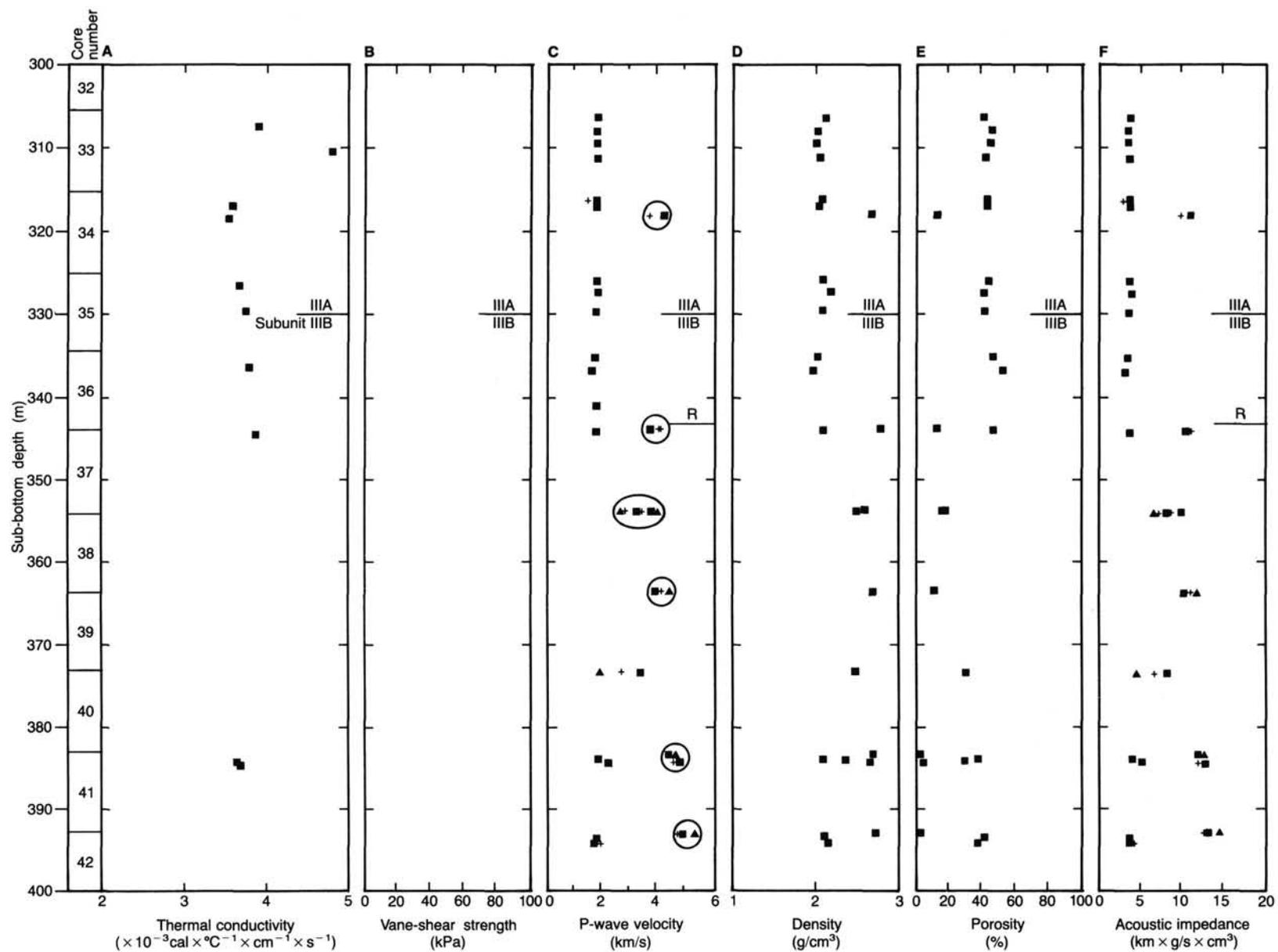
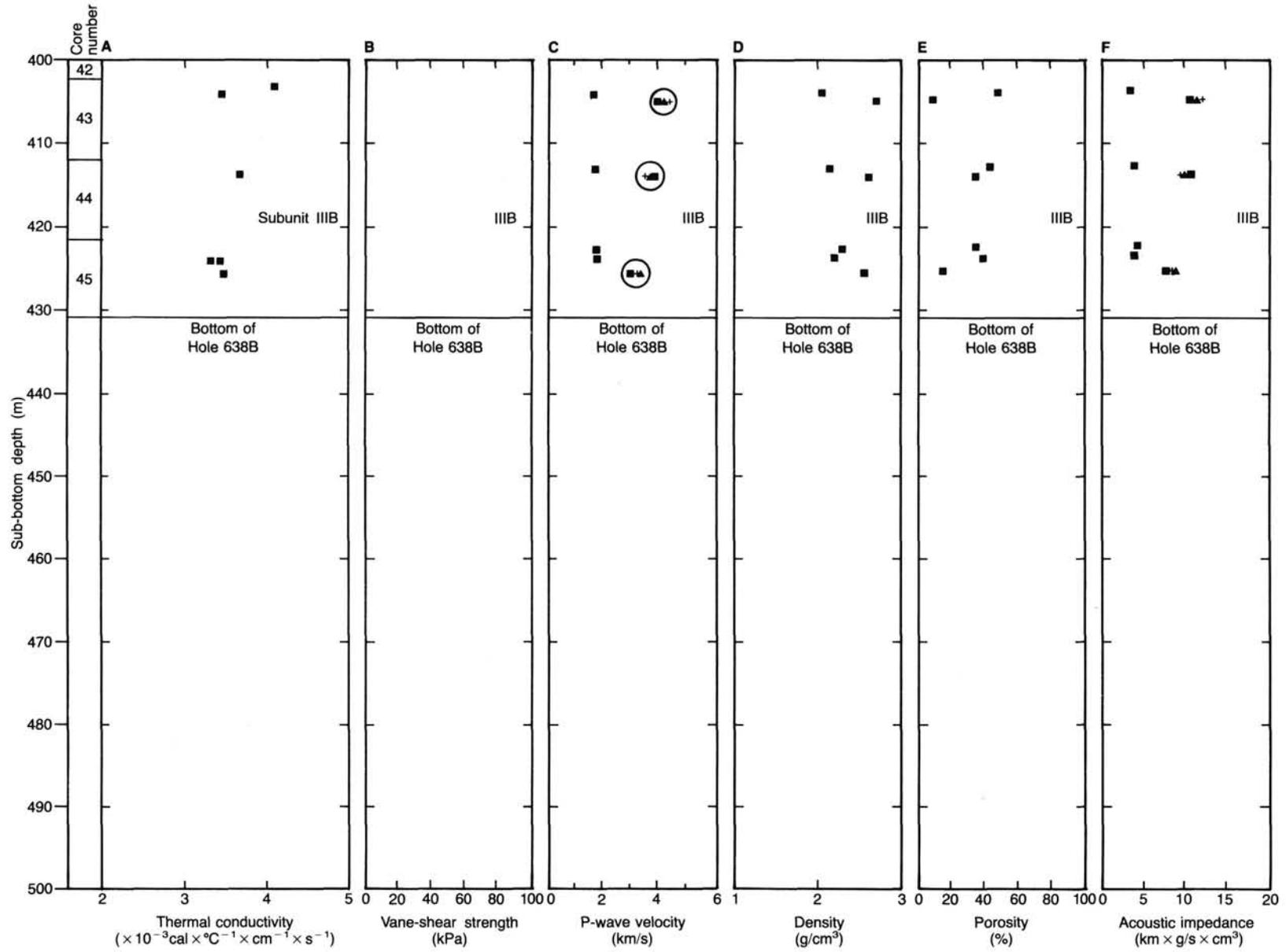


Figure 28 (continued).



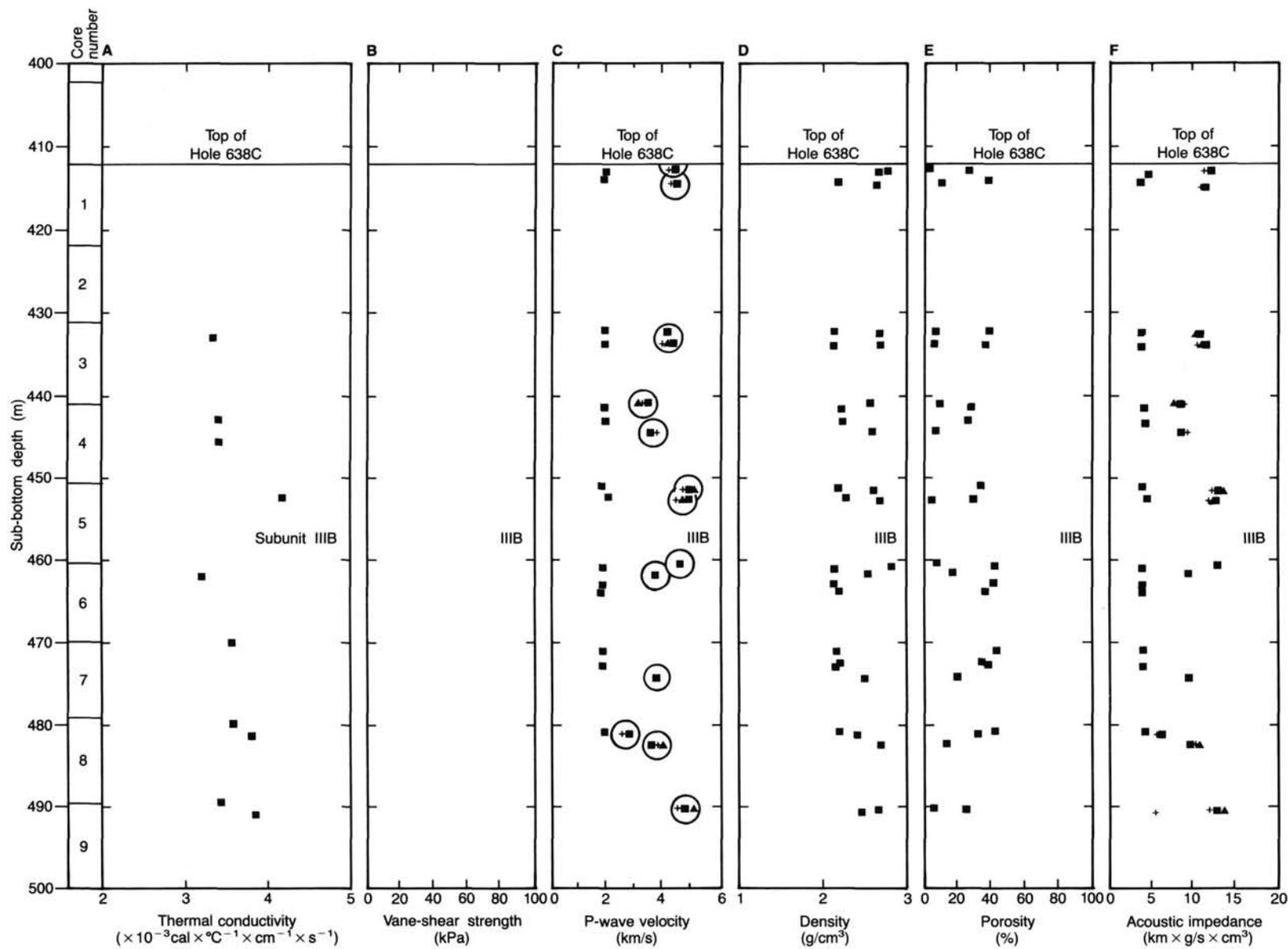


Figure 28 (continued).

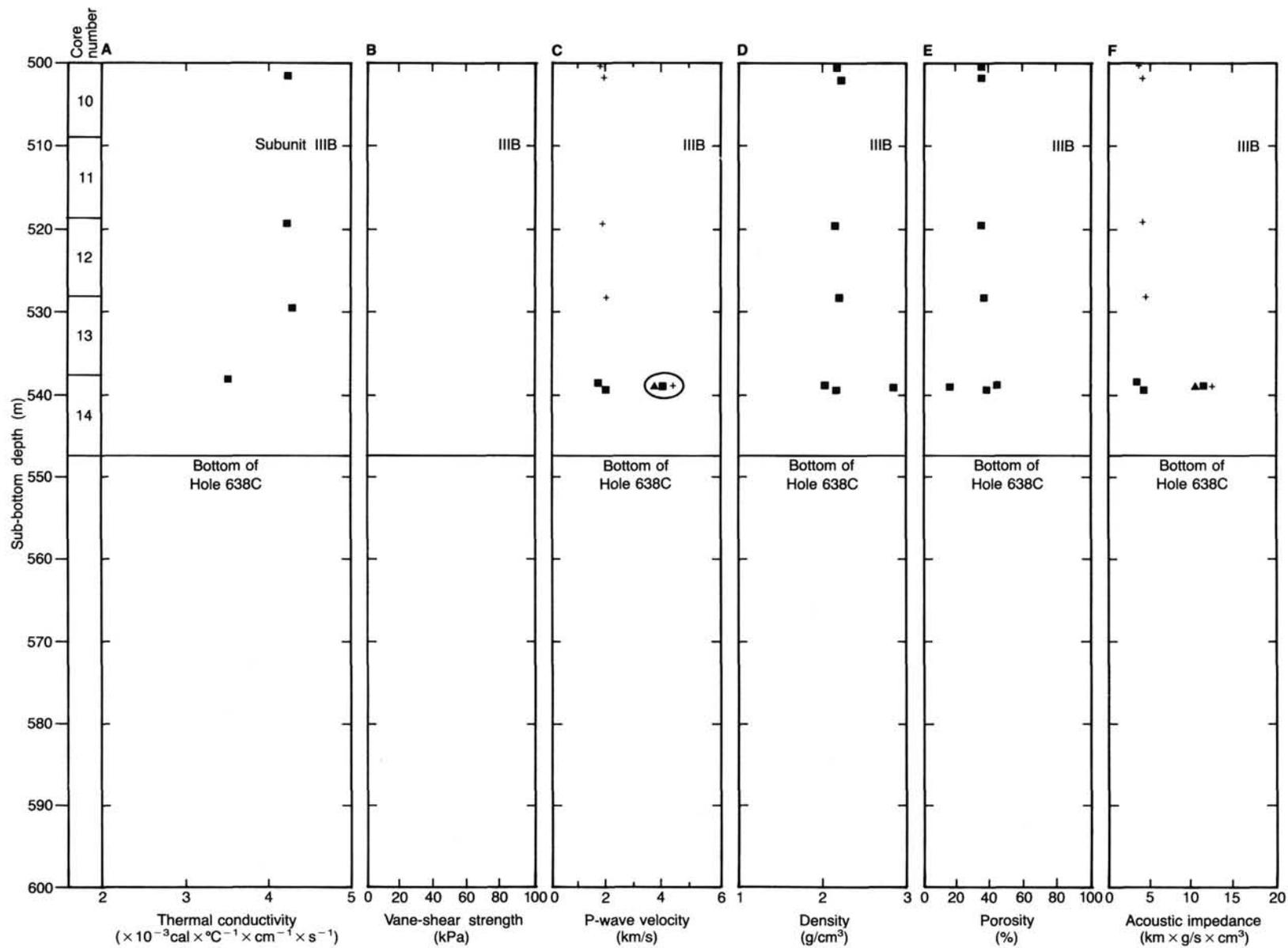


Figure 28 (continued).

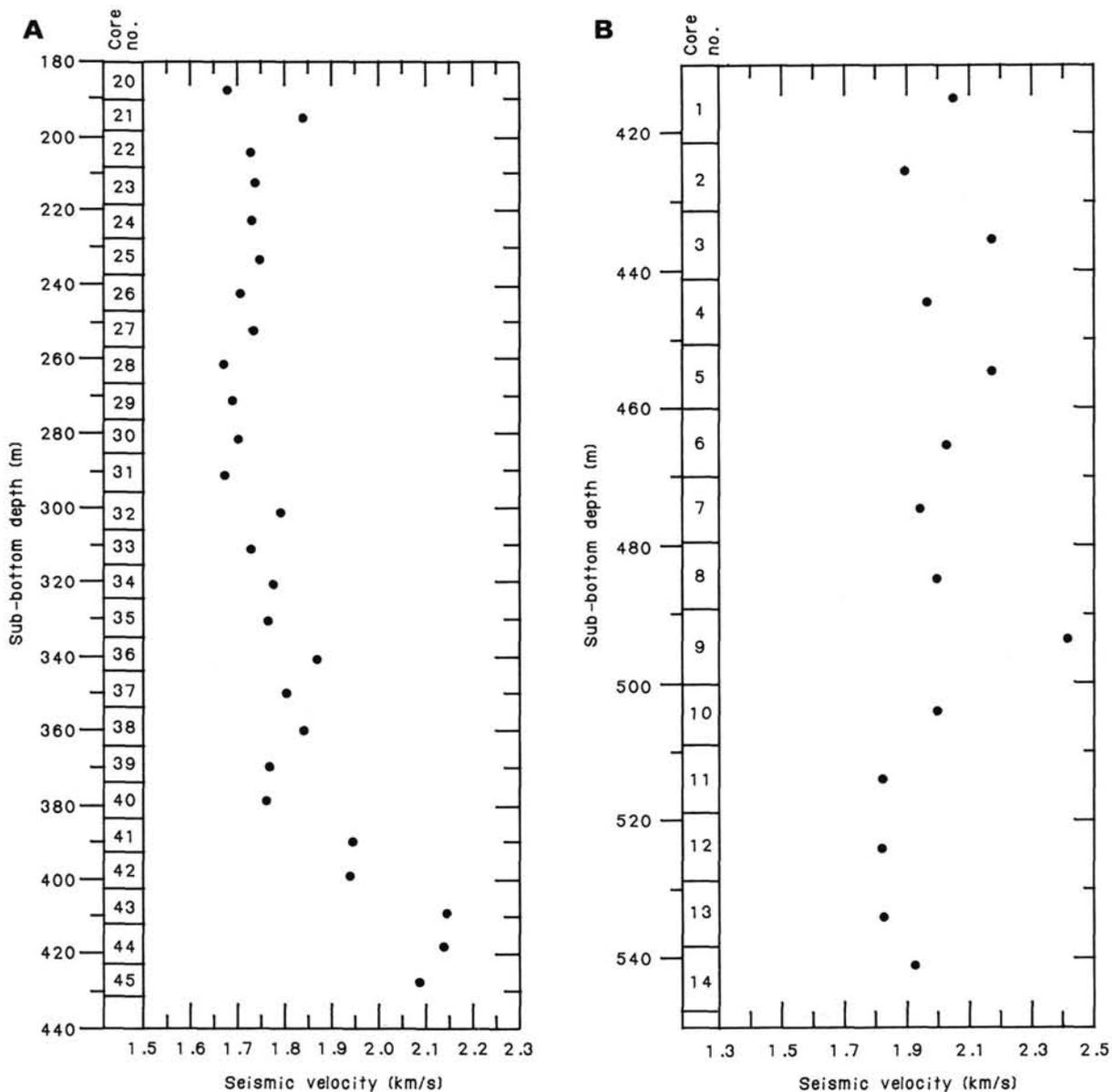


Figure 29. A. Calculated average seismic velocity of cores from the Mesozoic section of Hole 638B (lithologic Units II and III; Cores 103-638B-20R through 103-638B-45R, 181–431 m sub-bottom) plotted against sub-bottom depth. B. Calculated average seismic velocity of cores from Hole 638C.

not only by changes in lithology and physical properties but also by a drilling time decrease, between Core 103-638B-22R (199.7–209.3 m sub-bottom) and Core 103-638B-23R (209.3–218.8 m sub-bottom) the hydraulic pump accelerated from 35 to 60 RPM, and hydraulic pressure was increased from 350 to 500 pounds per square inch (psi). The shift in drill rate at this interval is, thus, of ambiguous origin and may not support the existence of a reflector here.

In drilling the cores spanning the depth of the conjectured reflector at 344 m sub-bottom (Core 103-638B-36R from 334.5 to 344.2 m sub-bottom and Core 103-638B-37R from 344.2 to 353.8 m sub-bottom), the same drilling parameters were maintained, and the observed decrease in drilling rate is, therefore, less ambiguously attributable to lithologic changes. The drilling-time decrease at 344 m sub-bottom correlates with the beginning of sandstone occurrences in a large proportion of recovered material. Although sandstone is harder than the surround-

ing cohesive marl beds, its rigidity may make it more easily drilled.

The computer-generated synthetic seismogram (see "Logging Results" section, this chapter) and some of the physical-properties data presented in this section places a reflector near this lower reflector at about 300 m sub-bottom. At about 300 m, the first sandstone sample was measured for seismic velocity and bulk density. The several measurements of sandstone velocity and index properties between 300 and 344 m sub-bottom may give a false impression of the proportion of sandstone recovered in the cores; sandstone does not appear in significant proportion in the cores until about 344 m sub-bottom.

### Summary

Thermal conductivity of unlithified sediments from Holes 638B and 638C generally increases with depth from about 2.4 to about  $4.3 \text{ cal} \times \text{°C}^{-1} \times \text{cm}^{-1} \times \text{s}^{-1}$ . The increase with depth

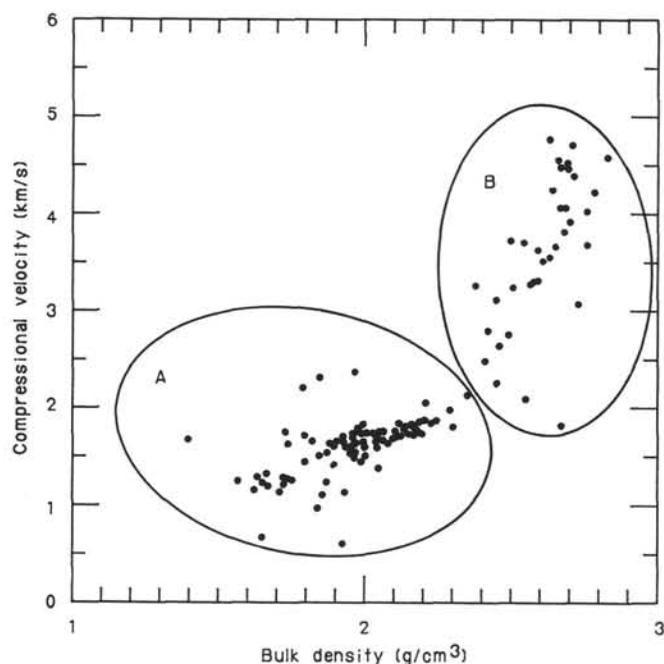


Figure 30. Bulk density plotted against compressional seismic velocity of Holes 638B and 638C. The set of data points within area A corresponds to unlithified sediments that show a slight increase in seismic velocity with increasing bulk density. The set of data points in area B corresponds to cemented sandstone and limestone.

Table 6. Average compressional seismic velocities ( $V_p$ ) and bulk densities ( $\rho_b$ ) used to calculate acoustic impedance ( $V_p\rho_b$ ) and reflectivity (R) between lithologic units.

|                     | $V_p$ (km/s) | $\rho_b$ (g/cm <sup>3</sup> ) | $V_p\rho_b$ | R                       |
|---------------------|--------------|-------------------------------|-------------|-------------------------|
| Unit I              | 1.65         | 2.00                          | 3.30        |                         |
| Subunit IIA         | 1.76         | 2.06                          | 3.62        | 0.046 (I/IIA)           |
| Subunits IIB + IIIA | 1.69         | 2.00                          | 3.38        | 0.034 (IIA/IIB + IIIA)  |
| Subunit IIIB        | 1.92         | 2.19                          | 4.20        | 0.108 (IIB + IIIA/IIIB) |

is fairly constant except over the interval ascribed to lithologic Subunit IIB (213–298 m sub-bottom, Cores 103-638B-23R to 103-638B-32R). Thermal conductivity over this interval falls within a narrower range of  $2.6\text{--}3.5 \text{ cal} \times \text{°C}^{-1} \times \text{cm}^{-1} \times \text{s}^{-1}$ . The change of thermal conductivity with depth is probably linked most closely with the downhole decrease in porosity and consequent increased transmission efficiency of lattice vibration.

Vane-shear-strength measurements on sediment from lithologic Unit I in Cores 103-638B-1R through 103-638B-18R show a gradual increase with depth of undrained shear strength. This somewhat reflects the greater degree of drilling disturbance in the upper part of Hole 638B. Note that the exponential increase of shear strength with sub-bottom depth is not accompanied by a similarly dramatic increase in other physical properties, such as seismic velocity or bulk density; remote-sensing techniques such as seismic profiling or logging cannot be used to predict sediment cohesiveness.

Compressional seismic velocities in sediments and sedimentary rocks of Hole 638B generally increase with depth. In the nanofossil ooze of the Neogene lithologic Unit I, velocities increase from about 1.25 km/s in the upper six cores to about 1.75 km/s at the base of the unit; the mean velocity measured below the drilling-disturbed upper 54 m is about 1.65 km/s. The very low velocities measured in the upper six cores are puzzling. We are not certain whether the low values reflect (1) a greater admixture of air from core handling after the material

had been brought aboard ship, (2) the expansion of gas generated in the biologically more active upper 50 m or so of sediment when ambient pressure is reduced to 1 atmosphere, or (3) the inability of the Hamilton Frame velocimeter to measure accurately the seismic velocity of sediment having high water content.

The upper boundary of lithologic Unit II is distinguishable not by a shift in nanofossil-ooze or -marl velocity but by the presence of several layers of chalk and limestone, which raise the average velocity in Subunit IIA to 1.76 km/s. Seismic velocities in lithologic Subunit IIB (212–298 m sub-bottom; Cores 103-638B-23R to 103-638B-32R) are remarkably uniform and indistinguishable from those measured in lithologic Subunit IIIA (298–330 m sub-bottom; Cores 103-638B-32R through 103-638B-35R), except for the occurrence of a few higher velocity sandstone layers in the latter; average seismic velocity for both units, based on visual core description tabulation, is 1.74 km/s. At about 344 m sub-bottom the average seismic velocity of the interval increases because of both an increase in the number of sandstone layers (with a seismic velocity average of about 4.2 km/s) and an increase in velocity of unlithified marl and clay in Subunit IIIB below about 344 m sub-bottom.

The core-by-core average seismic velocities presented in Figure 29 were calculated assuming that any unrecovered sediment consisted of unlithified marl. Had we assumed that the unrecovered material consisted of unlithified sand, the outcome would not be greatly altered because seismic velocities in uncemented sand range from 1.7 to 1.85 km/s (Bryant et al., 1981), and the velocities we used for marl generally fell within this range.

Bulk-density and porosity values predictably reflect the decreasing water content with depth. Despite drilling disturbance in the upper seven cores of Hole 638B, the velocity-to-bulk density ratio over the length of these cores (about 0.8) is roughly the same as that maintained through the length of the section at Holes 638B and 638C. The lack of change in these properties throughout Subunits IIB and IIIA suggests that these materials are at a consolidation limit, which may reflect an earlier, greater amount of overburden subsequently removed by erosion; the presence of chalk and limestone layers in Subunit IIA supports this suggestion (Hamilton, 1976). Biostratigraphic evidence, adding further support, indicates unconformities between Neogene nanofossil ooze in Unit I and late Barremian-early Aptian(?) limestone, marl, and marlstone in Subunit IIA, and between Subunit IIA and lower-middle Valanginian-Hauterivian nanofossil marl and marlstone in Subunit IIB.

Empirical diagrams of depth vs. porosity by Hamilton (1976) imply that an overburden of about 400 m is necessary to attain a porosity of about 45%, and an overburden of some 800 m is required to achieve a porosity of 35% in fine-grained terrigenous sediment. By this simplistic relationship, the porosities of 45%–50% measured at the top of lithologic Unit II at a sub-bottom depth of around 190 m indicate that about 200 m of overburden has been removed, whereas the porosities clustering around 35% at sub-bottom depths greater than about 450 m indicate about 350 m removal of overburden. Porosity-depth studies are limited in general application; variation of the sediment composition (grain size, carbonate content) and the rate of sediment accumulation can greatly affect the shape of the curve. Comparison of other sections with an empirical curve derived for a specific section are most useful when the two regions have a similar sedimentation history and sediment composition. Cautious application of Hamilton's (1976) porosity-depth curve for fine-grained terrigenous sediment to the porosity values of Cretaceous sediments at Site 638 results in an estimated removal of 200 m of overburden from the present section at the level of the unconformity.

The changes in average bulk density and average seismic velocity across lithologic unit boundaries between Units I and IIA, IIA and IIB, and IIIA and IIIB may have expression in

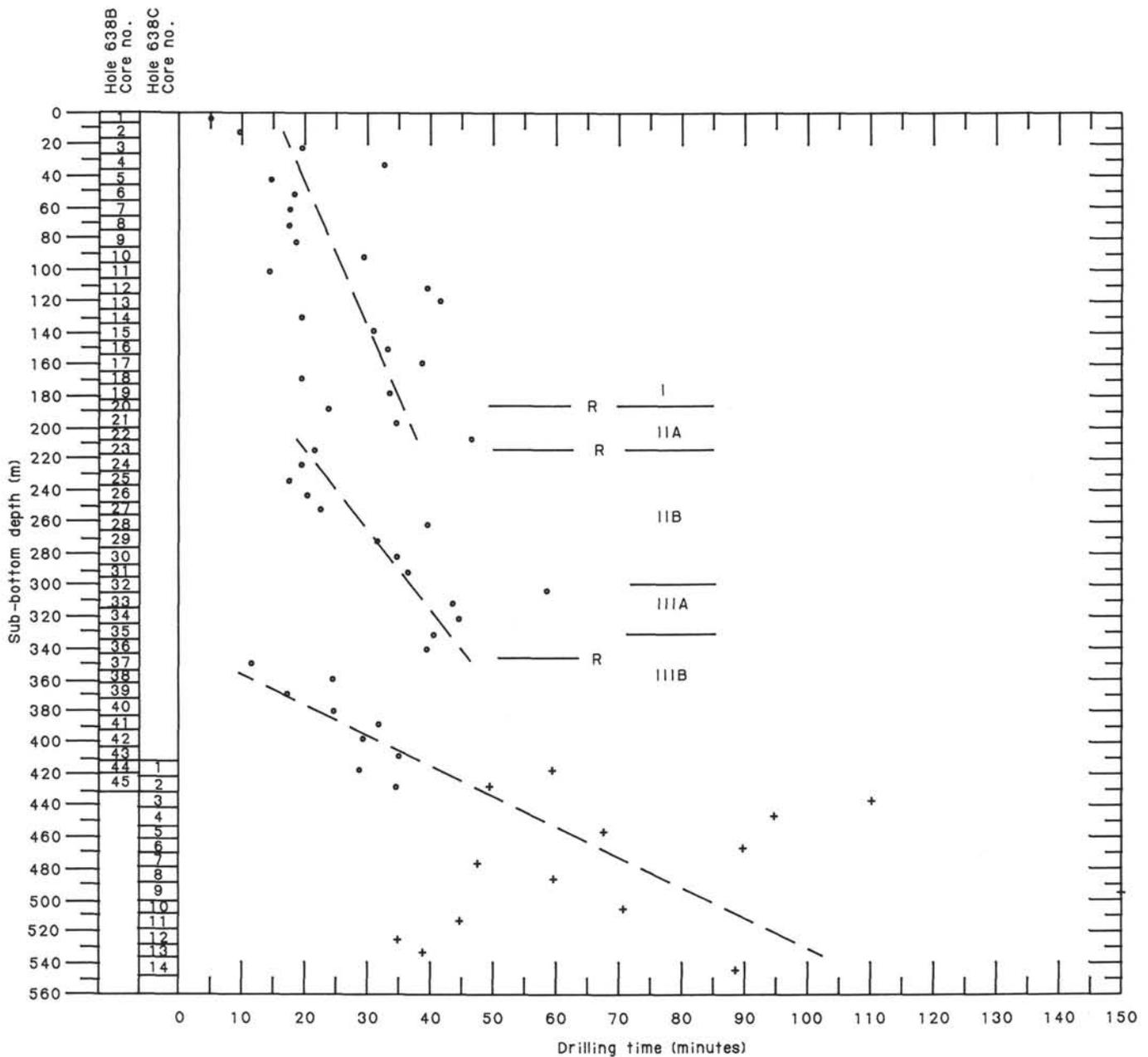


Figure 31. Drilling time plotted against sub-bottom depth. Solid circles are data from Hole 638B and crosses are Hole 638C data. Lithologic units (Roman numerals) and possible reflectors (R) are indicated.

seismic reflectors; calculated reflectivity coefficients at these boundaries are rather low. Because the velocities and bulk densities used are averages based on extrapolation of values measured in cores having poor recovery, our reflection coefficients are probably conservative. The major uncertainty in defining the strongest reflector at about 344 m sub-bottom depth is the occurrence of sandstone beds; a strong reflector may not exist if the increase in the proportion of section occupied by sandstone is gradational.

One clue in the identification of reflectors may be extracted from coring data: at two of the conjectured reflectors (between lithologic Units IIA and IIB and at 344 m sub-bottom in lithologic Unit IIIB), the amount of time necessary to drill the length of a core shifts abruptly.

### AGE-VS.-DEPTH CURVE

The age-vs.-depth curve for Holes 638B and 638C is shown in Figure 32, along with calculated values of sedimentation and accumulation rates.

In the Neogene, a discrepancy exists between foraminiferal- and nannofossil-age determinations; consequently, two curves are shown for the interval from about 50 to 183 mbsf. The differences are small and make virtually no difference in the calculated rates. The calculated rates are high for the late Miocene (about 20 g/cm<sup>2</sup>/1000 yr) and for the middle Pliocene (about the same value) but much slower for the early Pliocene and the late Pliocene. Most of the Pleistocene is missing or perhaps was not cored (see "Operations" section, this chapter).

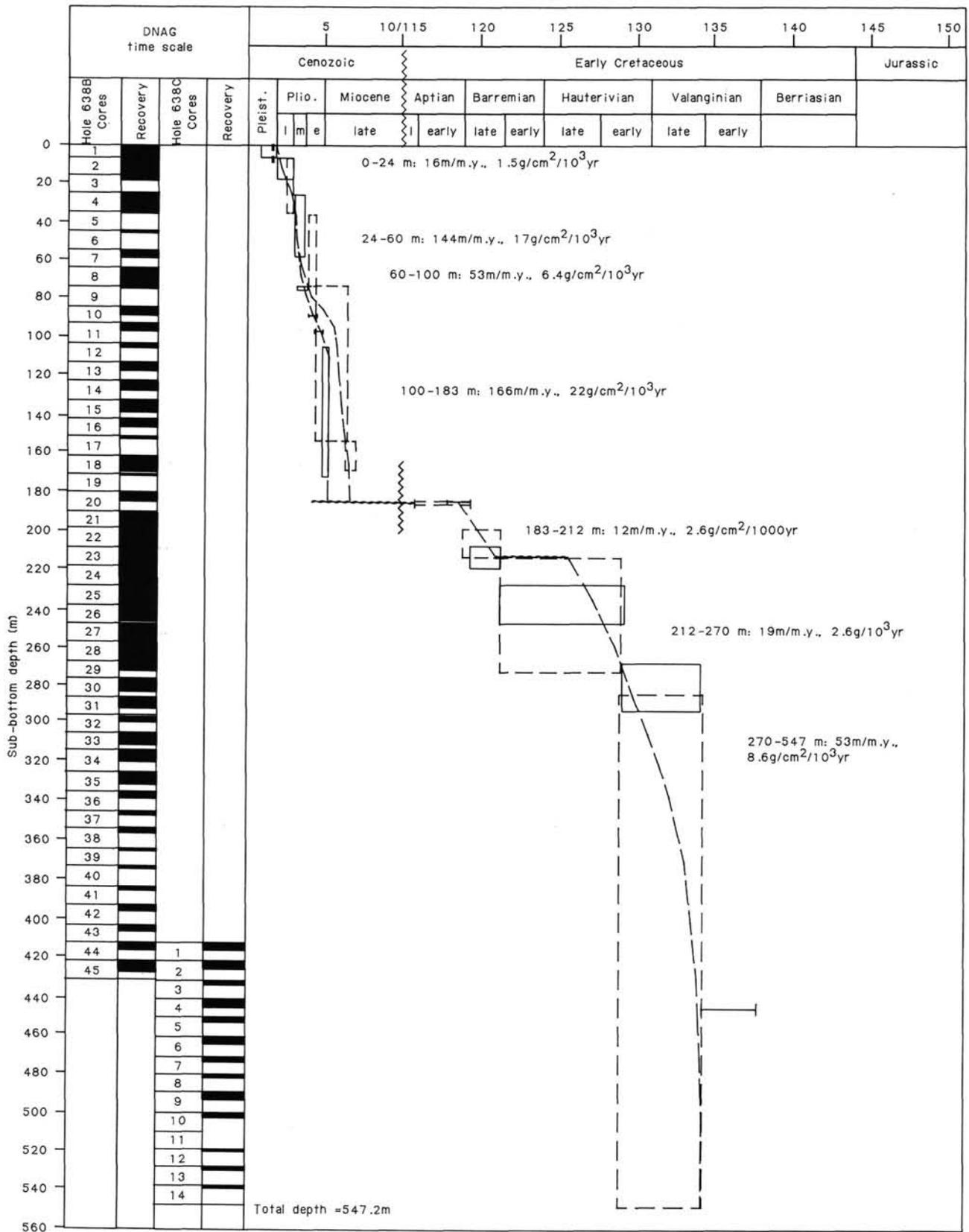


Figure 32. Age of biostratigraphically dated intervals in Holes 638B and 638C, expressed in millions of years, plotted against depths of the samples in the holes. The range of uncertainty in age assignments is indicated by the width of the age-range bars and boxes. Note that a gap of 105 m.y. appears in the diagram, indicated by a zig-zag vertical line. The figures to the right of the curve indicate, for each more-or-less straight-line segment, the rate of sedimentation in m/m.y. and the rate of accumulation, in g/cm<sup>2</sup>/1000 yr, adjusted for porosity and grain density of sediments from each interval and made using the values measured in the laboratory.

During the Early Cretaceous, rates were moderately high (about 10 g/cm<sup>2</sup>/1000 yr) in the Valanginian and slowed to about one-fourth this value during the Hauterivian and Barremian, reflecting the change from sandy turbidite to clay and marl deposition.

## LOGGING RESULTS

### Introduction

Geophysical logs were obtained at Site 638 in the pilot hole (638B) and the reentry hole (638C). The total depth of Hole 638B was 431.1 mbsf. Schlumberger long-spaced sonic, dual-induction, gamma-ray, and caliper tools were first run in Hole 638B from 100 to 278 mbsf. After a wiper trip was made in an attempt to get deeper into the hole, the L-DGO multichannel sonic (MCS) tool was run in the interval 100–164 mbsf. Neither run successfully reached total depth as a result of impassable bridges at 278 and 164 mbsf, respectively.

The total depth of reentry Hole 638C was 547.2 mbsf. The same suite of Schlumberger tools used in Hole 638B was used to log the deeper sedimentary interval but was again stopped by a bridge at 287 mbsf. A second suite, including lithodensity, neutron, and natural gamma-ray spectrometry tools, was employed from 105 to 250 mbsf, where a shallower constriction limited logging operations.

Both holes were drilled with a 9.875-in. bit and filled with 9.7 lb/gal fresh gel mud. The 5-in. (outer diameter) drill pipe and 8.25-in. (outer diameter) drill collars were pulled up to 100 mbsf before logging. The logs were recorded as the tools were pulled uphole at approximately 1000 ft/hr.

### Log Analysis

Three characteristic log-lithologic units are determined from the tool responses over the logged interval. These units are identified by distinct changes in the logs, shown in Figures 33 through 35. The ranges of the log values are summarized in Tables 7 (Hole 638B) and 8 (Hole 638C). Borehole rugosity and washout prevent reliable log data in several intervals in log-lithologic Units B and C in both holes. These intervals are apparent in the logs by low values of induction (ILD and SFLU) and density (RHOB and PEF) and high values of sonic slowness (DT), porosity (NPHI), and caliper (CAL) logs. Some improvement of the hole condition in Hole 638C resulted in a reliable sonic log where "cycle skipping" occurred in the log from Hole 638B. Other logs show no significant differences between Holes 638B and 638C attributable to changes in the hole condition.

Log-lithologic Unit A has relatively homogeneous log character; gamma-ray readings are about 25 API units, sonic velocities between 1.96 and 2.3 km/s, and resistivity values about 1.3 ohmm (Figs. 33A and 33B). Bulk density and neutron porosity logs in Hole 638C vary between 1.7 to 2.0 g/cm<sup>3</sup> and 42% to 54%, respectively. Compressional velocities obtained from the multichannel sonic log in Hole 638B range between 2 and 2.25 km/s from 100 to 164 mbsf. In the interval between 154 and 164 mbsf, gamma-ray values increase with depth to 45 API units, sonic velocity decreases to 1.6 km/s, and resistivity measurements vary inversely with the caliper changes, which range between 10.75 and 12.25 in. These rapid variations may be due to washed-out clay, which blocked the MCS tool at 164 mbsf.

Log-lithologic Unit B has a heterogeneous log profile with sharp boundaries and variations in borehole diameter between 9.75 and 12.25 in. (Figs. 34A and 34B). Gamma-ray, resistivity, density, and neutron porosity values fluctuate, and there are several intervals where "cycle-skipping" occurs in the sonic log. Despite cycle-skipping on sonic logs, reliable values range be-

tween 90 and 180  $\mu$ s/ft, caused by the alternation of clay and limestone in 1- to 4-m thick layers. The top and bottom of this unit in Hole 638C is located 3 m higher and 17 m lower than in Hole 638B. Therefore, Unit B is 20 m thicker in Hole 638C.

In log-lithologic Unit C, the variations of gamma-ray and resistivity values again suggest relative changes in clay content (Figs. 35A and 35B). Clay-poor intervals have both low resistivity (0.4 ohmm) and velocity (1.6 km/s) values relative to clay-rich intervals. Variations in borehole diameter in this unit severely affect the log measurements in both holes.

### Lithostratigraphic Correlation

The three log-lithologic units correspond reasonably well with the lithostratigraphic units described from the recovered cores (see "Sediment Lithology" section, this chapter). This correlation is summarized in Table 9. In log-lithologic Unit A, low gamma-ray values generally correspond to the nannofossil ooze and chalk of lithologic Unit I. High gamma-ray values correspond to the stiff, reddish brown clay in Core 103-638B-17R and Section 103-638B-18R-1. This clay interval is absent in Hole 638C.

The Cenozoic/Mesozoic boundary between lithologic Units I and II correlates with sharp changes in log responses. Log-lithologic Unit B is heterogeneous, consistent with the three different lithologies identified in lithologic Subunit IIA (see "Sediment Lithology" section, this chapter). A correlation exists between (1) low gamma-ray and high resistivity values and bioturbated limestone and (2) high gamma-ray and low resistivity values and calcareous clay.

In Unit C, high gamma-ray and resistivity values probably correspond to alternating layers of nannofossil and clay-rich marls in lithologic Subunit IIB. Low gamma-ray and resistivity readings may relate to slumped intervals in Section 103-638B-23R-3 and Core 103-638B-26R.

### Preliminary Seismic Correlation

A synthetic seismogram was calculated from a simplified physical-properties model of the sedimentary sequence at Site 638. In the logged section, bulk-density and sonic-velocity values were averaged in intervals determined from log analysis; elsewhere, selected laboratory measurements were used. Corrections for rebound porosity of the laboratory samples were ignored, and poor core recovery increased the depth uncertainty of the laboratory data. As a result, the composite log/lab model in Table 10 is only a possible interpretation of the data. Slight modifications of this model, however, do not significantly change the major results.

The depths in Table 10 correspond to the top of each interval, and the compressional velocity is constant below. A zero-phase wavelet, band limited between 10 and 60 Hz, was used to approximate the source function for the synthetic computation. The effects of internally reflected energy are included, although mode conversions and spherical divergence are ignored. The resulting synthetic seismogram at Site 638 is shown in Figure 36 with the nearby underway seismic record. Relative seismic amplitude is plotted vs. two-way traveltime. Prominent high-amplitude reflections in the synthetic seismogram at about 6240, 6290, 6380, and 6480 ms correspond to impedance contrasts in the sediments at approximately 58, 105, 185, and 298 mbsf, respectively, as indicated in Figure 36. These depths are identified by sharp changes in the velocity and density values in Table 10. Note, however, that these seismic phases are influenced by changes in the model and assumptions about the source signature. We advise caution, therefore, in making interpretations using this correlation.

## SEISMIC STRATIGRAPHY

### Interpretation of the Seismic Line Recorded on *JOIDES Resolution*

During the transit of the drill ship from Sites 637 to 638, we generated a seismic-reflection profile, part of which is shown in Figure 37. Comparison of the seismic stratigraphy of the sedimentary basin west of Site 638 with that seen on seismic profiles near DSDP Site 398 (about 200 km southeast of Site 638), which were calibrated by drilling (Sibuet, Ryan, et al., 1979), suggests that the oldest strata shown on the *JOIDES Resolution* profile are black shale beds of Albian to middle Cenomanian age (seismic sequence 3 on Fig. 37). Layers older than sequence 3, such as the syn-rift and pre-rift units seen on multichannel seismic lines, cannot be identified on the unprocessed profile.

Near Site 638, the profile is more difficult to interpret. The drill site is in a valley having side slopes that create side echoes in the form of hyperbolic traces, and the unprocessed profile has a large vertical exaggeration (about  $19\times$ ). Even so, two seismic reflectors, labeled R1 and R2 on Figure 37, are plainly seen east of the valley. The acoustically transparent unit between the two reflectors we identify as seismic sequence 3, the black shale, seen on the processed multichannel line GP-101 (Fig. 38C). Reflector R1, thus, is probably middle Cenomanian in age, and R2 is near the Albian/Aptian boundary and marks the regional "break-up" unconformity between syn- and post-rift sedimentary sequences. Another display of the *JOIDES Resolution* profile, processed to reduce the vertical exaggeration and to emphasize strong-amplitude reflections, is shown in Figure 38A.

### Correlations Between Drilling Data and Seismic Profiles

Although Site 638 is about 1 km north of multichannel seismic line GP-101 (Figs. 5 and 38), the seismic profile recorded from *JOIDES Resolution* during the approach to the site (Fig. 37) is similar to line GP-101. In particular, the seismic stratigraphy at the point where we dropped the acoustic beacon resembles that at shotpoint 3085. The two places are at about the same position relative to the axis of the submarine valley and have nearly the same water depth; reflectors R1, R2, and R3 intersect the seafloor at about the same relative positions along the valley and dip eastward at about the same angle. For these reasons, we shall use both line GP-101 at shotpoint 3085 and the seismic section at Site 638 in relating the drilled sequence to the seismic stratigraphy.

To make reliable correlations between the seismic and physical stratigraphy, data on density and velocity from downhole logging and from laboratory measurements are required. Logging data on sonic velocity and density exist for only the interval from about 105 to 272 mbsf for velocity and 105 to 243 mbsf for density and thus provide only weak support for correlations. The log velocity data are, furthermore, at odds with the data from direct laboratory measurements on core samples and require us to assume a velocity change of about 15% from effects of pressure release on the samples to bring the log and laboratory results into harmony (see "Physical Properties" section, this chapter).

Figure 39 shows a synthetic seismogram, constructed by combining both logging and *uncorrected* laboratory data on velocity and density and then convolving the resultant impedance curve with an artificial source signal in a frequency band similar to that used in processing multichannel seismic line GP-101 (see "Logging Results" section, this chapter). Because of assumptions made in the model, the relative amplitude of reflections in the synthetic seismogram may be distorted.

The correspondence between major reflectors on the GP-101 seismic profile (Fig. 40) and lithologic changes recorded by the

cores and log data from Site 638 are discussed as follows, from youngest to oldest:

1. At Site 638, the 184-m-thick Neogene ooze and chalk sequence rests unconformably on Cretaceous strata. This sequence correlates with the valley-fill unit seen on the seismic profiles (Figs. 38B and 38C). The strong peak in seismic amplitude on the synthetic seismogram at the level of the unconformity has a calculated two-way traveltime of approximately 220 ms; the actual seismic profile has a strong reflector at 220 ms.

2. The outcrop of reflector R1, believed to be near the Cenomanian, is on the lower slopes of the hill east of Site 638; the reflector was, therefore, not intersected during drilling. Likewise, reflector R2, which correlates with the regional break-up unconformity near the Aptian/Albian boundary, has its subcrop beneath the Neogene valley fill slightly east of the drill site; hence, no Albian or Cenomanian black shale underlies Site 638.

3. The interval from 184 to 212 m consists of upper Barremian claystone, marlstone, and limestone, assigned to lithologic Subunit IIA (Table 2, this chapter), which is separated from the underlying Subunit IIB by an unconformity. This unconformity is associated with one of the weak reflectors above R3, within the wedge of syn-rift sediments that thickens eastward into the half graben (Fig. 40).

4. Before drilling at Site 638, we had thought that reflector R3 marked the top of the Jurassic/Lower Cretaceous carbonate platform. One of the most important findings of the drilling is that R3 is instead a reflector within the Lower Cretaceous clastic syn-rift sequence.

R3 is visible both on the GP-101 (Figs. 38B and 40) and on the *JOIDES Resolution* seismic lines (Fig. 38A). At the position corresponding to Hole 638B, the reflector is at 315–320 ms bsf on both lines, i.e., at about 300 mbsf on the synthetic seismogram. Within the syn-rift sequence drilled at Site 638, there is one major change in lithology at 298 mbsf, between turbidite sandstone of lithologic Unit III and the overlying claystone and marlstone of Unit II. On the synthetic seismogram, a large spike in seismic amplitude at 298 mbsf (315 ms) (Fig. 39) corresponds to the highest sample of high-velocity sandstone of Unit III within a series of samples of alternating lower velocity claystone and high-velocity sandstone. Thus, all data are coherent, and we conclude that reflector R3 marks the boundary between lithological Units II and III (Fig. 40).

Close study of the seismic records shows that the stratigraphy within the syn-rift sequence is highly complex and includes many lenses and local unconformities. Reflector R3 is clear at the position of Hole 638, but as it is traced eastward on line GP-101, continuity is uncertain, owing to a divergent pattern of reflectors that branch away from R3. R3 has the appearance of an unconformity on line GP-101; reflectors near the base of the overlying wedge overlap R3; R3, in turn, seems to truncate reflectors of the underlying sequence.

5. The deepest reflector R4, at about 530 ms below the seafloor at Site 638, is very strong and implies a large impedance contrast. Because shallow-water limestone was dredged from the west-facing escarpment where this strong reflector crops out, about 6 km north of Site 638 (see "Background and Objectives," this chapter), we thought after drilling Site 638 that this reflector marks the top of Mesozoic carbonate-platform rocks; this was confirmed by drilling at Site 639 (see Site 639 chapter, this volume). If we use an average (weighted) velocity of 3.4 km/s, from the combined log and lab data (Table 10), for the interval from 298 m to the total depth of 547 mbsf and simply extrapolate to the reflector R4 at 530 ms, which is the reflector marking the top of the carbonate platform, we obtain a depth of 667 mbsf.

We can improve this estimate by using data from Hole 639A. The highest strata in the Mesozoic in Hole 639A (see Site 639

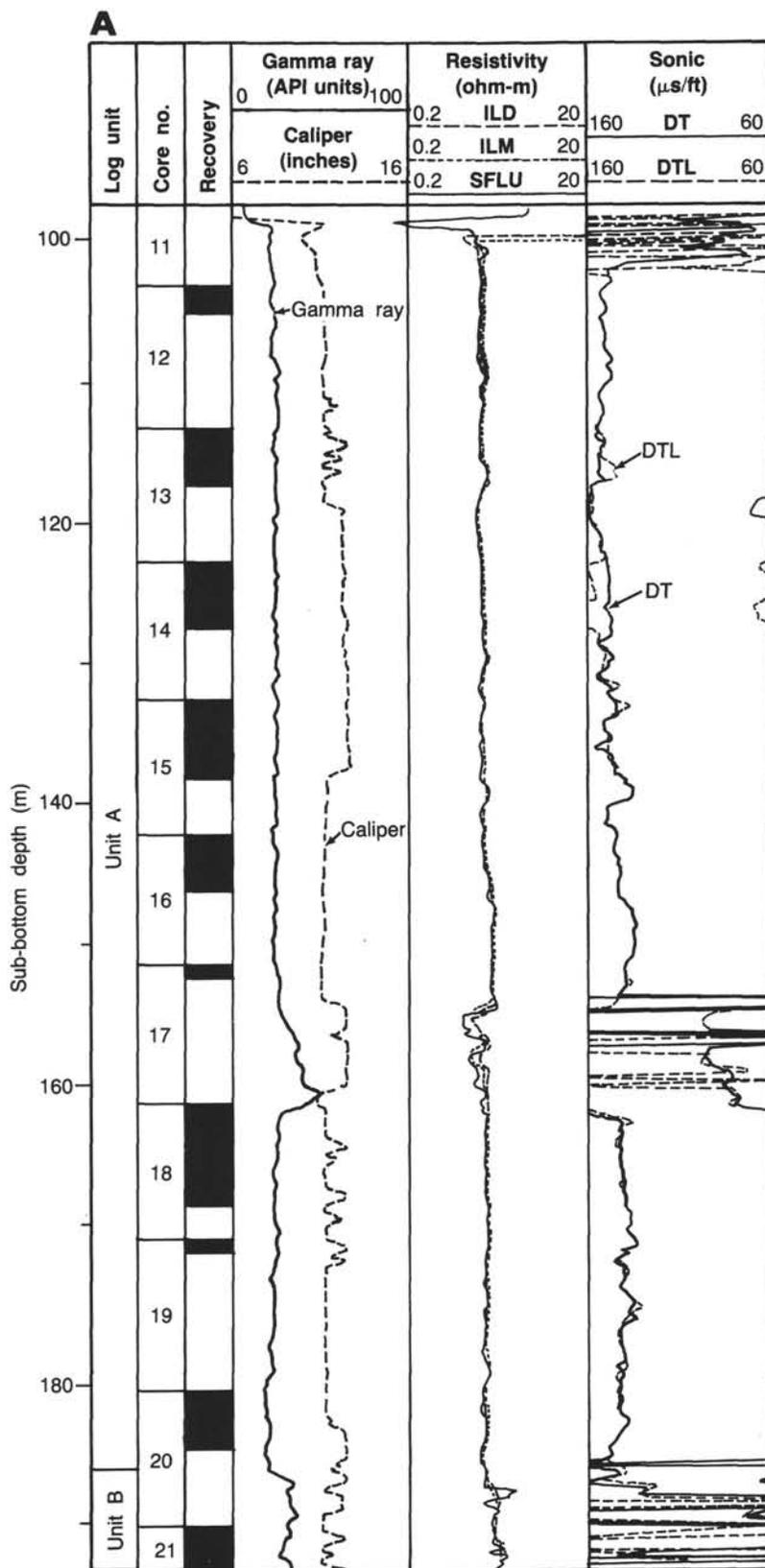


Figure 33. A. Composite log and core recovery in log-lithologic Unit A (Hole 638B). See text for description of logs. B. Composite log in log-lithologic Unit A (Hole 638C). See text for description of logs.

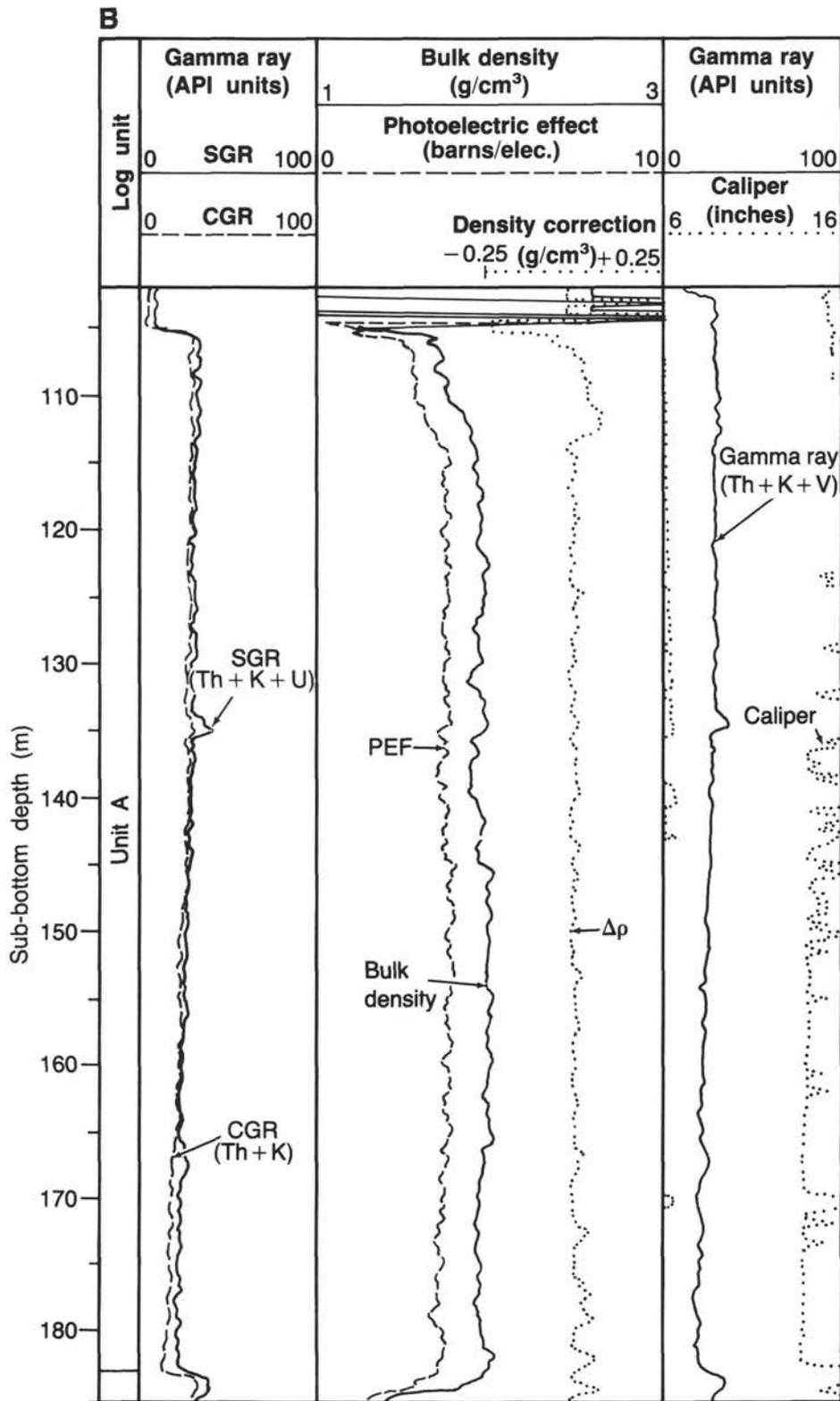


Figure 33 (continued).

chapter, this volume) are beds of Valanginian sandstone, similar to those near the bottom of Hole 638C but underlain by some 30–40 m of marl and marlstone having a velocity of only about 2.0 km/s and lying directly on the carbonate platform rocks. Taking into account these strata and the seismic velocities, we estimate the thickness at Site 638 of Cretaceous strata between

298 m and the top of the carbonate platform to be as follows: (1) Hauterivian–Valanginian sandstone turbidites (lithologic Unit III) are 300 m thick (based on an assumed velocity of 3.43 km/s and a seismic thickness of 175 ms), and (2) Valanginian marl and marlstone are 40 m thick (based on an assumed seismic velocity of 2.0 km/s and a seismic thickness of 40 ms).

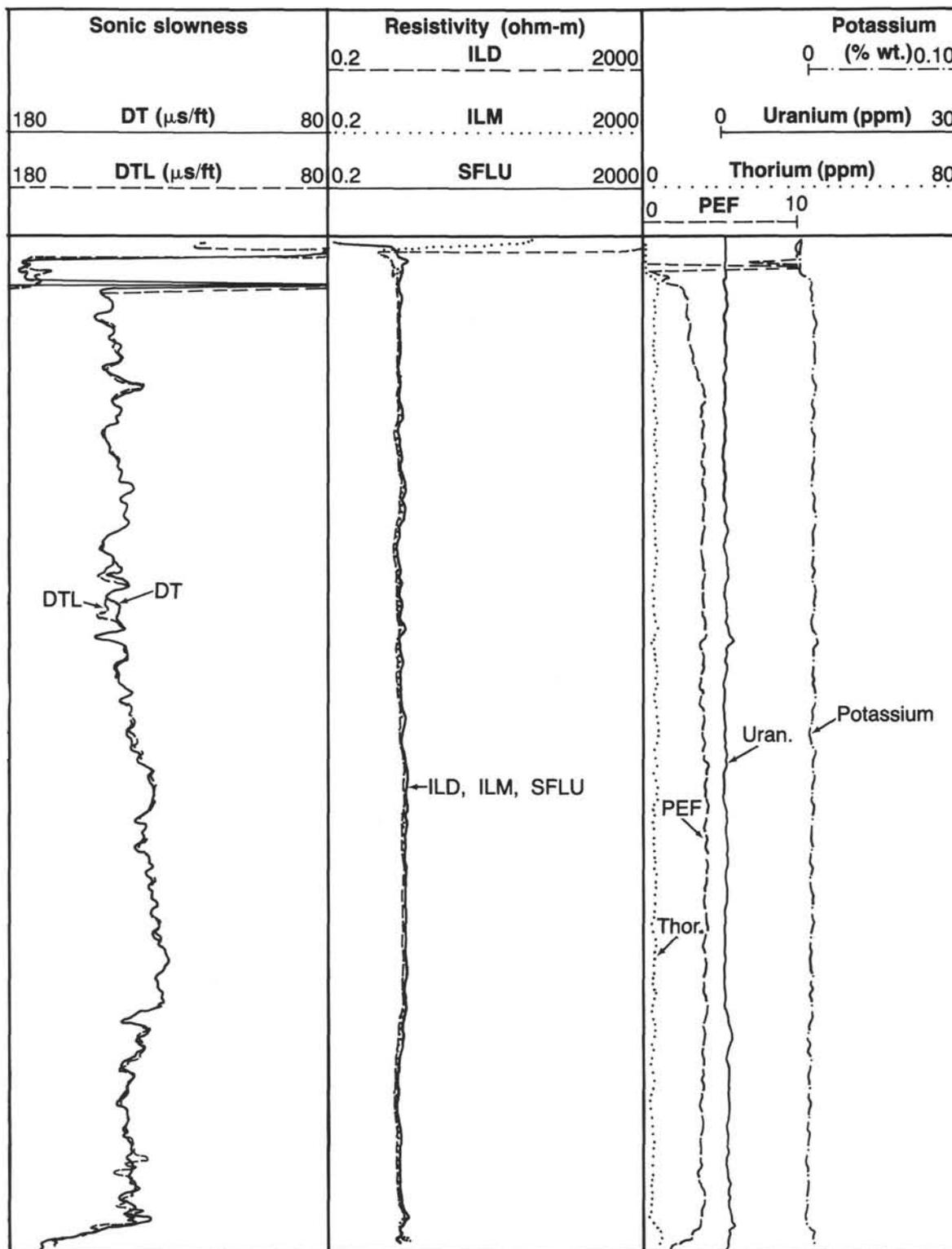


Figure 33 (continued).

The estimated depth at Site 638 to the top of the carbonate platform is thus 638 m, or about 91 m below the total depth reached. This estimate implies that about 50 m of turbidite sandstone lies between the bottom of Hole 638C and the top of Hole 639A.

### SUMMARY AND CONCLUSIONS

Site 638 is about midway across a tilted fault block that is typical of the succession of such blocks forming a staircase descending the outer part of west Galicia margin. Such tilted blocks

are common and even characteristic of many passive margins. To understand their origin and history has been one of the major aims of scientific ocean drilling since the inception of the JOIDES program nearly two decades ago. The site was chosen because exploration of the entire pre-rift sequence there appeared possible, albeit time consuming. The JOIDES Planning Committee, therefore, allotted about 5 to 6 weeks for completion of the drilling and logging at the site. The scientific staff included many specialists in carbonate petrology and in micropaleontology of Lower Cretaceous and Jurassic strata. Site 638 drilling was to be a major undertaking.

The particular goal of drilling at Site 638 was to core through the Cretaceous syn-rift sediments that we believed formed a relatively thin cover over a pre-rift shallow-water carbonate platform and then to continue on through the platform rocks into crystalline basement rock. The drilling plan was based on the conventional model of the seismic stratigraphy of the Galicia margin. We thought that the strong reflector R4 (Fig. 40), which forms acoustic basement, was the top of the Hercynian basement complex known at outcrop on the Iberian mainland and from a dredge haul only a few kilometers north of Site 638 (Mougenot et al., 1985). The conspicuous reflector R3, about 0.3 s above acoustic basement, we identified as being the top of the carbonate platform. We expected the presence of, above the carbonate platform, only a thin wedge of syn-rift sediments, covered by Neogene sediments in the submarine valley in which the site is located. We estimated the thickness of sediments above basement to be about 1000 to 1200 m.

Although we did not reach the basement at this site, we were rewarded by finding a stratigraphic succession different from the one predicted. The interval between acoustic basement and the conspicuous reflector 0.3 s above it is occupied not by platform carbonates but by syn-rift strata, comprising sandstone turbidites, mainly of Valanginian age, overlain by Hauterivian and Barremian marlstone and claystone. We estimate the thickness of syn-rift sediments at the drill site to be about 500 m, but the thickness increases to several times this value only a few kilometers farther east, in the half graben (Fig. 41).

The details of the stratigraphic section drilled at Site 638 are shown in Figure 42, and the salient features are described below.

### Stratigraphy of the Syn-Rift Cretaceous Rocks at Site 638

The sediments of the syn-rift sequence at Site 638 consist of about 250 m of sandstone turbidites interbedded with claystone and minor marlstone, overlain by about 100 m of alternating marlstone and claystone, much disturbed by slumping and creep structures. The sandstone is mainly Valanginian, and the overlying claystone and marlstone is Hauterivian and upper Barremian. The graded sandstone beds typically begin with massive, Bouma  $T_a$  lithology at the base, and few beds include the ripple cross-lamination of Bouma  $T_c$ . Granules occur at the base of some beds, especially in the lowest part of the sequence cored, and even a few small pebbles occur in one bed. Redeposited plant debris from the land is ubiquitous and forms almost lignitic concentrations at a few places. The claystone beds contain about 1% organic carbon, the marlstone beds about 0.6%, and the sandstone layers about 0.1%.

Clearly, we are dealing here with relatively proximal turbidites, as confirmed by inspection of the seismic-profiler records, which show a confused pattern of lenticular units and local unconformities, caused perhaps by deposition of the turbidites in lobes or channels. The relatively poor recovery rate for cores in the sandstone unit precludes our identifying upward-fining or -coarsening sequences; on the other hand, the proportion of claystone and marlstone beds shows a broad tendency to in-

crease upward, and the upper 20 m of sandstone are gradational into the overlying claystone and marlstone unit. No reliable *in-situ* indicators of the environments of deposition are present in the microfaunal and nannofloral assemblages since most of the microfossils are probably resedimented. Yet, a whole range of depth environments, from neritic to infrabathyal is represented in the transported foraminiferal assemblages, along with ammonite aptychi, denoting depths below the dissolution levels for aragonite. Modern marine turbidites generally do not accumulate in depths of less than 500–1000 m, and the coarse texture of the sandstone turbidites at Hole 638C imply high-energy currents, requiring substantial submarine relief for steep canyons to funnel the sands toward the basins.

The contact with the overlying unit, which is at about 300 mbsf, is marked by a prominent seismic reflector about 315 ms below the seafloor, according to the synthetic seismogram constructed by combining laboratory and logging data on sound velocity and density (Fig. 39); indeed a prominent reflector appears in that position on the seismic profile recorded from *JOIDES Resolution* across the site (Fig. 38A).

Of what lies below 547 m, we have no completely satisfactory way to estimate the thickness of sediments between the deepest level reached in Hole 638C and the top of the prominent seismic reflector that marks the top of the shallow-water carbonate rocks sampled at Site 639. We estimate, from logs and laboratory data, the sound velocity of any turbidite sandstone/claystone lithology in this interval to be about 3.4 km/s. We also have laboratory data from the 40 m of lower Valanginian marlstone just above the carbonate rocks drilled at Hole 639A (see Site 639 chapter, this volume) that show velocities of about 2 km/s. Using these interval velocities, we estimate a thickness of about 90 m left to drill below the bottom of Hole 638C to reach the carbonate platform. Of this amount, some 40 m were penetrated and sampled at Hole 639A, leaving about 50 m of unsampled sandstone below the total depth of Hole 638C.

Above the turbidite sandstone, an interval about 190 m thick of claystone and marlstone begins in the upper Valanginian or lower Hauterivian and extends to the upper Barremian; an unconformity omits the lower Barremian. The claystone and marlstone alternate at scales of a few centimeters to a meter or so. The claystone probably largely represents distal turbidites, and indeed some layers have a silty base and show grading. Small bits of terrestrial plant debris are common in some layers, and the average content of organic carbon is about 0.4%. The marlstone occurs both as the upper member of claystone/marlstone couplets, where it probably represents the finest material in turbidity currents of turbid flows, and as separate layers, commonly more bioturbated than the claystone. Both marlstone and claystone commonly show microslumping structures, and larger slump masses occur, some measuring several meters thick. The thickest of these is just beneath the Hauterivian-upper Barremian unconformity. The upper Barremian interval, which is only about 30 m thick, is different from the beds below because it includes interbeds of bioturbated clayey limestone between the intervals of claystone/marlstone couplets.

The organic matter in the Cretaceous rocks at Site 638 is mostly composed of terrigenous Type III kerogen, according to analyses using the Rock-Eval, and is highly oxidized and detrital. The organic matter has not had enough thermal intensity to bring it near maturity.

Interstitial waters from the Cretaceous at Site 638 show a downward increase in calcium, suggesting calcium dissolution at depth, and a concomitant decrease in magnesium, perhaps owing to formation of diagenetic clay. A marked increase in salinity occurs in one sample of Hauterivian claystone, possibly resulting from lateral advection of seawater along a permeable (slumped?) layer of an outcrop at the seafloor.

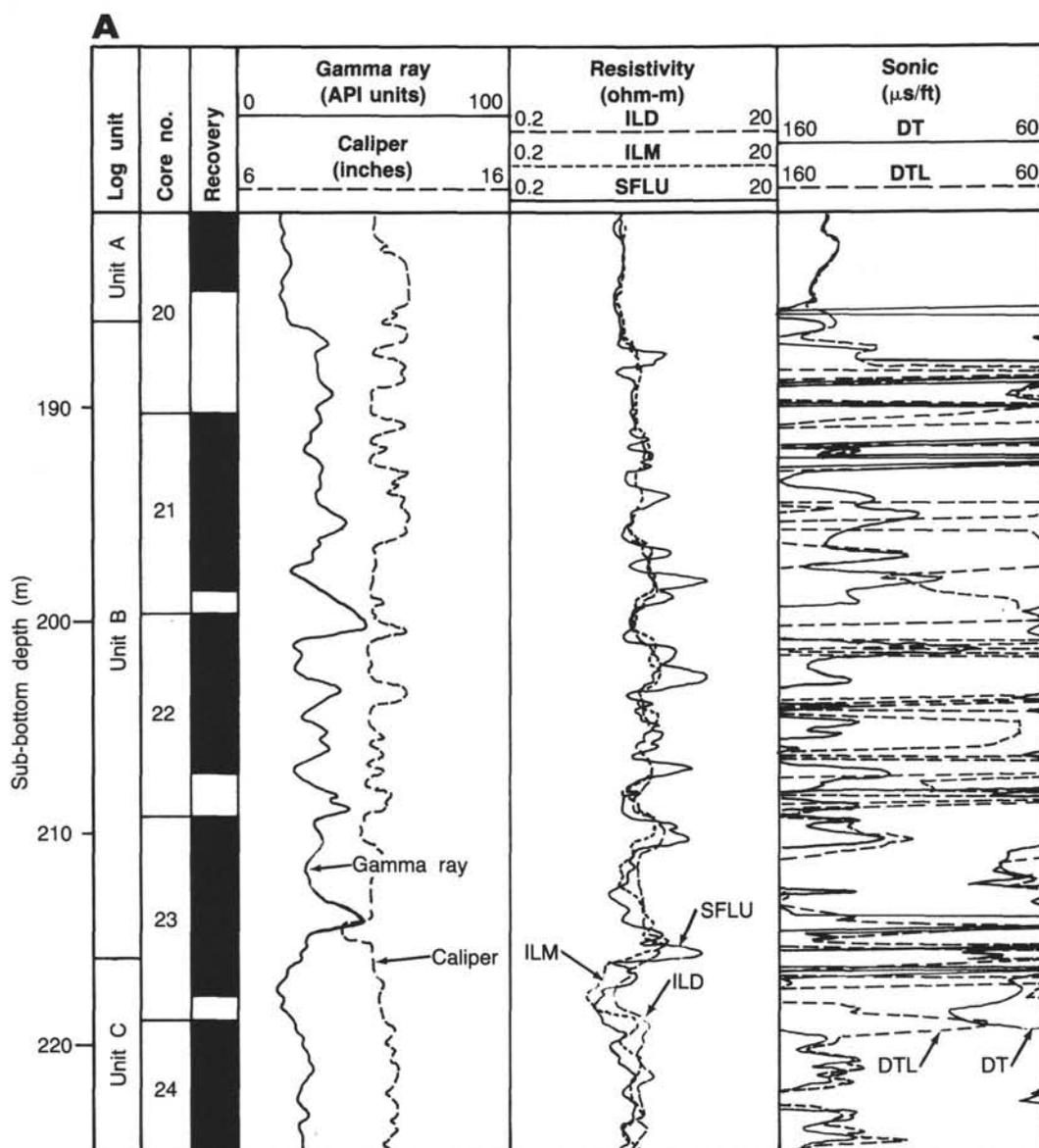


Figure 34. A. Composite log and core recovery in log-lithologic Unit B (Hole 638B). See text for description of logs. B. Composite log in log-lithologic Unit B (Hole 638C). See text for description of logs.

### Neogene Valley Fill

As seen on the seismic profiles (Figs. 38A and 38B) and on the location map (Fig. 4), Site 638 is on the floor of a valley that runs parallel to and east of the submarine cuesta formed by the resistant carbonate beds at the western edge of the tilted fault block. The valley heads on the southwest edge of Galicia Bank, some 40 km to the north, and after crossing Site 638 turns southwest across the broad, gentle turbidite slope that leads down to the Iberian Abyssal Plain. Site 638 is slightly east of the present-day thalweg of the valley (Fig. 4) but is nearly over the deepest part of the now back-filled erosional valley defined by the angular unconformity between the Neogene and the underlying Cretaceous strata (Fig. 38). As shown on the seismic profile, the valley was first carved deeply into the Cretaceous strata, perhaps migrating eastward down a bedding surface in the Cretaceous sequence, most likely along the limestone beds in the upper Barremian.

Deposition in the valley began during the late Miocene and has mainly been by pelagic processes or by gentle traction currents, rather than by turbidity currents. No clearly graded beds were seen in the cores in the Neogene, although reworked older fossils are present at many levels. In one interval, about 152 mbsf, pebbles of Cretaceous black shale suggest a possible debris flow interstratified in the sequence, but the pebbles may be cavings from the seafloor. The lowest part of the Neogene section is white nannofossil chalk, having a calcium carbonate content of about 90%; this passes gradually upward into nannofossil ooze, whereas the calcium carbonate values decrease to only about 70% in the uppermost part of the sequence. In several cores, generally badly disturbed Pleistocene brownish ooze and a few pebbles occur, leading us to suspect cavings. Since the topmost core material recovered at the site is lower Pleistocene gray ooze, we further suspect that a few meters of even younger brownish ooze lies just beneath the seafloor but was not sampled. That the depth to the seafloor and to the skirt of the reen-

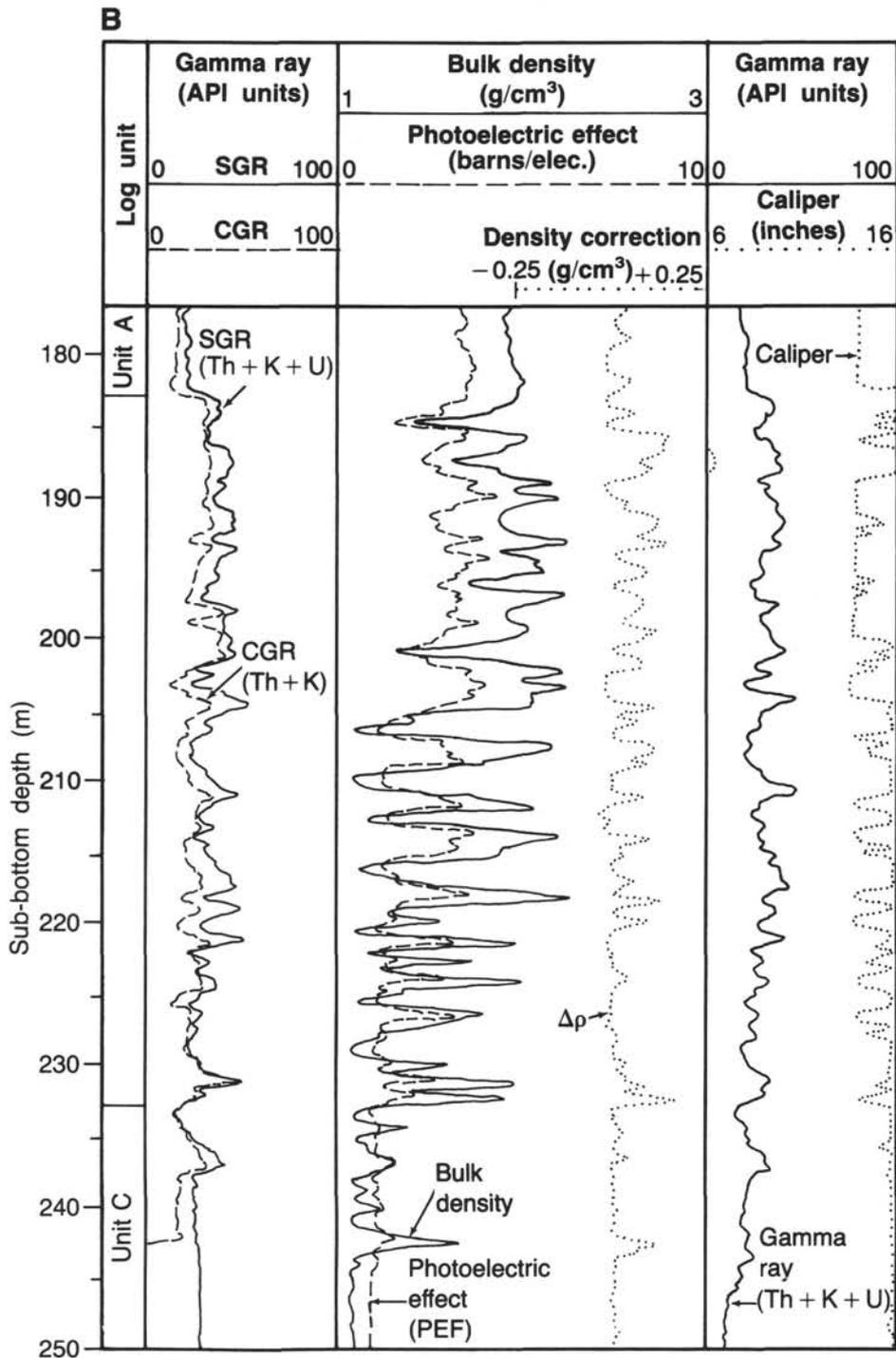


Figure 34 (continued).

try cone seen by the sonar search tool used during reentry at Hole 638C was several meters shallower than the depth at which we took the first core strengthens this possibility.

**Regional Implications of the Cretaceous Syn-rift Strata at Site 638**

The discovery of syn-rift rather than pre-rift strata between the two reflectors R3 and R4 (Fig. 38) has important implications for interpretations of seismic profiles elsewhere in the region. The general scheme previously accepted by most workers for correlating seismic profiles and physical stratigraphy is now

shown to be incorrect on a fundamental point, and a reinterpretation of the stratigraphy beneath the regional break-up unconformity is necessary.

Two examples illustrate the reinterpretation required. At DSDP Site 398, about 90 km southeast of Site 638, the seismic profiles have generally been interpreted (Bouguigny and Willm, 1979; Groupe Galice, 1979; Sibuet and Ryan, 1979) as showing that the reflector identified as "acoustic basement" is the base of the syn-rift sequence, which from the drilling results at Site 398 would be somewhere in the Hauterivian. As pointed out by Sibuet and Ryan (1979), strata beneath this "acoustic basement"

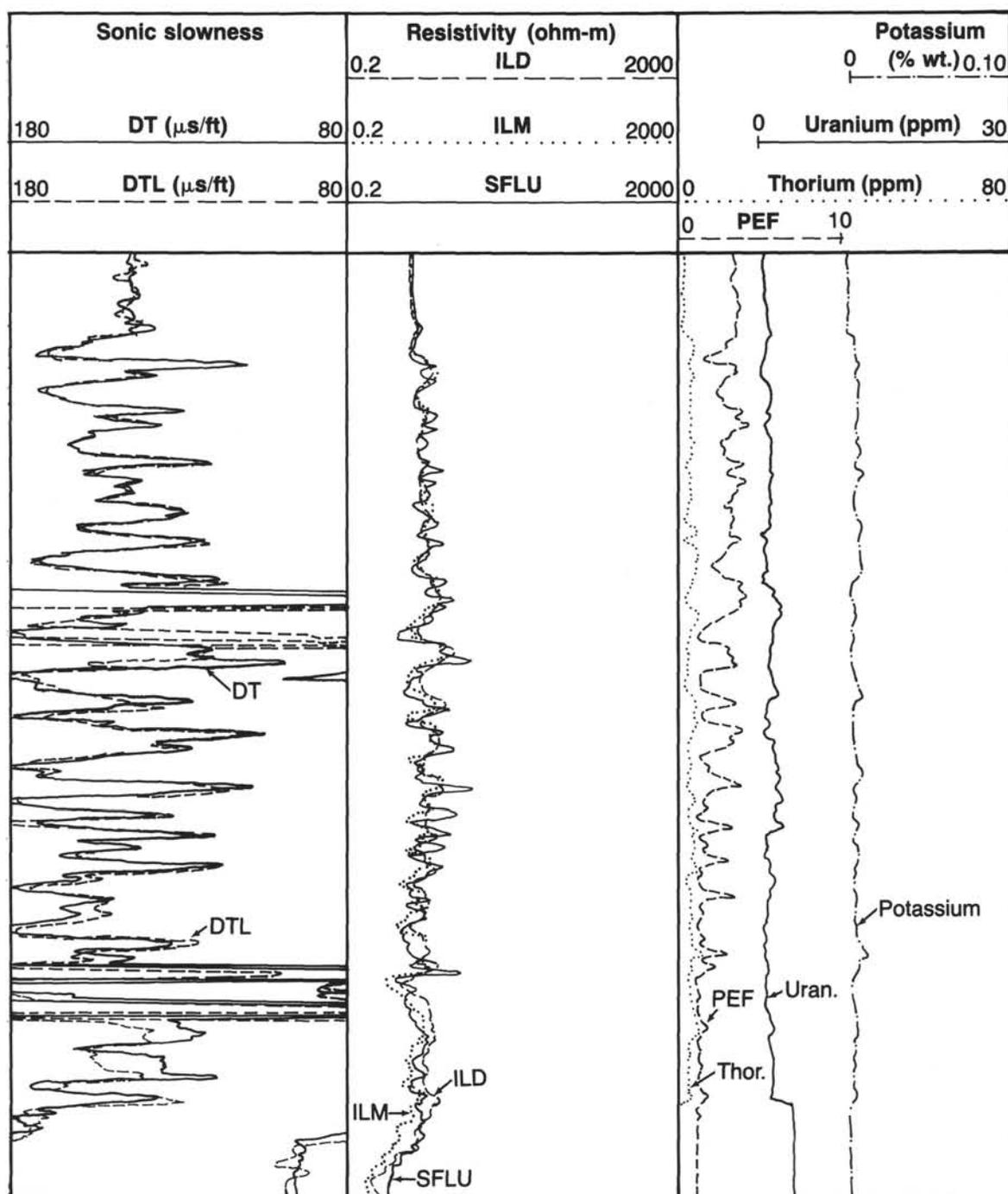


Figure 34 (continued).

are clearly sedimentary near Site 398 and, on the basis of drilling results at Site 638, we think also include important thicknesses of pre-Hauterivian syn-rift sediments. The second example is more remote, on the Armorican margin facing the Bay of Biscay. A typical seismic profile across a tilted fault block deep in that margin is shown by Montadert et al. (1979) (Fig. 43). The base of seismic formation 3, basal Albian in age, is identified as the break-up unconformity, and only formation 4 is regarded as syn-rift; the next underlying "acoustic basement" formation is recognized as sedimentary by Montadert et al. (1979), but assigned to pre-rift, Jurassic time. The similarity in geome-

try and reflection character between the "acoustic basement" formation on the Biscay margin and the Lower Cretaceous syn-rift sequence in the half graben drilled at Site 638 suggests that they may be correlatives.

Beyond the major recalibration of seismic profiles is the more fundamental question of the timing of rifting on Galicia Bank. The results from Site 638 clearly demonstrate that rifting began at least as long ago as early as the Valanginian, about 25 m.y. before the onset of seafloor spreading at the end of the Aptian. This early inception of rifting predates by nearly 15 m.y. the reported beginning of rifting on the Armorican margin, even

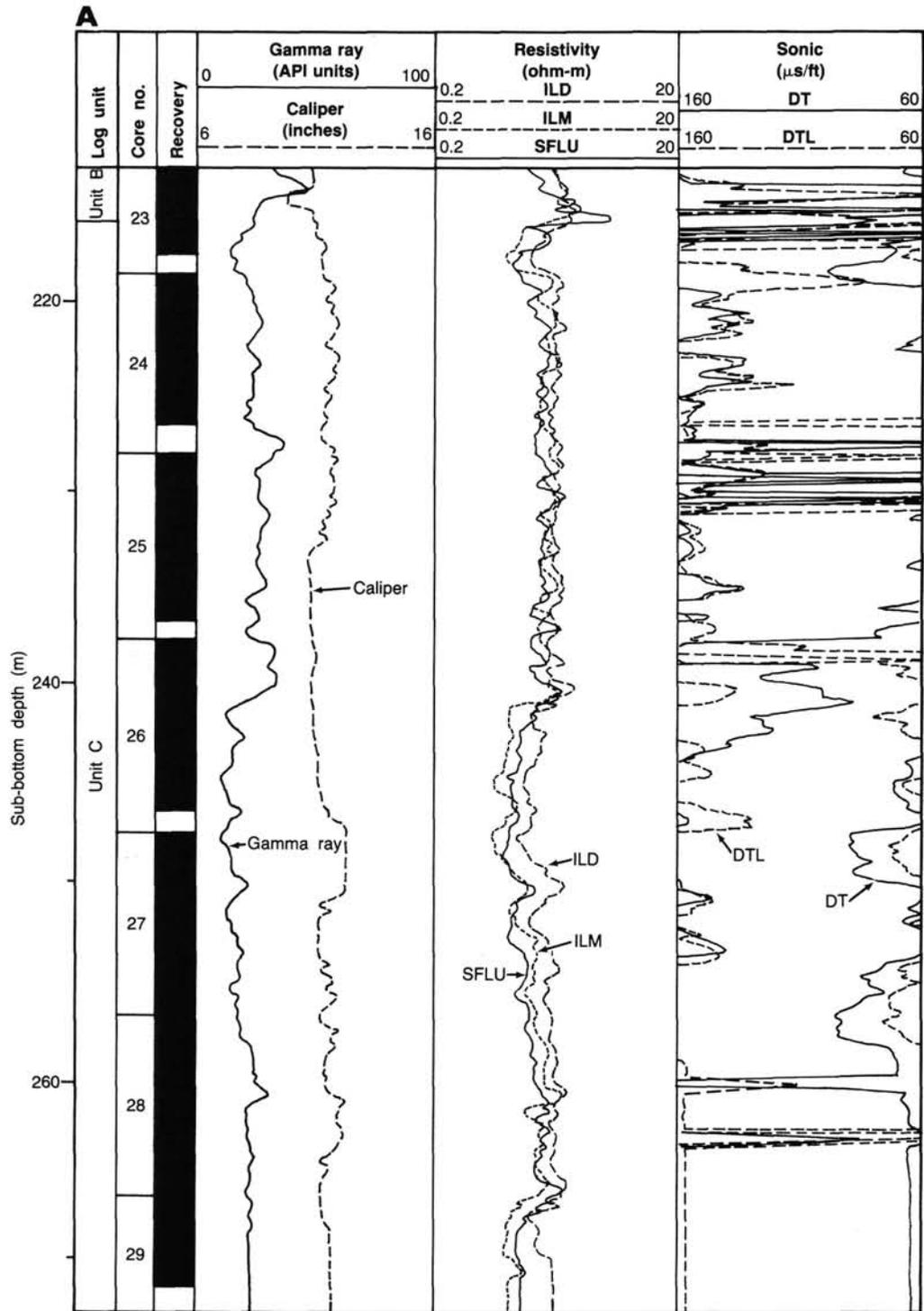


Figure 35. A. Composite log and core recovery in log-lithologic Unit C (Hole 638B). See text for description of logs. B. Composite log in log-lithologic Unit C (Hole 638C). See text for description of logs.

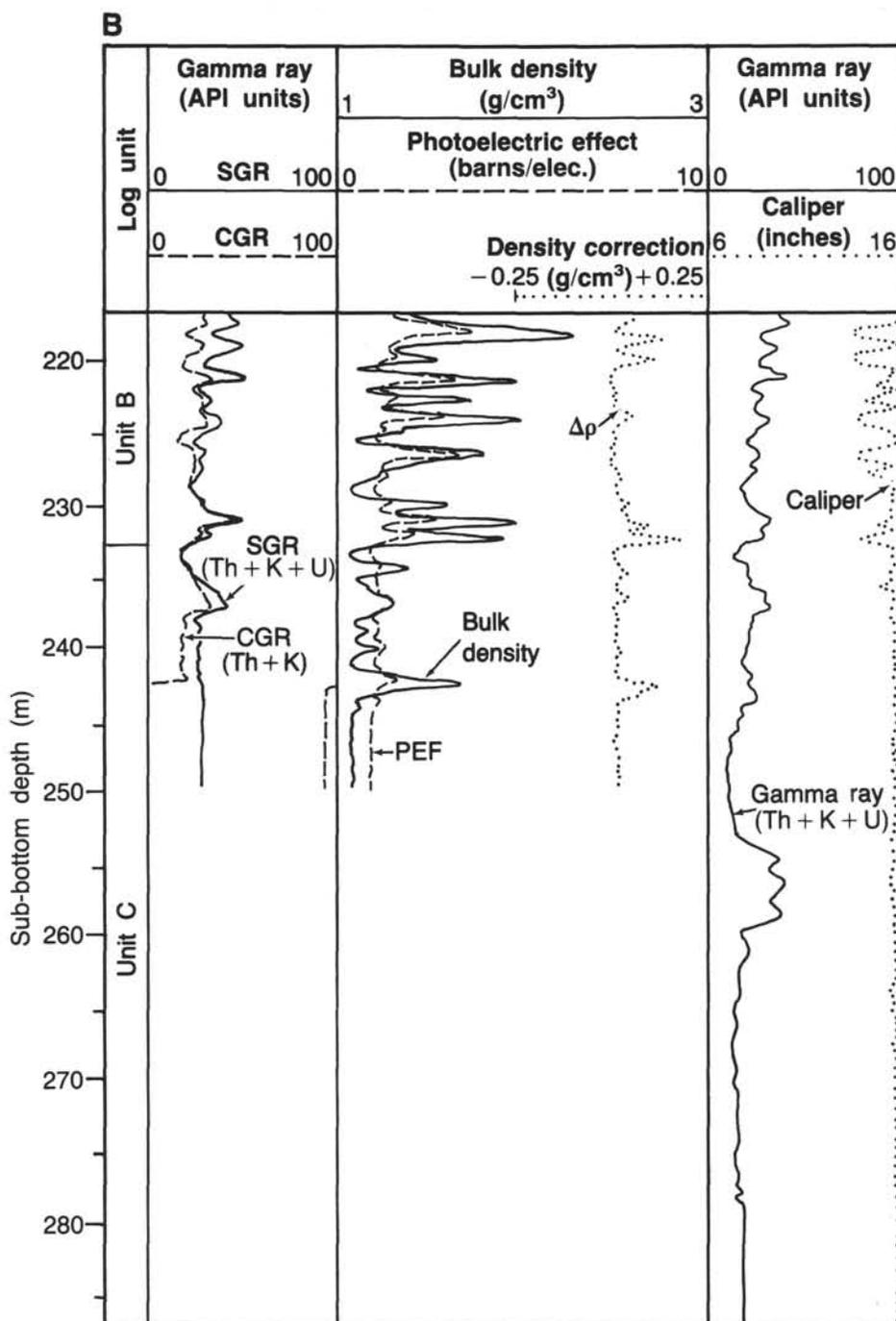


Figure 35 (continued).

though the break-up unconformity lies between lowest Albian and upper Aptian beds on both the Galicia and American margins (Sibuet, Ryan, et al., 1979; de Graciansky, Poag, et al., 1985). As suggested in the foregoing discussion on recalibration of seismic formations on the Armorican margin, our correlations suggest that rifting began on the Biscay margin studied by Montadert et al. (1979) much earlier in the Cretaceous than formerly believed.

The time during which the syn-rift sediments accumulated on the Galicia margin corresponds roughly to the emplacement time of the vast clastic deposits collectively lumped under the term "Wealdan," after the formation in the south of England.

Wealden deltas were built out onto the continental margin at many places on both sides of central and North Atlantic (Castelain, 1965; Jansa and Wade, 1975; von Rad and Arthur, 1979; von Rad and Sarti, in press), and thick turbidites accumulated in deep water on both sides of central North Atlantic, off Morocco (Lancelot and Winterer, 1980), and off New Jersey (Sarti and von Rad, in press). The plate-tectonic events that led to rifting on the margins of Galicia and its conjugate, Newfoundland, were felt widely, both on the Afro-Iberian plate (these had been joined since sometime in the Late Jurassic), and on the North American plate. The great influx of clastic sediment, revealed mostly by the textural and mineralogical immaturity of the sand-

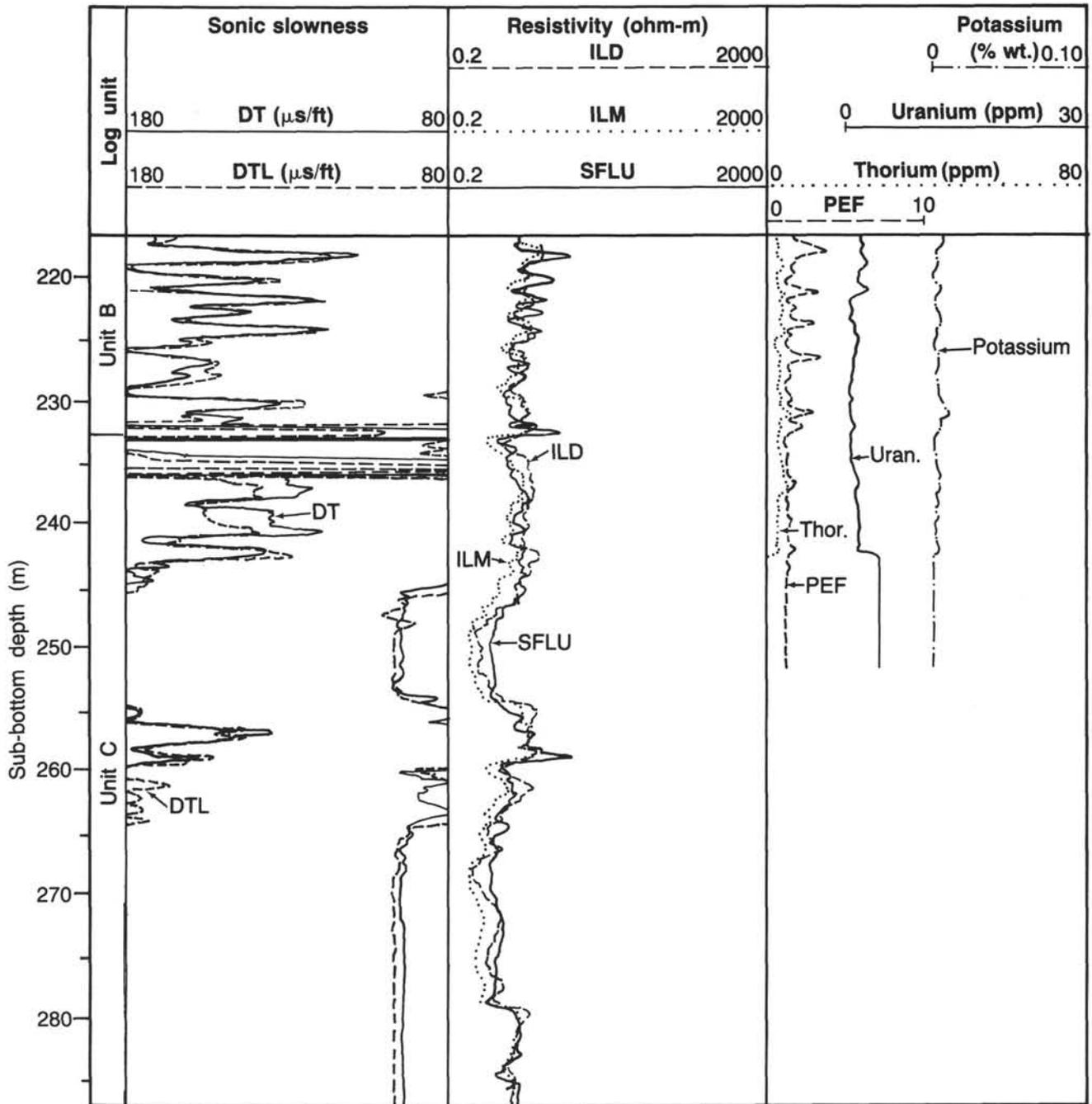


Figure 35 (continued).

stone characteristics of first-cycle derivation from crystalline basement, implies uplift of crystalline basement rocks on the land, perhaps accompanied by climatic changes that resulted in higher sediment loads in streams feeding the North Atlantic.

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**Table 7. Minimum/maximum values in log-lithologic units in Hole 638B. GR = gamma ray, ILD = deep induction, SFLU = spherical focused, DT = sonic slowness.**

| Log unit       | Unit A  | Unit B         | Unit C         |
|----------------|---------|----------------|----------------|
| Depth (mbsf)   | 99-186  | 186-216        | 216-271        |
| GR (API units) | 20/45   | 20/47          | 10/34          |
| ILD (ohmm)     | 1.1/1.3 | 1.5/3          | 1/2.1          |
| SFLU (ohmm)    | 1/1.3   | 1.1/6          | 0.7/2          |
| DT (μs/ft)     | 145/185 | cycle skipping | cycle skipping |

**Table 8. Minimum/maximum values in log-lithologic units in Hole 638C. GR = gamma ray, DT = sonic slowness, ILD = deep induction log, SFLU = spherical focused log, RHOB = bulk density, PEF = photoelectric effect, POTA = potassium content, URAN = uranium content, THOR, = thorium content, NPHI = neutron porosity.**

| Log unit                  | Unit A     | Unit B      | Unit C      |
|---------------------------|------------|-------------|-------------|
| Depth (mbsf)              | 105-183    | 183-233     | 233-286     |
| GR (API units)            | 20/41      | 20/52       | 7/38        |
| DT (μs/ft)                | 132/155    | 90/180      | 112/195     |
| ILD (ohmm)                | 1.1/1.5    | 1.1/4.1     | 0.4/2.5     |
| SFLU (ohmm)               | 1.2/1.5    | 0.9/7       | 0.6/7       |
| RHOB (g/cm <sup>3</sup> ) | 1.7/2.0    | 1.05/2.3    | 1.05/1.65   |
| PEF (barns/elect.)        | 3.5/4      | 1/4.2       | 1/1.5       |
| POTA (% wt)               | 0.003/0.01 | 0.003/0.012 | 0.002/0.012 |
| URAN (ppm)                | 0/1        | 0/2.3       | 0/1         |
| THOR (ppm)                | 1/2        | 1/4         | 1/4         |
| NPHI (%)                  | 42/54      | 28/75       | 62/75       |

**Table 9. Preliminary correlation between log-lithologic and lithologic units in Hole 638B.**

| Log unit | Lithologic unit | Cores                        | Lithology                                              |
|----------|-----------------|------------------------------|--------------------------------------------------------|
| Unit A   | Unit I          | 103-638B-11R to 103-638B-20R | Nannofossil ooze                                       |
| Unit B   | Subunit IIA     | 103-638B-20R to 103-638B-23  | Bioturbated limestone and marl; clay and marl couplets |
| Unit C   | Subunit IIB     | 103-638B-23R to 103-638B-29R | Bioturbated nannofossil marl                           |

**Table 10. Average velocity and density values calculated in intervals determined by log analysis and using uncorrected laboratory data (see text). The values shown correspond to the interval below each depth.**

| Depth (mbsf) | Density (g/cm <sup>3</sup> ) | Velocity (km/s) |
|--------------|------------------------------|-----------------|
| 0            | 1.57                         | 1.24            |
| 12           | 1.67                         | 1.22            |
| 18           | 1.64                         | 1.32            |
| 27           | 1.74                         | 1.28            |
| 58           | 1.74                         | 1.77            |
| 71           | 1.74                         | 1.62            |
| 86           | 1.80                         | 1.45            |
| 95           | 1.90                         | 1.62            |
| 104          | 1.80                         | 1.72            |
| 105          | 1.75                         | 1.99            |
| 111          | 1.90                         | 2.12            |
| 116          | 1.95                         | 2.06            |
| 130          | 1.90                         | 2.07            |
| 140          | 1.93                         | 2.18            |
| 145          | 2.00                         | 2.22            |
| 165          | 1.93                         | 2.10            |
| 184          | 1.45                         | 1.79            |
| 185          | 2.05                         | 2.77            |
| 187          | 1.70                         | 1.79            |
| 189          | 2.20                         | 2.26            |
| 191          | 1.90                         | 1.91            |
| 193          | 2.20                         | 2.54            |
| 194          | 2.10                         | 1.97            |
| 197          | 2.00                         | 2.34            |
| 202          | 2.20                         | 2.65            |
| 211          | 2.00                         | 1.67            |
| 221          | 1.95                         | 1.74            |
| 224          | 2.00                         | 1.68            |
| 226          | 1.80                         | 1.75            |
| 230          | 1.90                         | 1.76            |
| 242          | 1.60                         | 1.66            |
| 253          | 1.93                         | 1.72            |
| 265          | 2.00                         | 1.61            |
| 280          | 1.91                         | 1.67            |
| 283          | 2.21                         | 2.05            |
| 297          | 1.96                         | 1.68            |
| 298          | 2.61                         | 3.52            |
| 308          | 2.01                         | 1.69            |
| 318          | 2.65                         | 3.68            |
| 344          | 2.76                         | 4.01            |
| 354          | 2.59                         | 3.31            |
| 364          | 2.67                         | 4.05            |
| 374          | 2.46                         | 2.63            |
| 384          | 2.69                         | 4.49            |
| 385          | 2.66                         | 4.54            |
| 393          | 2.71                         | 4.70            |
| 405          | 2.71                         | 4.39            |
| 412          | 2.78                         | 4.20            |
| 414          | 2.64                         | 4.24            |
| 433          | 2.68                         | 4.05            |
| 441          | 2.57                         | 3.27            |
| 444          | 2.59                         | 3.62            |
| 451          | 2.63                         | 4.76            |
| 453          | 2.69                         | 4.47            |
| 461          | 2.83                         | 4.56            |
| 475          | 2.50                         | 3.72            |
| 481          | 2.41                         | 2.49            |
| 483          | 2.68                         | 3.82            |
| 490          | 2.67                         | 4.46            |
| 491          | 2.45                         | 2.25            |
| 500          | 2.18                         | 1.78            |
| 519          | 2.17                         | 1.84            |
| 528          | 2.21                         | 1.97            |
| 538          | 2.05                         | 1.68            |
| 539          | 2.85                         | 4.35            |
| 540          | 2.16                         | 1.94            |

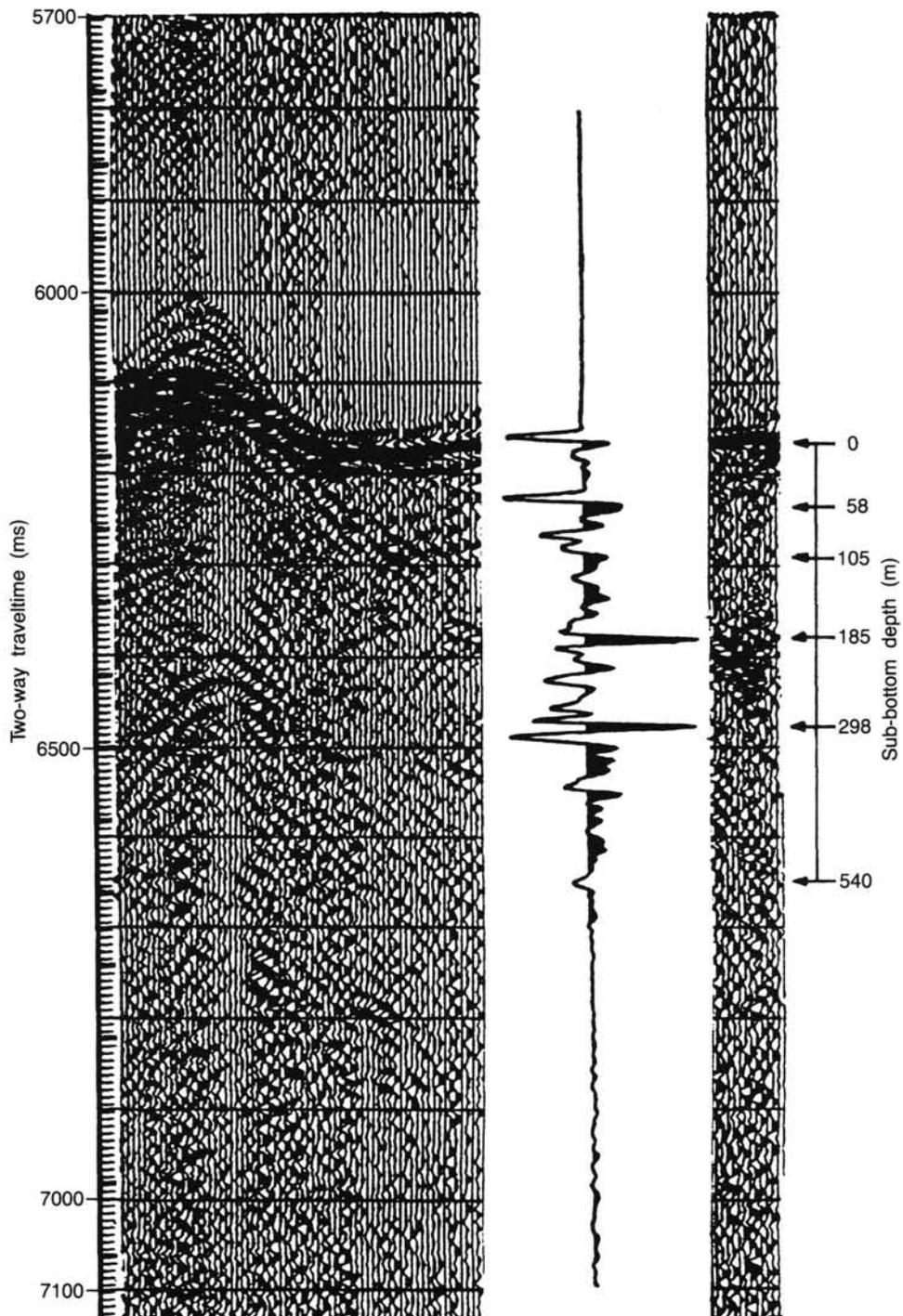


Figure 36. Preliminary seismic correlation. Synthetic seismogram calculated from 69-layer velocity/density model in Table 10. Source used is zero-phase and band-limited between 10 and 60 Hz (see text).

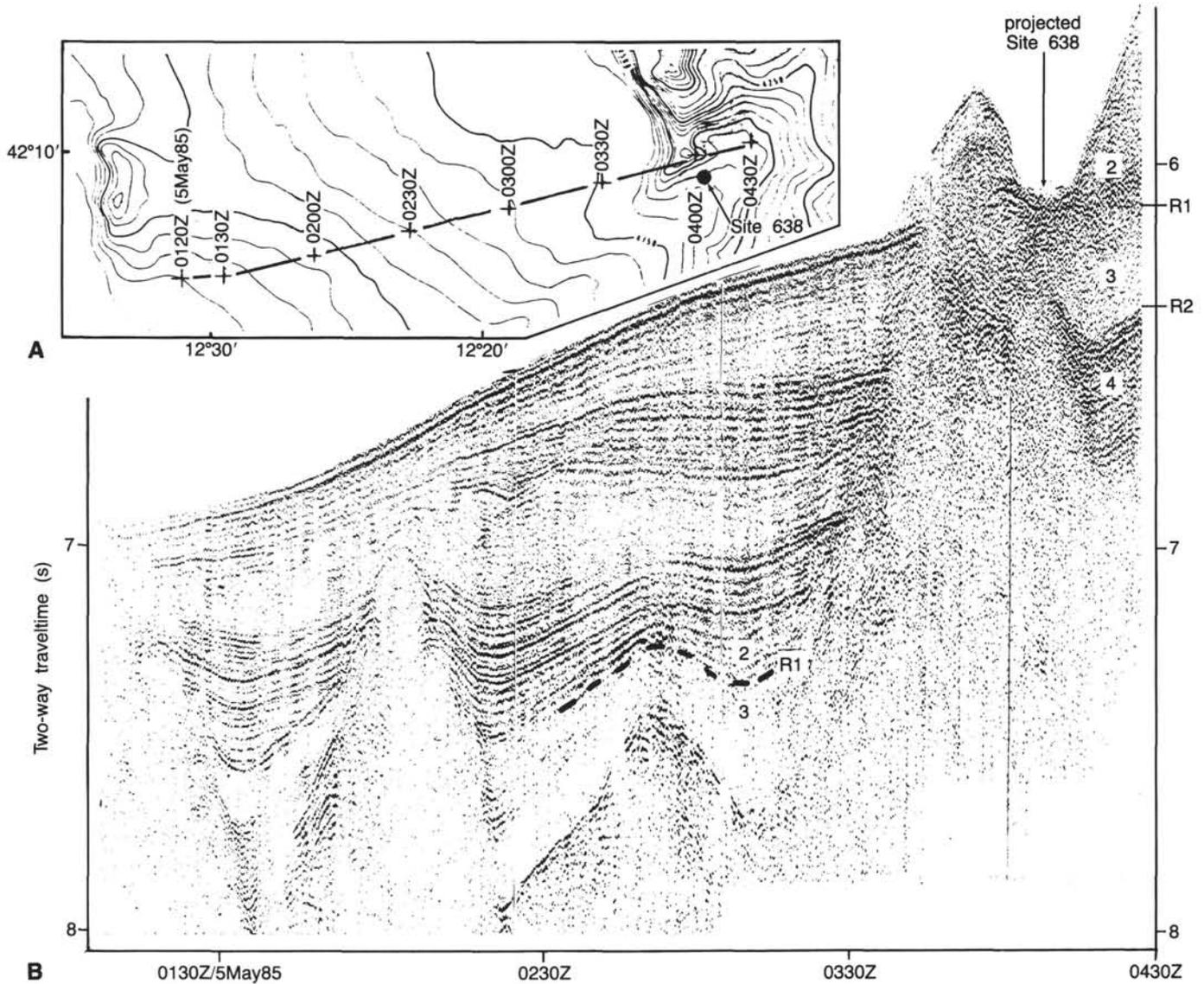


Figure 37. A. Part of Sea Beam map showing trackline of *JOIDES Resolution* seismic line from Site 637 to Site 638, and location of Site 638. B. Seismic line recorded from *JOIDES Resolution* while approaching Site 638. R1, reflector correlated with boundary between middle Cenomanian black shale (3) and Upper Cretaceous pelagic sediments (2); R2, reflector correlated with “break-up” unconformity between Albian black shale and Barre-mian-Aptian syn-rift sediments; (4) syn-rift (pre-Albian) strata.

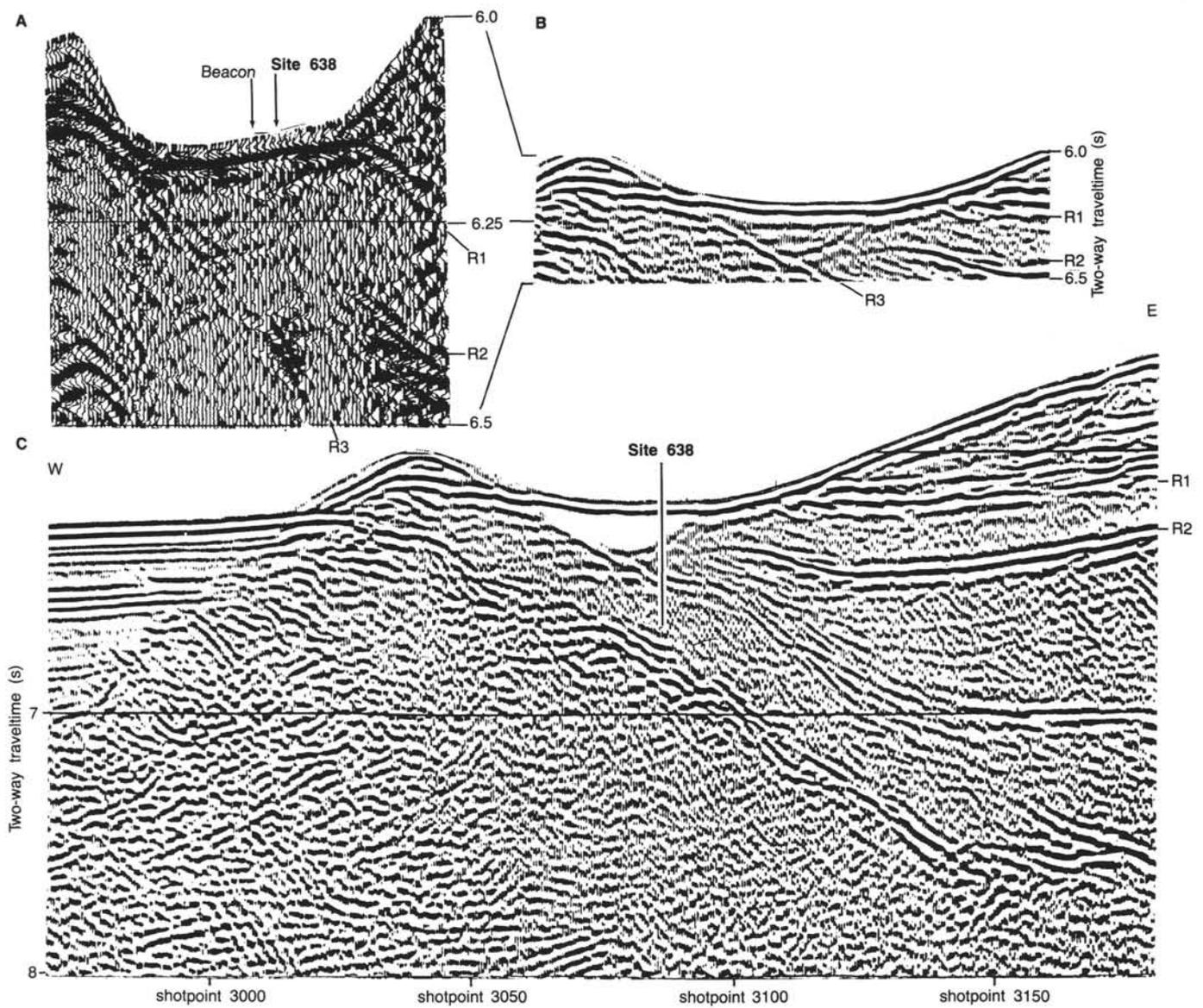


Figure 38. A. Location of the acoustic beacon and of Site 638 on processed seismic line taken from *JOIDES Resolution*. Reflectors R1, R2, and R3 are indicated by tick marks. B. Part of processed multichannel seismic line GP-101 near Site 638 (see Fig. 4 for location of line), showing reflectors R1, R2, and R3. C. A larger part of line GP-101, depicting the downward and lateral continuation of reflectors shown in Figure 38B. The Neogene valley fill near Site 638 has been left without shading.

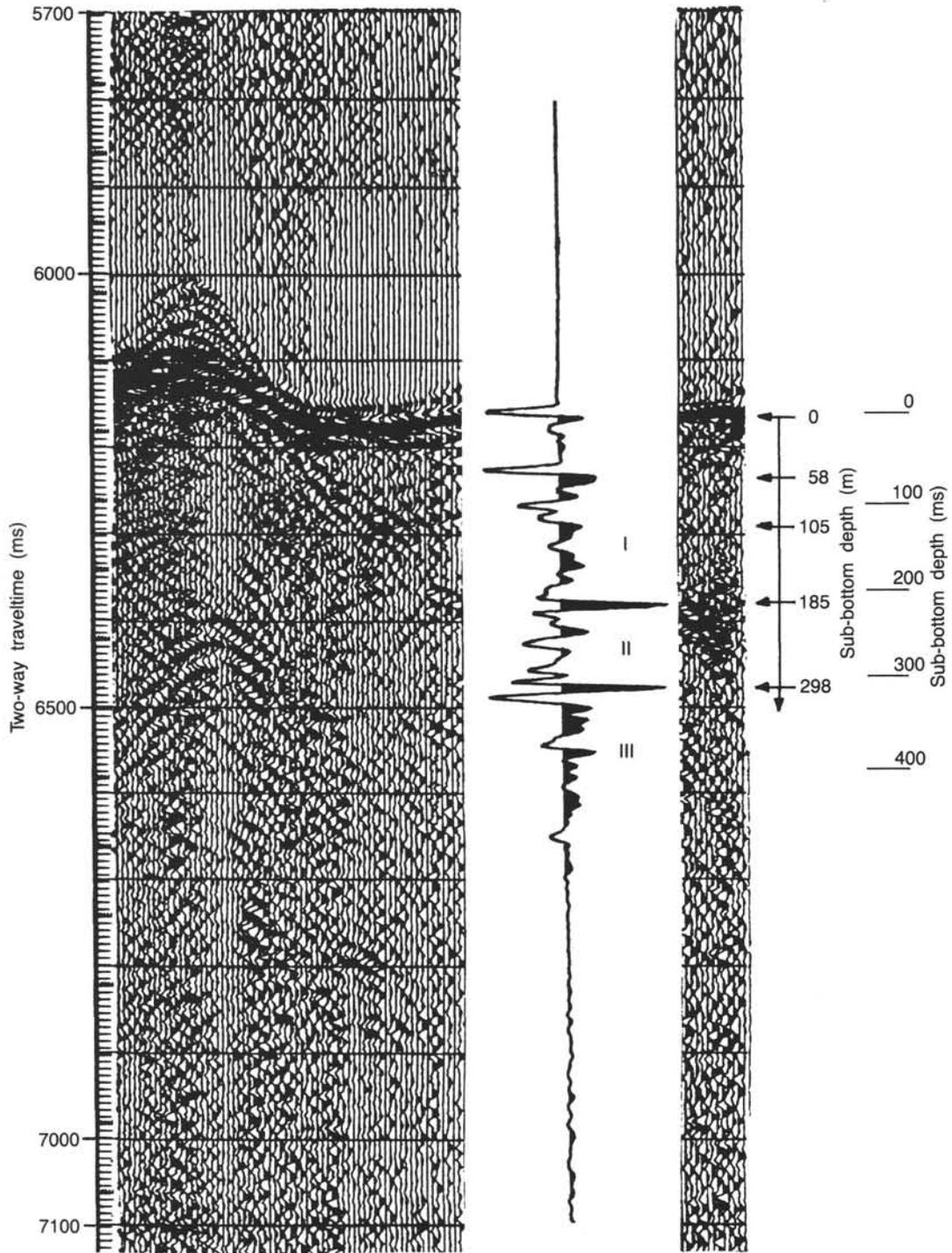


Figure 39. Seismic-reflection profile through Site 638, synthetic seismogram constructed using both downhole logs and laboratory data on velocity and density, and source signal used in processing multichannel line GP-101. The positions of lithologic Units I, II, and III are indicated with their depths.

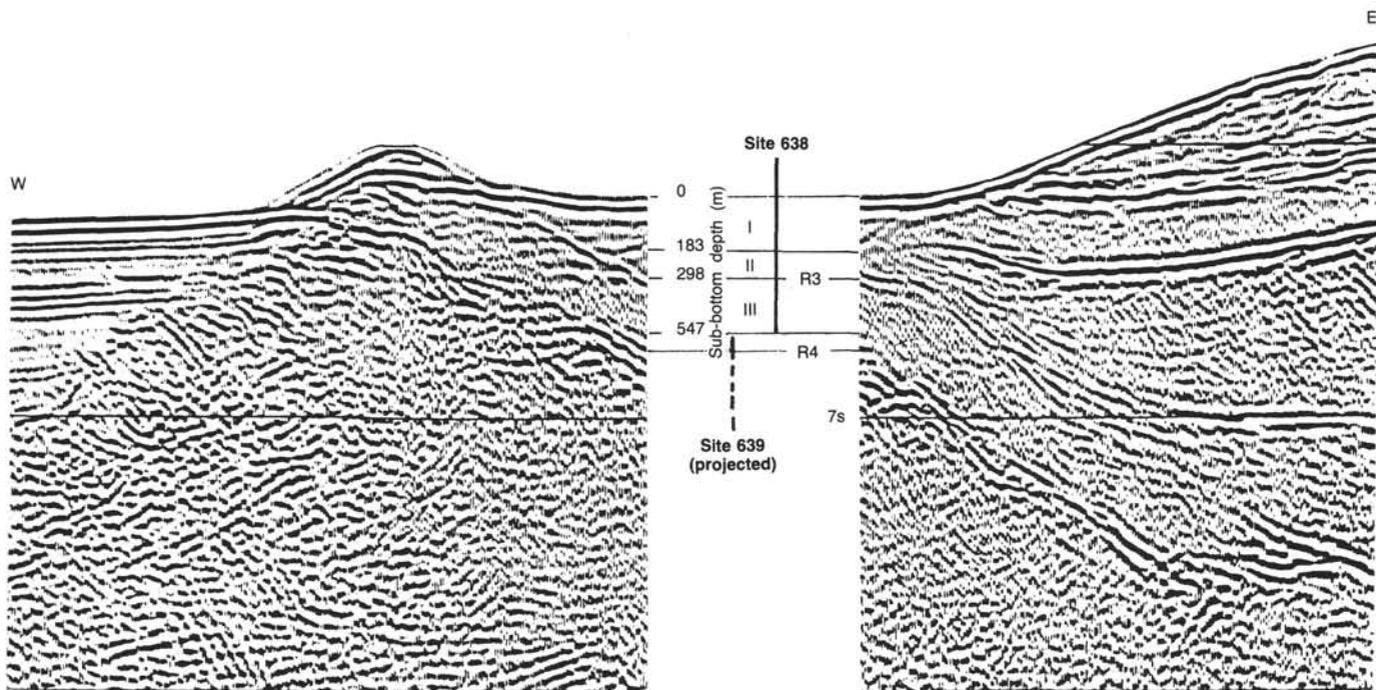


Figure 40. Correlation between the seismic line GP-101 and the drilled sequence at Sites 638 and 639 (projected). Location of seismic line shown in Figure 4.

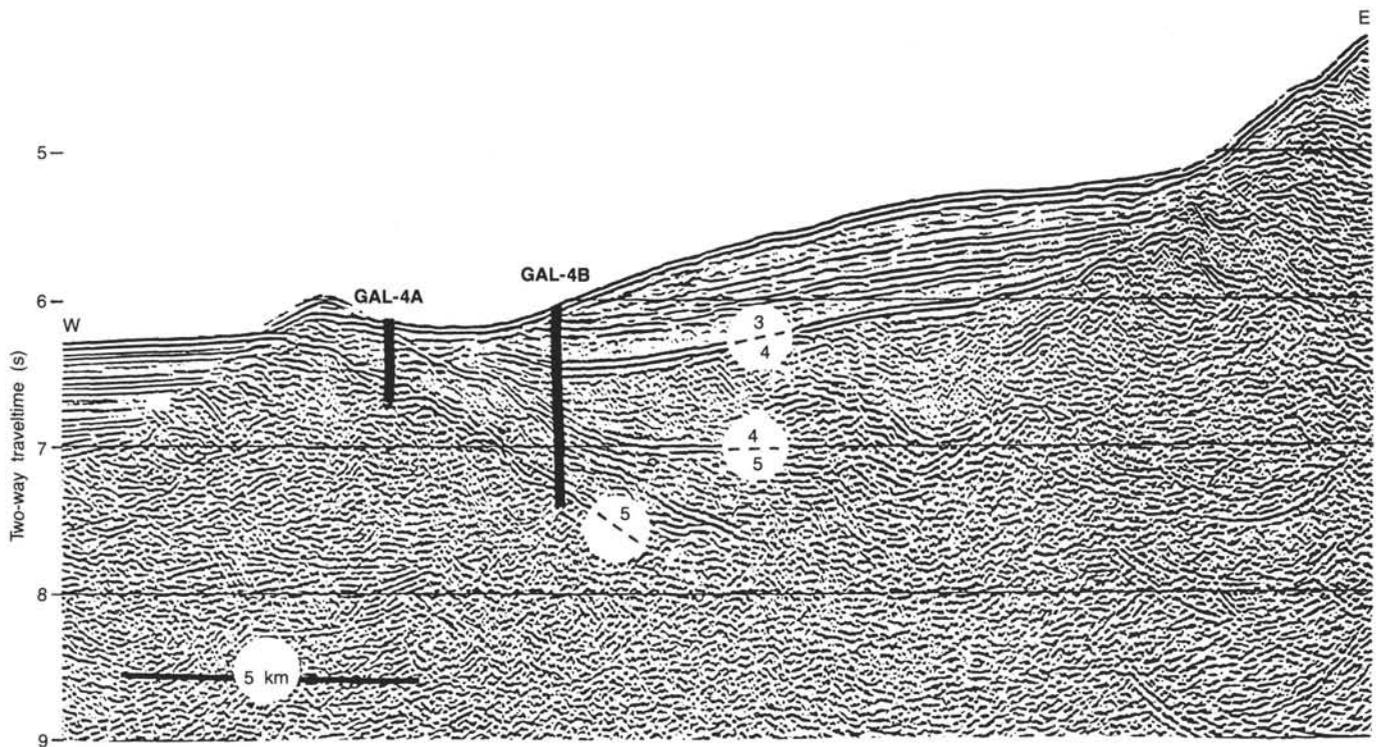
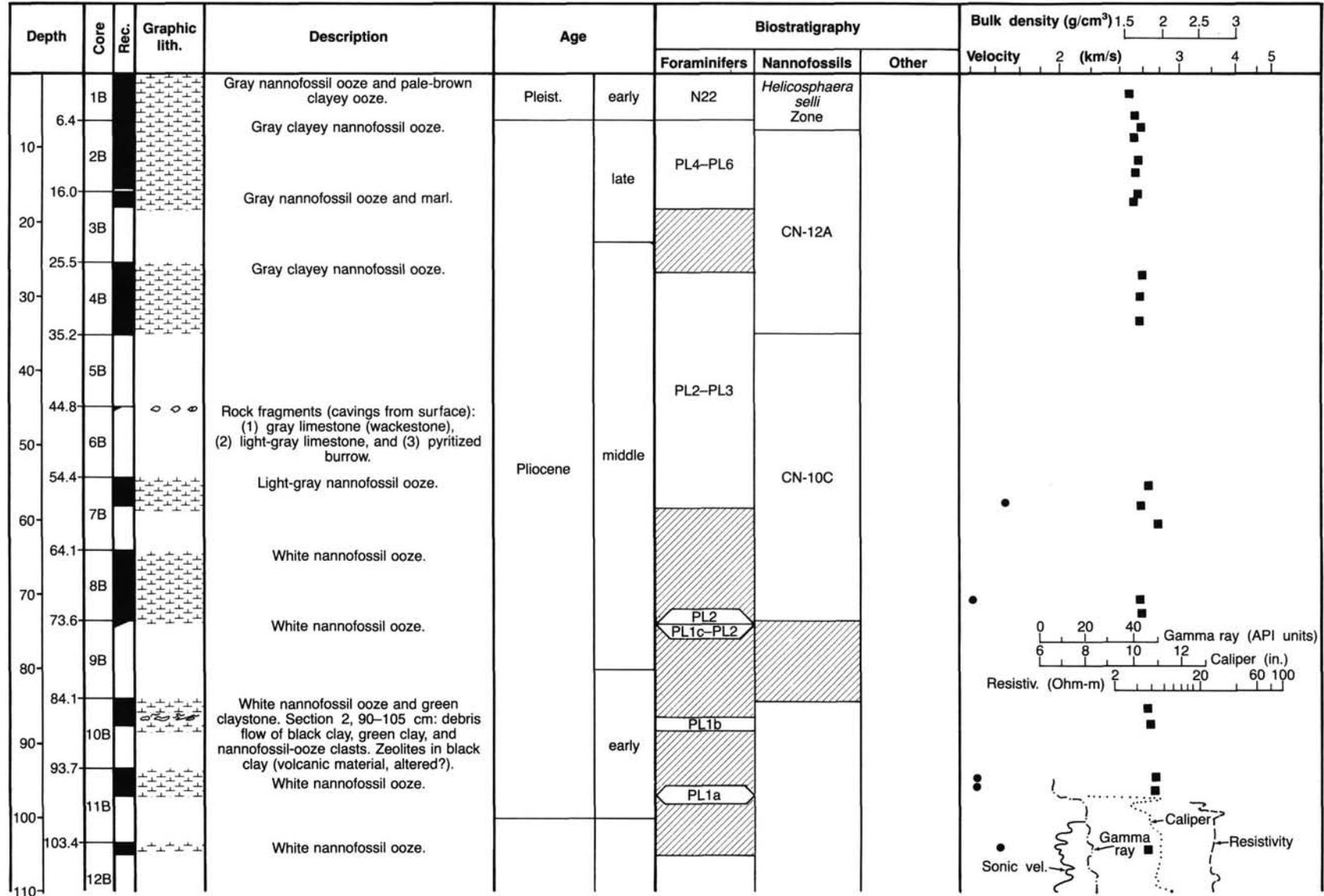


Figure 41. Multichannel seismic-reflection profile across the locations of target sites GAL-4A and GAL-4B, showing the seismic stratigraphic units recognized widely over most of the Galicia margin. The original caption on this figure, from the Scientific Prospectus for Leg 103 reads, "Note the pre-rift series (5) tilted with the basement block and the syn-rift series (4)." Site 638 is about 1 km east and 1 km north of target site GAL-4A.

Location: 42°09.2'N, 12°11.8'W Water depth: 4673 m below derrick floor (4663 mbsl)



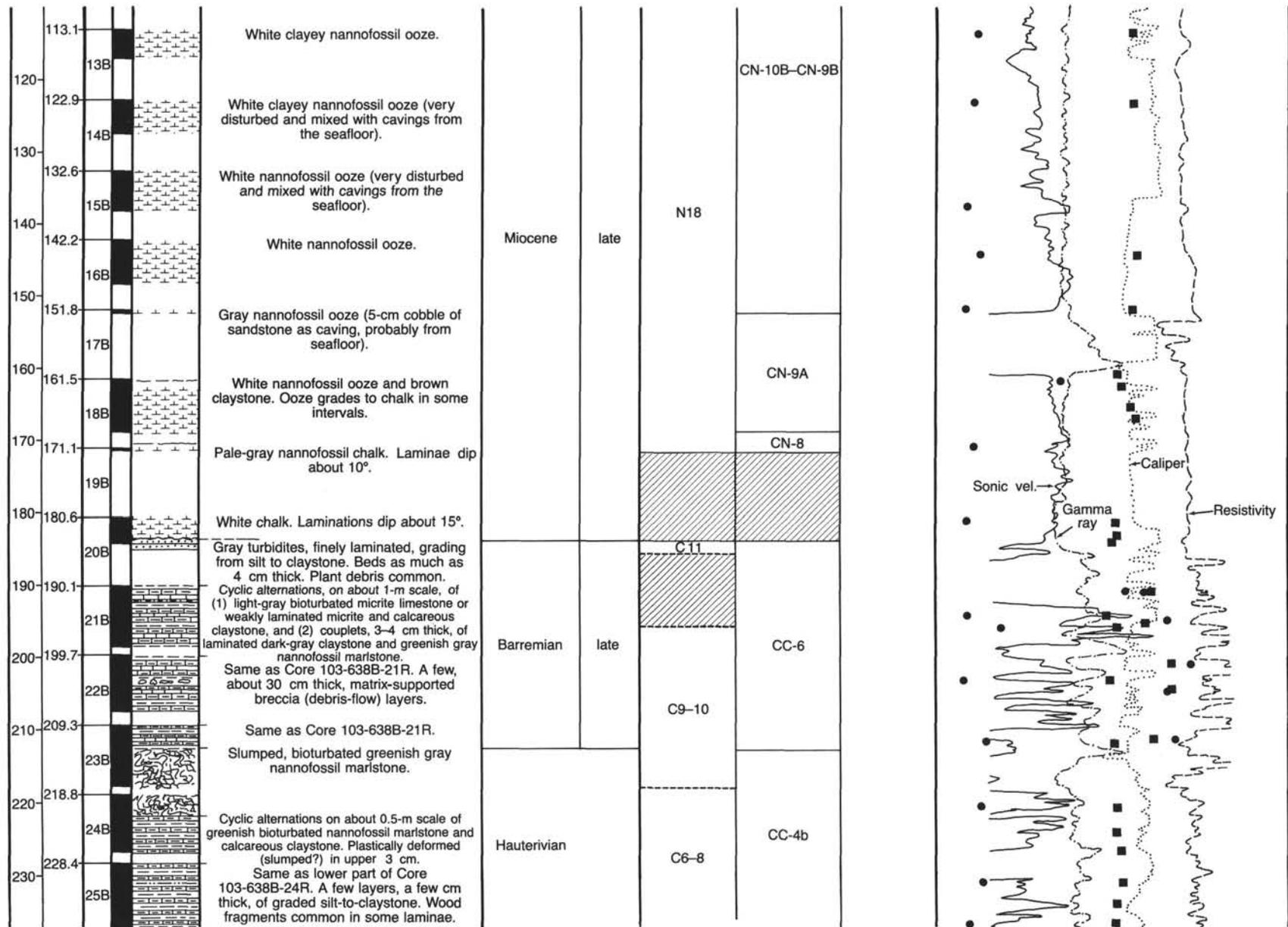
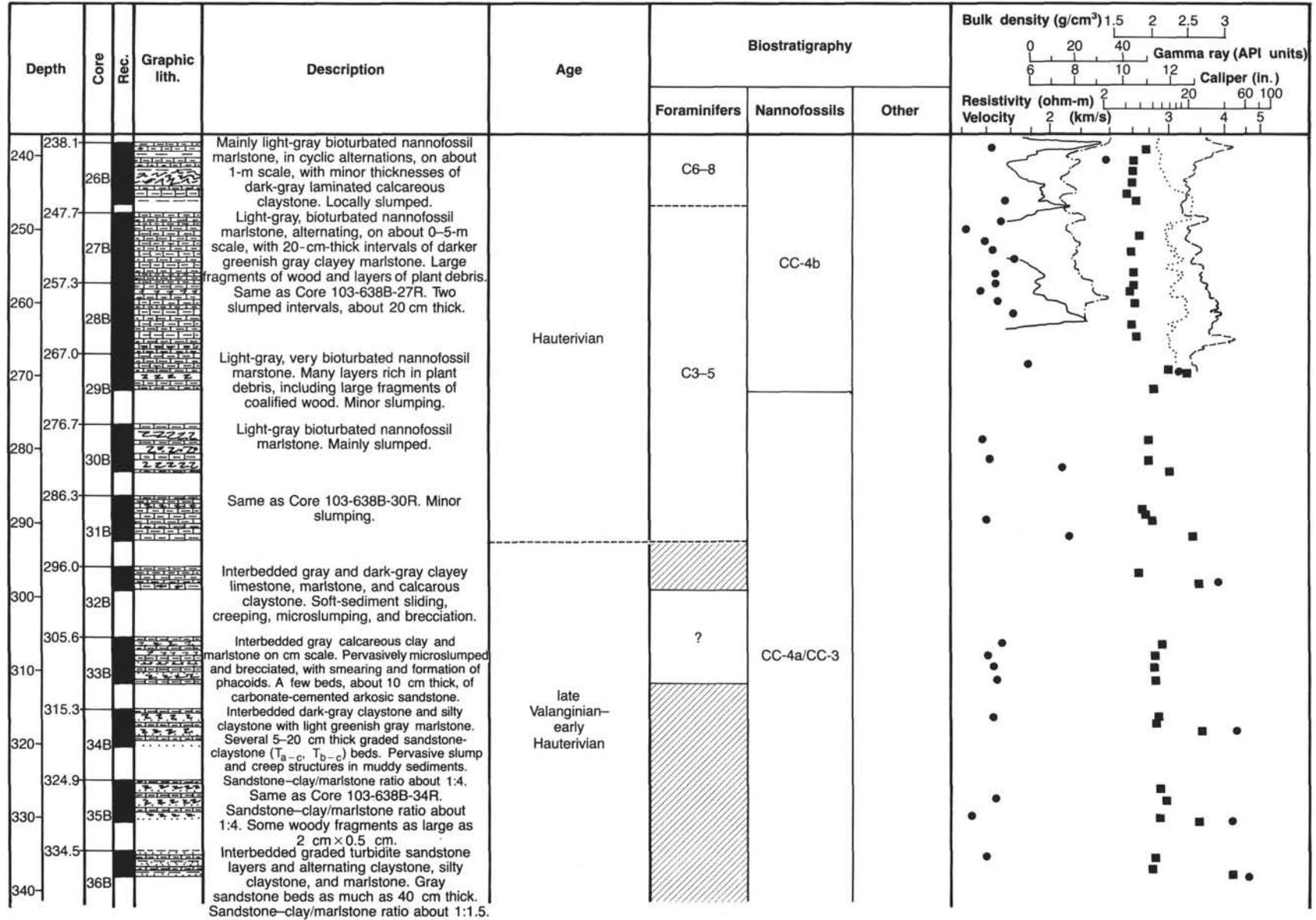


Figure 42. Site 638 summary logs. In right-hand columns, velocity data points are indicated by dot symbols; bulk-density data points are indicated by square symbols.



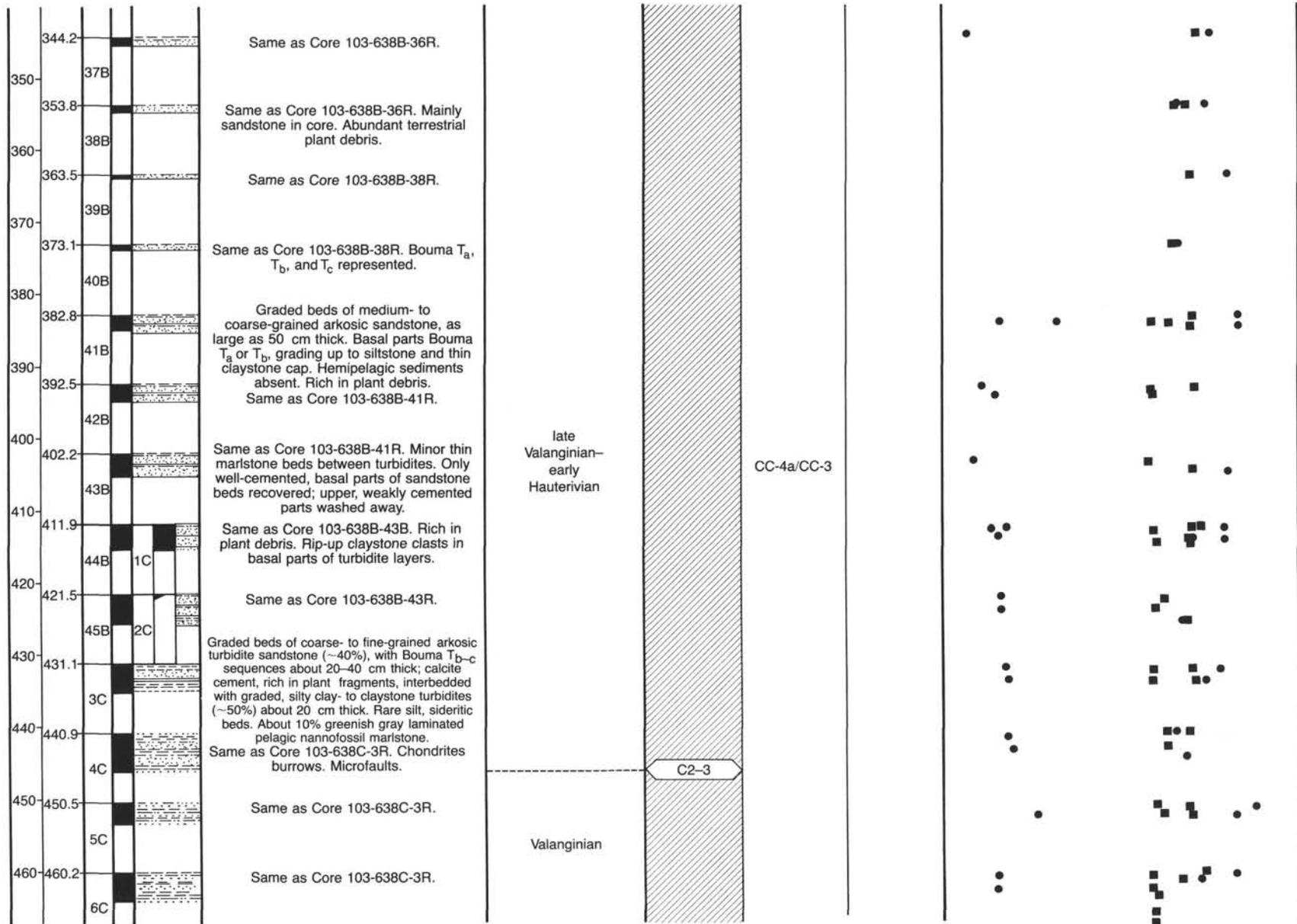
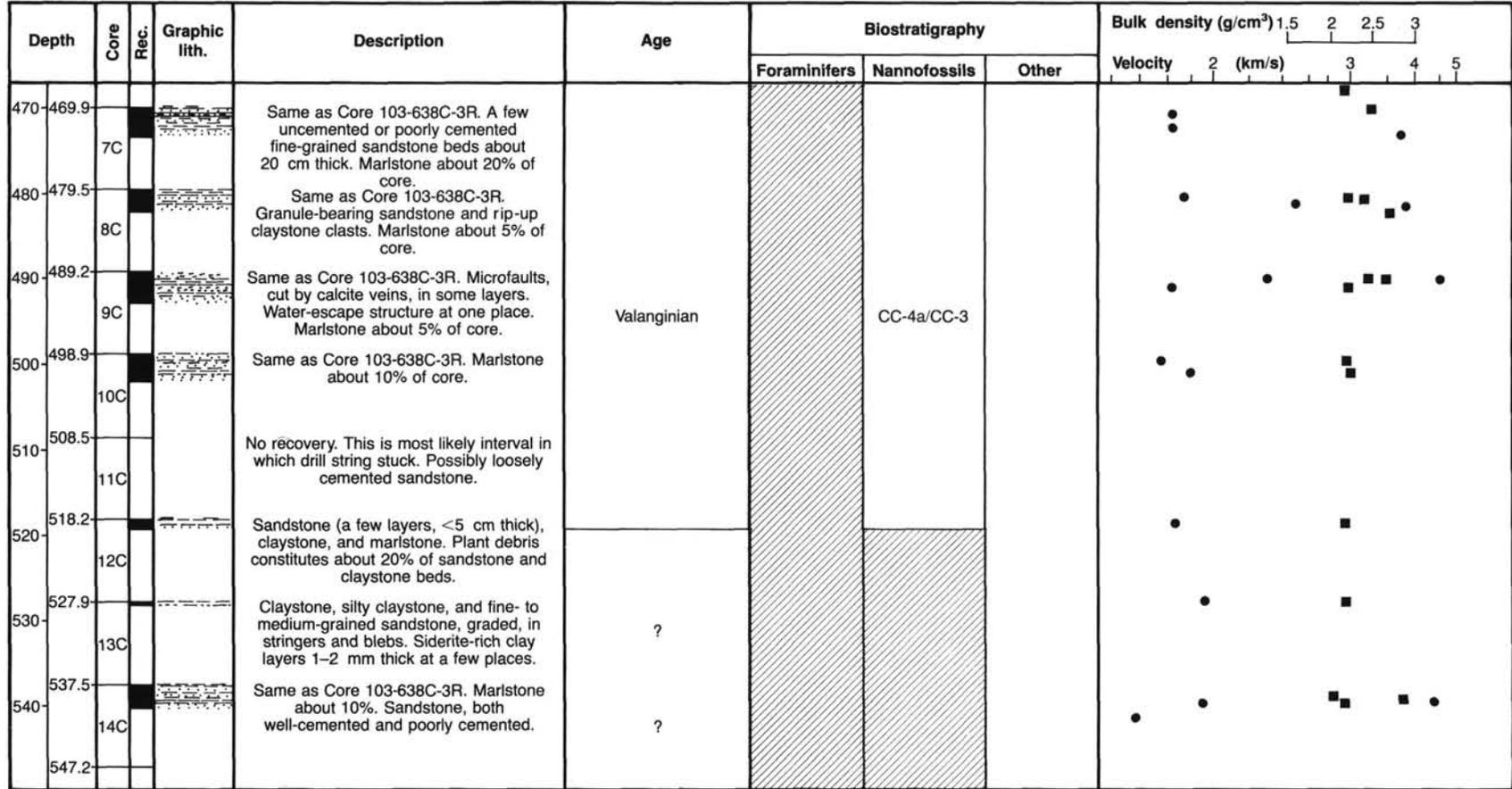


Figure 42 (continued).



Total depth = 547.2 m

Figure 42 (continued).

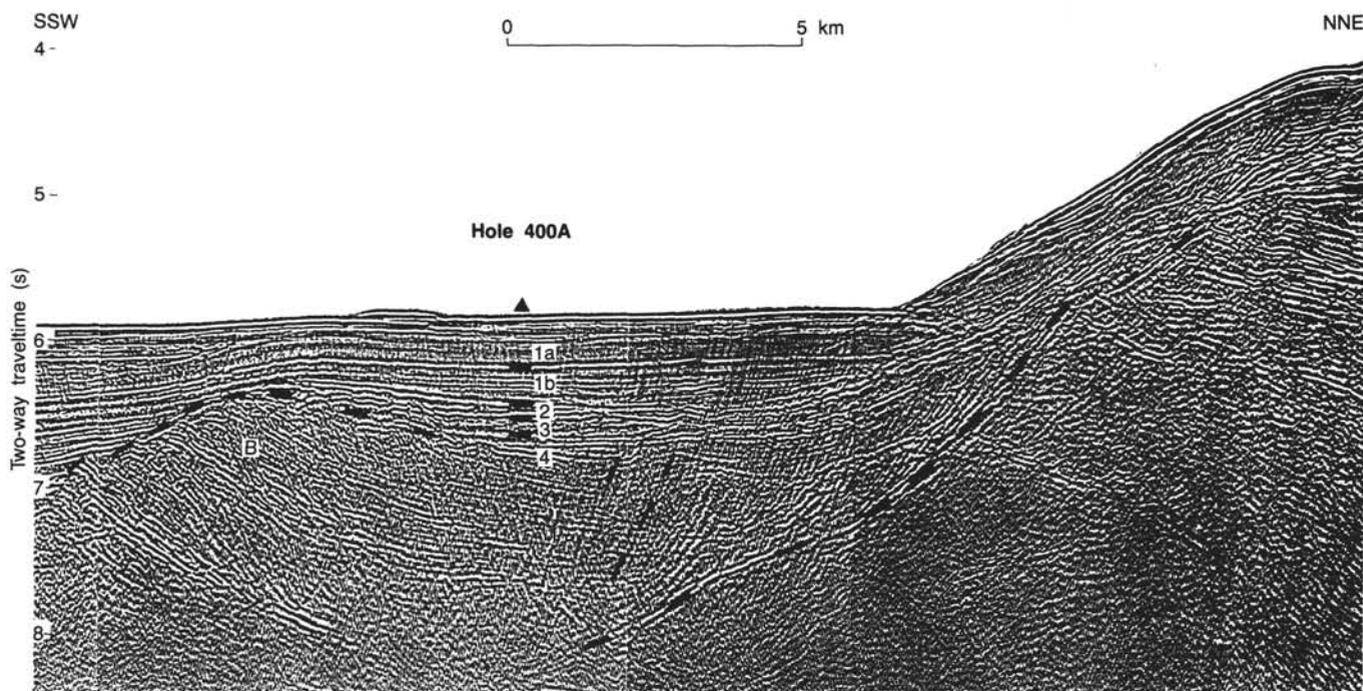


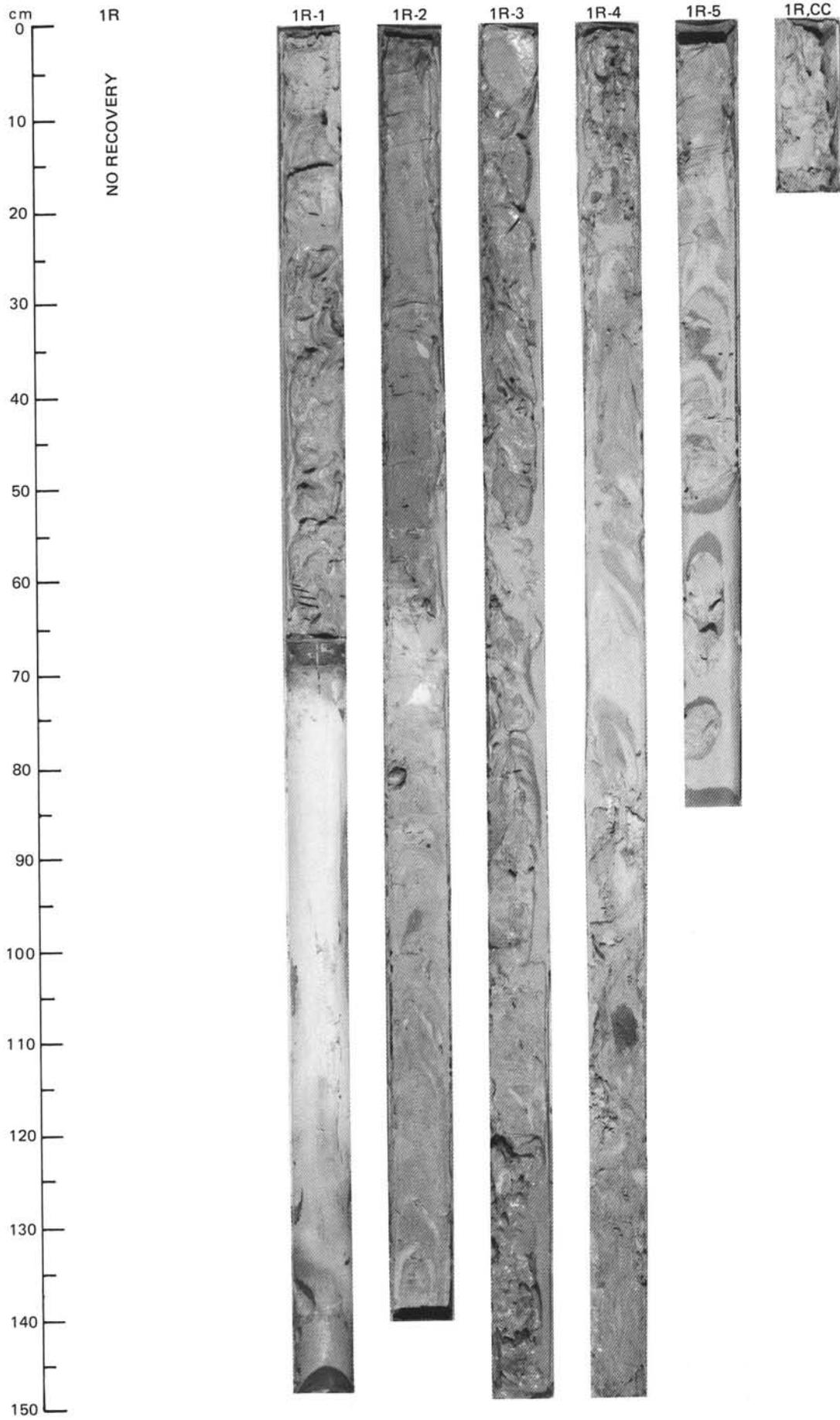
Figure 43. Seismic-reflection profile of part of the Armorican margin, near Hole 400A, drilled during DSDP Leg 48. The original caption includes the following: "Acoustical basement B consists in large part of layered sedimentary rocks of probable Jurassic and early Mesozoic age. These formerly continuous layers were faulted and tilted during the Early Cretaceous rifting phase." We interpret seismic formation B as being syn-rift Lower Cretaceous sediments, not as pre-rift Jurassic strata. The top of the carbonate platform is probably at about 7 s of two-way reflection time at the left side of the profile. From Montadert et al., 1979.

SITE 638 HOLE A CORE 1 R CORED INTERVAL 0.0-44.6 mbsf

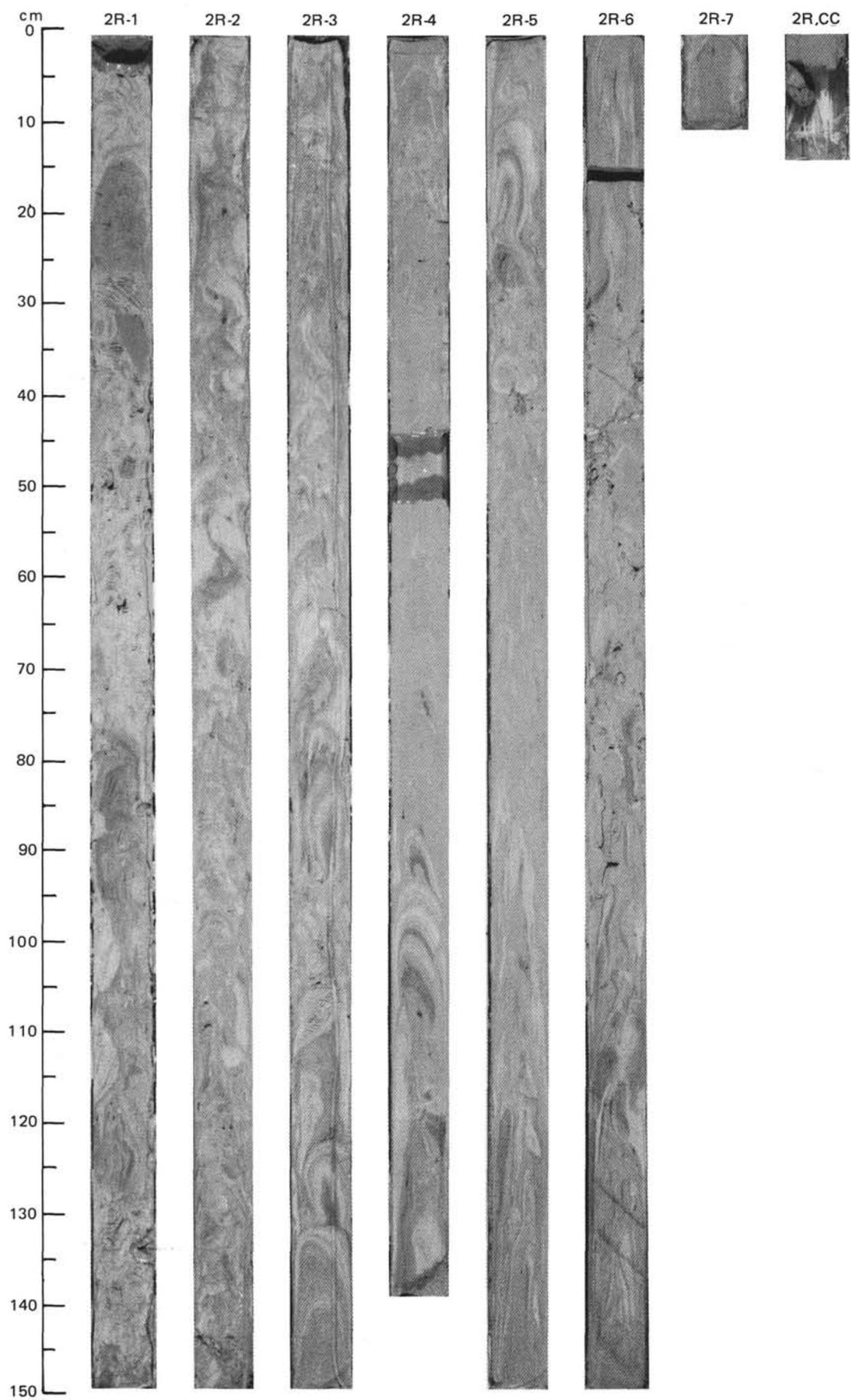
| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                       |
|----------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                              |
|                |                                     |              | B            |         |                |                  |           |         | 0.5    |                   |                   |                 |         | NANNOFOSSIL OOZE<br><br>This core consisted of a few centimeters of nannofossil ooze used by the paleontologists for dating. |

SITE 638 HOLE B CORE 1 R CORED INTERVAL 4662.7-4669.1 mbsf; 0-6.4 mbsf

| TIME-ROCK UNIT                       | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
|--------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----|------|------|------|------|--|---|---|---|---|---|------|---|----|----|---|---|------|----|----|----|----|----|--------|---|---|----|----|---|----------|---|---|---|----|---|------|----|----|----|----|----|------|---|---|----|----|----|--------------------------------------|----|----|---|----|---|--------------|---|---|----|---|---|--------------|----|----|----|----|----|-----------------|---|---|----|---|---|--|------|-------|------|------|------|-----------|---|------|---|---|---|----------|---|------|---|---|------|----------|------|---|---|---|---|-------|---|---|------|---|---|
|                                      | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| EARLY PLEISTOCENE                    | A/G                                 | A/G          | A/G          | A/G     |                |                  |           | 1       | 0.5    |                   |                   |                 | *       | <p><b>GRAY and PALE BROWN CLAYEY NANNOFOSSIL OOZE</b></p> <p>This core consists of highly disturbed light gray (5Y7/1) and pale brown (10YR6/3) clayey nannofossil ooze. The two lithologies are badly mixed by drilling. More clayey layers are recognizable at Section 1, 23-68 cm; Section 2, 0-60 cm; and Section 3, 10-105 cm. Any internal structure has been destroyed by drilling. Pyrite concretions were found at Section 1, 9 cm, and Section 2, 60 cm. A round limestone pebble was found at Section 2, 80 cm.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>1,7</td> <td>1,10</td> <td>1,66</td> <td>2,53</td> <td>5,36</td> </tr> <tr> <td></td> <td>D</td> <td>M</td> <td>D</td> <td>D</td> <td>M</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Silt</td> <td>5</td> <td>12</td> <td>10</td> <td>3</td> <td>3</td> </tr> <tr> <td>Clay</td> <td>95</td> <td>88</td> <td>90</td> <td>97</td> <td>97</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Quartz</td> <td>-</td> <td>-</td> <td>Tr</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Feldspar</td> <td>-</td> <td>-</td> <td>-</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Mica</td> <td>Tr</td> <td>Tr</td> <td>Tr</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Clay</td> <td>2</td> <td>5</td> <td>10</td> <td>87</td> <td>40</td> </tr> <tr> <td>Accessory Minerals (Pyrite, Opaques)</td> <td>Tr</td> <td>10</td> <td>1</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Foraminifers</td> <td>5</td> <td>2</td> <td>15</td> <td>3</td> <td>3</td> </tr> <tr> <td>Nannofossils</td> <td>93</td> <td>83</td> <td>74</td> <td>10</td> <td>57</td> </tr> <tr> <td>Sponge Spicules</td> <td>-</td> <td>-</td> <td>Tr</td> <td>-</td> <td>-</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>2,95</td> <td>2,121</td> <td>4,50</td> <td>4,71</td> <td>5,70</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>-</td> <td>1,24</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td><math>\rho_b</math></td> <td>-</td> <td>1,57</td> <td>-</td> <td>-</td> <td>1,65</td> </tr> <tr> <td><math>\gamma</math></td> <td>1,70</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td><math>T_c</math></td> <td>-</td> <td>-</td> <td>2,48</td> <td>-</td> <td>-</td> </tr> </table> |  | 1,7 | 1,10 | 1,66 | 2,53 | 5,36 |  | D | M | D | D | M | Silt | 5 | 12 | 10 | 3 | 3 | Clay | 95 | 88 | 90 | 97 | 97 | Quartz | - | - | Tr | Tr | - | Feldspar | - | - | - | Tr | - | Mica | Tr | Tr | Tr | Tr | Tr | Clay | 2 | 5 | 10 | 87 | 40 | Accessory Minerals (Pyrite, Opaques) | Tr | 10 | 1 | Tr | - | Foraminifers | 5 | 2 | 15 | 3 | 3 | Nannofossils | 93 | 83 | 74 | 10 | 57 | Sponge Spicules | - | - | Tr | - | - |  | 2,95 | 2,121 | 4,50 | 4,71 | 5,70 | $V_p$ (c) | - | 1,24 | - | - | - | $\rho_b$ | - | 1,57 | - | - | 1,65 | $\gamma$ | 1,70 | - | - | - | - | $T_c$ | - | - | 2,48 | - | - |
|                                      | 1,7                                 | 1,10         | 1,66         | 2,53    | 5,36           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
|                                      | D                                   | M            | D            | D       | M              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Silt                                 | 5                                   | 12           | 10           | 3       | 3              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Clay                                 | 95                                  | 88           | 90           | 97      | 97             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Quartz                               | -                                   | -            | Tr           | Tr      | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Feldspar                             | -                                   | -            | -            | Tr      | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Mica                                 | Tr                                  | Tr           | Tr           | Tr      | Tr             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Clay                                 | 2                                   | 5            | 10           | 87      | 40             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Accessory Minerals (Pyrite, Opaques) | Tr                                  | 10           | 1            | Tr      | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Foraminifers                         | 5                                   | 2            | 15           | 3       | 3              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Nannofossils                         | 93                                  | 83           | 74           | 10      | 57             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| Sponge Spicules                      | -                                   | -            | Tr           | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
|                                      | 2,95                                | 2,121        | 4,50         | 4,71    | 5,70           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| $V_p$ (c)                            | -                                   | 1,24         | -            | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| $\rho_b$                             | -                                   | 1,57         | -            | -       | 1,65           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| $\gamma$                             | 1,70                                | -            | -            | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
| $T_c$                                | -                                   | -            | 2,48         | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
|                                      |                                     |              |              |         |                |                  | 2         | 1.0     | VOID   |                   |                   |                 | *       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
|                                      |                                     |              |              |         |                |                  | 3         |         |        |                   |                   |                 | W       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
|                                      |                                     |              |              |         |                |                  | 4         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
|                                      |                                     |              |              |         |                |                  | 5         |         |        |                   |                   |                 | *       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |
|                                      |                                     |              |              |         |                |                  | CC        |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |     |      |      |      |      |  |   |   |   |   |   |      |   |    |    |   |   |      |    |    |    |    |    |        |   |   |    |    |   |          |   |   |   |    |   |      |    |    |    |    |    |      |   |   |    |    |    |                                      |    |    |   |    |   |              |   |   |    |   |   |              |    |    |    |    |    |                 |   |   |    |   |   |  |      |       |      |      |      |           |   |      |   |   |   |          |   |      |   |   |      |          |      |   |   |   |   |       |   |   |      |   |   |

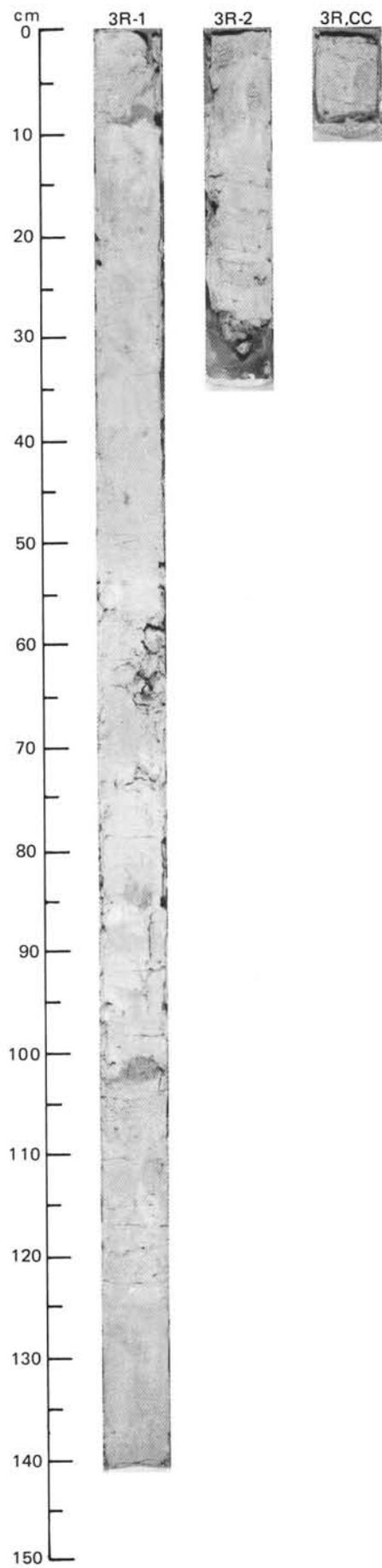


| TIME-ROCK UNIT               |                           | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |         |       |       | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
|------------------------------|---------------------------|-------------------------------------|---------|-------|-------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|---|---|---|------|----|---|------|-----|-----|--------|----|----|------|----|---|------|----|---|------------------------------|---|----|--------------|---|---|--------------|----|----|-----------------|----|---|--|------|-------|------|------|-------|------|-----------|---|------|---|---|------|---|----------|---|------|---|---|------|---|----------|---|---|---|------|---|---|-------|------|---|------|---|---|------|--|-------|------|------|-------|------|-----------|------|---|---|------|---|----------|------|---|---|------|---|----------|---|---|------|---|---|-------|---|------|---|---|------|
| FORAMINIFERS                 | NANNOFOSSILS              | RADIOLARIANS                        | DIATOMS |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| EARLY PLEIST.                |                           |                                     |         |       |       |                |                  |           |         |        |                   |                   |                 |         | <p>GRAY CLAYEY NANNOFOSSIL OOZE</p> <p>This core consists of light gray (5Y6/1) clayey nannofossil ooze and foram-bearing clayey nannofossil ooze. The whole core has been badly disturbed by drilling. Some black specks of pyrite can be seen but otherwise the ooze has lost any internal structure.</p> <p>SMEAR SLIDE SUMMARY (%):</p> <table border="0"> <tr> <td></td> <td>4,25</td> <td>5,26</td> </tr> <tr> <td>D</td> <td>D</td> <td>D</td> </tr> </table> <p>TEXTURE:</p> <table border="0"> <tr> <td>Silt</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Clay</td> <td>100</td> <td>100</td> </tr> </table> <p>COMPOSITION:</p> <table border="0"> <tr> <td>Quartz</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Mica</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Clay</td> <td>35</td> <td>5</td> </tr> <tr> <td>Accessory Minerals (Zircon?)</td> <td>-</td> <td>Tr</td> </tr> <tr> <td>Foraminifers</td> <td>5</td> <td>-</td> </tr> <tr> <td>Nannofossils</td> <td>60</td> <td>95</td> </tr> <tr> <td>Sponge Spicules</td> <td>Tr</td> <td>-</td> </tr> </table> <p>* PHYSICAL PROPERTIES DATA:</p> <table border="0"> <tr> <td></td> <td>1,50</td> <td>1,101</td> <td>2,50</td> <td>2,55</td> <td>2,101</td> <td>3,50</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>-</td> <td>1,28</td> <td>-</td> <td>-</td> <td>1,15</td> <td>-</td> </tr> <tr> <td><math>\rho_b</math></td> <td>-</td> <td>1,73</td> <td>-</td> <td>-</td> <td>1,63</td> <td>-</td> </tr> <tr> <td><math>\gamma</math></td> <td>-</td> <td>-</td> <td>-</td> <td>4,98</td> <td>-</td> <td>-</td> </tr> <tr> <td><math>T_c</math></td> <td>2,57</td> <td>-</td> <td>2,53</td> <td>-</td> <td>-</td> <td>2,53</td> </tr> </table> <p>IW</p> <p>* PHYSICAL PROPERTIES DATA:</p> <table border="0"> <tr> <td></td> <td>4,101</td> <td>5,50</td> <td>5,55</td> <td>5,101</td> <td>6,50</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>1,22</td> <td>-</td> <td>-</td> <td>1,24</td> <td>-</td> </tr> <tr> <td><math>\rho_b</math></td> <td>1,67</td> <td>-</td> <td>-</td> <td>1,66</td> <td>-</td> </tr> <tr> <td><math>\gamma</math></td> <td>-</td> <td>-</td> <td>5,44</td> <td>-</td> <td>-</td> </tr> <tr> <td><math>T_c</math></td> <td>-</td> <td>2,42</td> <td>-</td> <td>-</td> <td>2,64</td> </tr> </table> |  | 4,25 | 5,26 | D | D | D | Silt | Tr | - | Clay | 100 | 100 | Quartz | Tr | Tr | Mica | Tr | - | Clay | 35 | 5 | Accessory Minerals (Zircon?) | - | Tr | Foraminifers | 5 | - | Nannofossils | 60 | 95 | Sponge Spicules | Tr | - |  | 1,50 | 1,101 | 2,50 | 2,55 | 2,101 | 3,50 | $V_p$ (c) | - | 1,28 | - | - | 1,15 | - | $\rho_b$ | - | 1,73 | - | - | 1,63 | - | $\gamma$ | - | - | - | 4,98 | - | - | $T_c$ | 2,57 | - | 2,53 | - | - | 2,53 |  | 4,101 | 5,50 | 5,55 | 5,101 | 6,50 | $V_p$ (c) | 1,22 | - | - | 1,24 | - | $\rho_b$ | 1,67 | - | - | 1,66 | - | $\gamma$ | - | - | 5,44 | - | - | $T_c$ | - | 2,42 | - | - | 2,64 |
|                              | 4,25                      | 5,26                                |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| D                            | D                         | D                                   |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Silt                         | Tr                        | -                                   |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Clay                         | 100                       | 100                                 |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Quartz                       | Tr                        | Tr                                  |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Mica                         | Tr                        | -                                   |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Clay                         | 35                        | 5                                   |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Accessory Minerals (Zircon?) | -                         | Tr                                  |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Foraminifers                 | 5                         | -                                   |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Nannofossils                 | 60                        | 95                                  |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| Sponge Spicules              | Tr                        | -                                   |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
|                              | 1,50                      | 1,101                               | 2,50    | 2,55  | 2,101 | 3,50           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| $V_p$ (c)                    | -                         | 1,28                                | -       | -     | 1,15  | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| $\rho_b$                     | -                         | 1,73                                | -       | -     | 1,63  | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| $\gamma$                     | -                         | -                                   | -       | 4,98  | -     | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| $T_c$                        | 2,57                      | -                                   | 2,53    | -     | -     | 2,53           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
|                              | 4,101                     | 5,50                                | 5,55    | 5,101 | 6,50  |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| $V_p$ (c)                    | 1,22                      | -                                   | -       | 1,24  | -     |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| $\rho_b$                     | 1,67                      | -                                   | -       | 1,66  | -     |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| $\gamma$                     | -                         | -                                   | 5,44    | -     | -     |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| $T_c$                        | -                         | 2,42                                | -       | -     | 2,64  |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| LATE PLIOCENE                |                           |                                     |         |       |       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| A/G                          | PL 4-PL 6                 | A/G                                 |         |       |       |                | 78 %             | 1         | 0.5     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| A/G                          | (CN12 A)                  | A/G                                 |         |       |       |                | 72 %             | 2         | 1.0     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
| B                            | <i>Discoaster tamalis</i> | A/G                                 |         |       |       |                | 71 %             | 3         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
|                              |                           |                                     |         |       |       |                |                  | 4         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
|                              |                           |                                     |         |       |       |                |                  | 5         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |
|                              |                           |                                     |         |       |       |                |                  | 6         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |   |      |     |     |        |    |    |      |    |   |      |    |   |                              |   |    |              |   |   |              |    |    |                 |    |   |  |      |       |      |      |       |      |           |   |      |   |   |      |   |          |   |      |   |   |      |   |          |   |   |   |      |   |   |       |      |   |      |   |   |      |  |       |      |      |       |      |           |      |   |   |      |   |          |      |   |   |      |   |          |   |   |      |   |   |       |   |      |   |   |      |

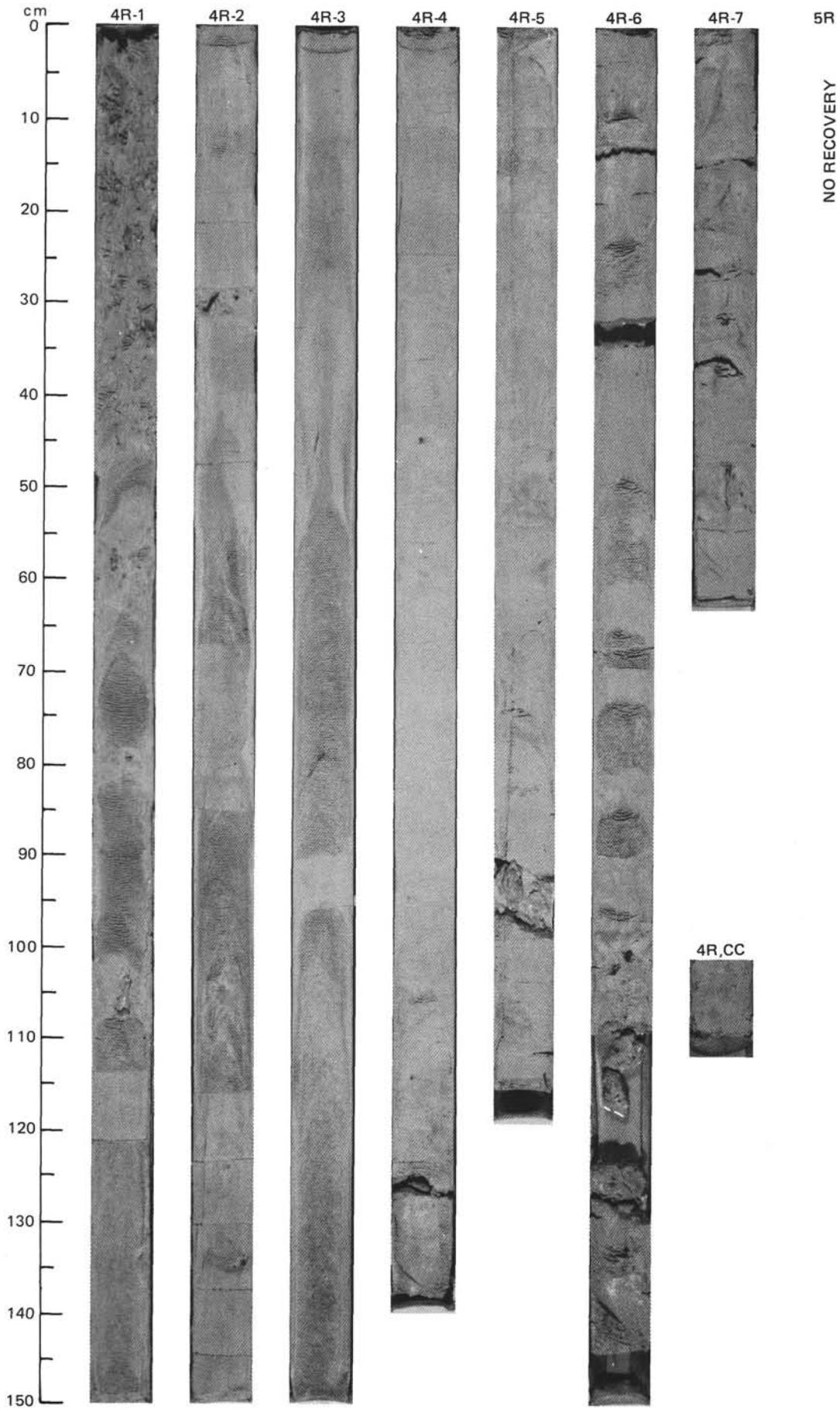


SITE 638 HOLE B CORE 3 R CORED INTERVAL 4678.7- 4688.2 mbsl; 16.0- 25.5 mbsf

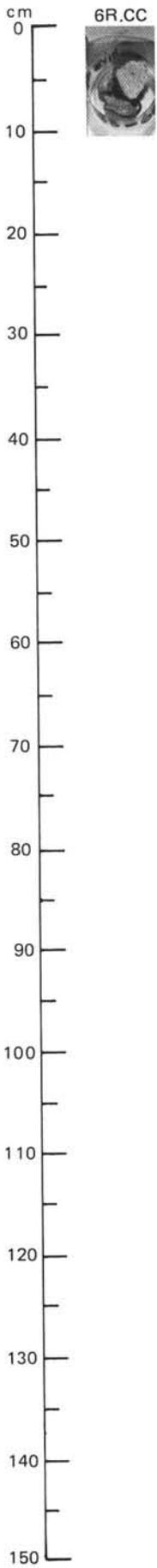
| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS     | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                 |
|----------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|------------|-------------------|-------------------|-----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                        |
| LATE PLOCIENE  | A/M                                 | PL 4-PL 5    | A/G          | B       |                |                  | 76 %      | 1       | 0.5<br>1.0 |                   |                   |                 | *       | GRAY CLAYEY FORAMINIFERAL NANNOFOSSIL OOZE and MARL<br><br>This core consists of soft white to light gray (5Y8/1) clayey nannofossil ooze with some brownish gray (2.5Y6/2) nannofossil marl patches. Whole core has been badly disturbed by drilling. |
|                |                                     |              |              |         |                |                  | 74 %      | 2       |            |                   |                   |                 | *       | SMEAR SLIDE SUMMARY (%):<br><br>1,30 1,102<br>D D                                                                                                                                                                                                      |
|                |                                     |              |              |         |                |                  |           | CC      |            |                   |                   |                 |         | TEXTURE:<br><br>Sand - 5<br>Silt 65 25<br>Clay 35 70                                                                                                                                                                                                   |
|                |                                     |              |              |         |                |                  |           |         |            |                   |                   |                 |         | COMPOSITION:<br><br>Quartz 2 -<br>Clay 30 35<br>Calcite/Dolomite - 3<br>Accessory Minerals 2 Tr<br>(Opakes)<br>Foraminifers 20 15<br>Nannofossils 46 47<br>Fish Remains Tr -                                                                           |
|                |                                     |              |              |         |                |                  |           |         |            |                   |                   |                 |         | PHYSICAL PROPERTIES DATA:<br><br>1,31 1,130 2,11 2,20<br><br>Vp (c) 1.33 - 1.32 -<br>ρb 1.67 - 1.64 -<br>γ - 6.46 - -<br>Tc - - - 2.66                                                                                                                 |



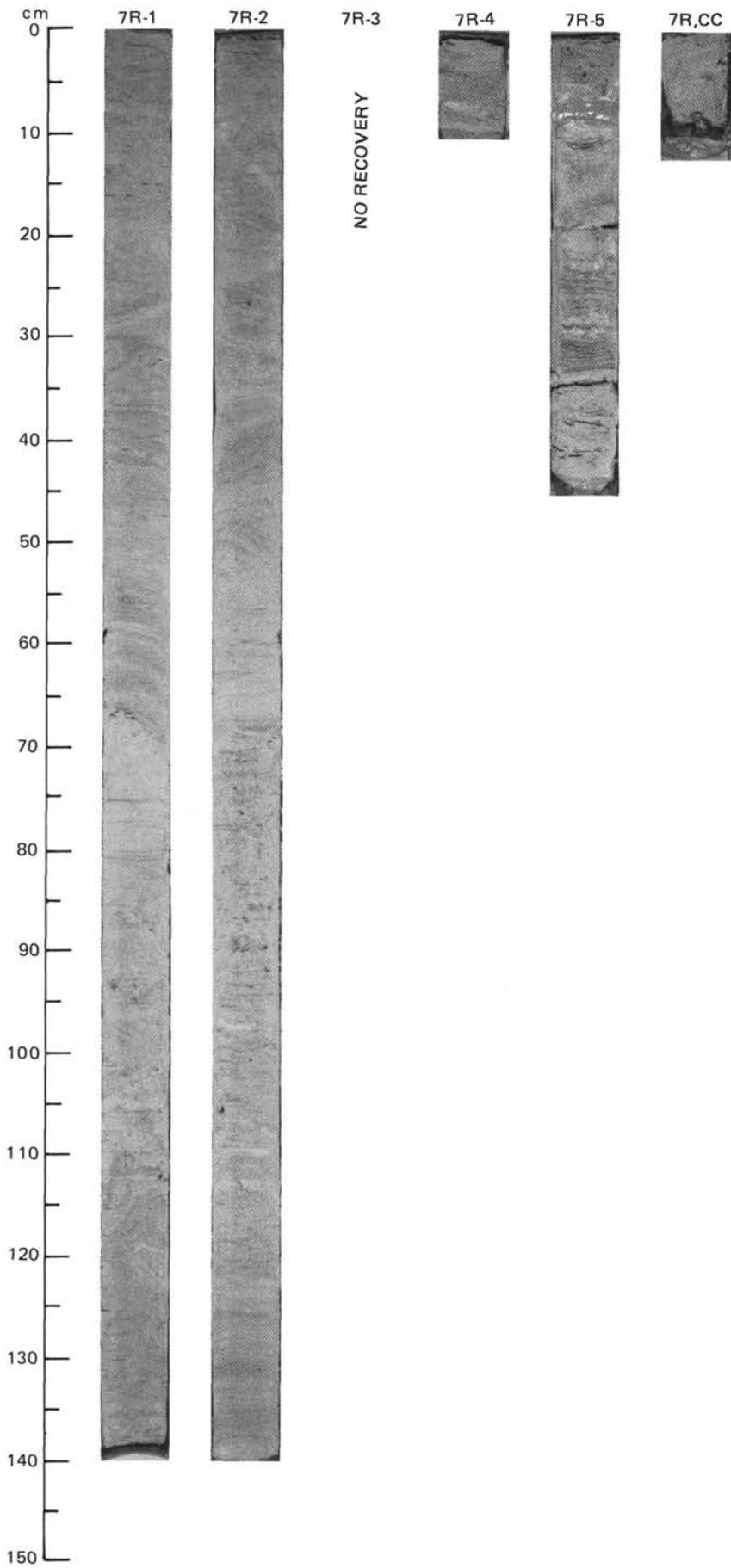




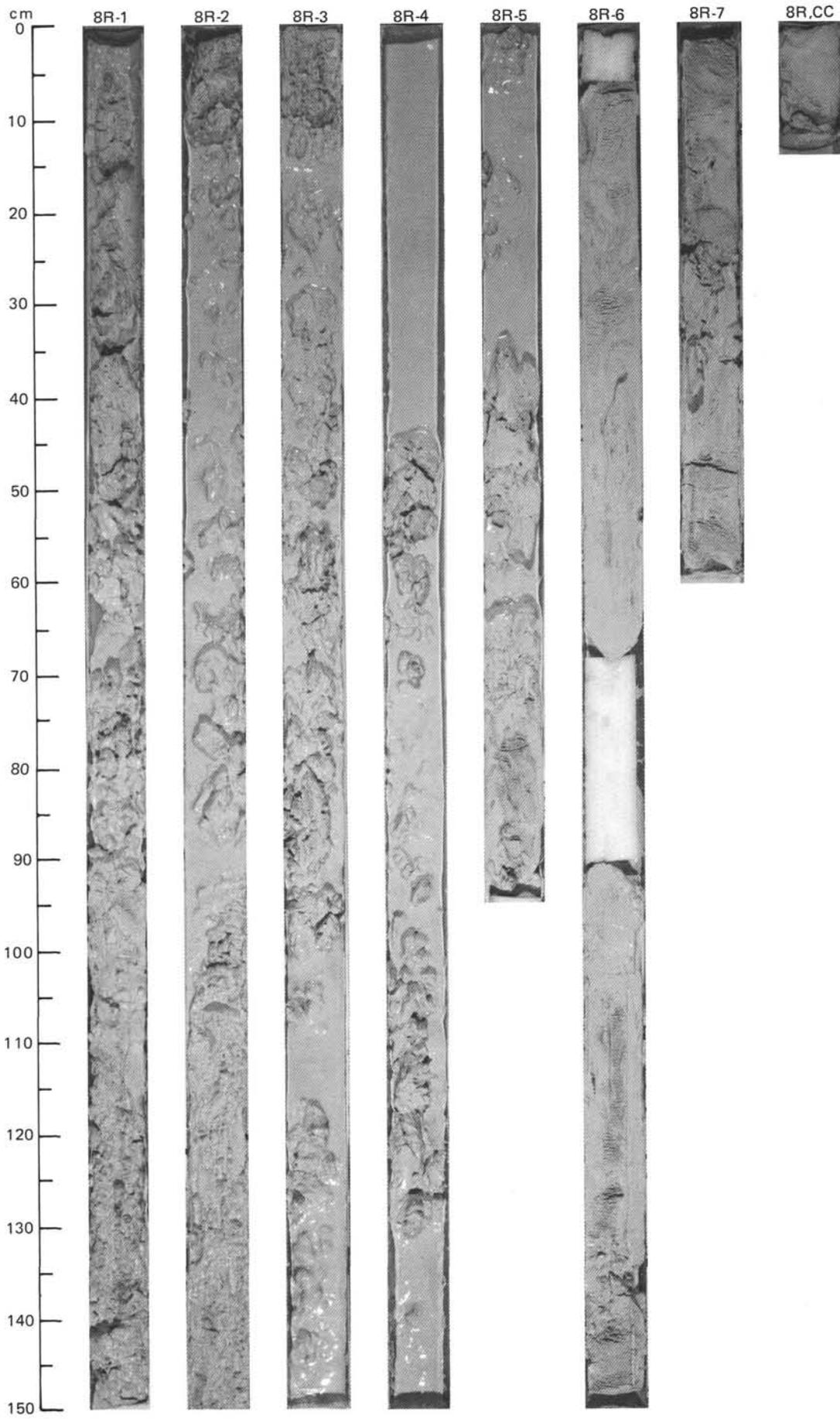




| TIME-ROCK UNIT          | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|-------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|-------|---|--|---|------|---|----|------|----|----|--------|----|---|------|----|---|------|----|----|--------------|---|---|--------------|----|----|--|------|-------|-------|------|-------------|---|------|---|---|----------|---|------|---|---|----------|---|---|-------|---|-------|------|---|---|------|--|------|-------|------|--|-------------|---|------|------|--|----------|---|------|------|--|----------|------|---|---|--|
|                         | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| EARLY / MIDDLE PLIOCENE |                                     |              |              |         |                |                  |           |         | 0.5    |                   |                   |                 |         | <p><b>LIGHT GRAY CLAYEY NANNOFOSSIL OOZE</b></p> <p>This core consists of white to light gray (5Y8/1 to 5Y7/1) nannofossil ooze to clayey nannofossil ooze. The core is highly disturbed by drilling but some faint lamination is discernible. Specks of pyrite are dispersed throughout the core, along with widely scattered quartz grains. A foraminiferal sand layer (probably the result of washing during drilling) is at Section 5, 7-9 cm.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="0"> <tr> <td></td> <td>1,75</td> <td>2,105</td> </tr> <tr> <td>D</td> <td></td> <td>M</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="0"> <tr> <td>Silt</td> <td>2</td> <td>40</td> </tr> <tr> <td>Clay</td> <td>98</td> <td>60</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="0"> <tr> <td>Quartz</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Mica</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Clay</td> <td>10</td> <td>50</td> </tr> <tr> <td>Foraminifers</td> <td>2</td> <td>-</td> </tr> <tr> <td>Nannofossils</td> <td>88</td> <td>50</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="0"> <tr> <td></td> <td>1,50</td> <td>1,101</td> <td>1,127</td> <td>2,50</td> </tr> <tr> <td><math>V\rho</math> (c)</td> <td>-</td> <td>2.31</td> <td>-</td> <td>-</td> </tr> <tr> <td><math>\rho_b</math></td> <td>-</td> <td>1.85</td> <td>-</td> <td>-</td> </tr> <tr> <td><math>\gamma</math></td> <td>-</td> <td>-</td> <td>19.25</td> <td>-</td> </tr> <tr> <td><math>T_c</math></td> <td>3.22</td> <td>-</td> <td>-</td> <td>3.16</td> </tr> <tr> <td></td> <td>2,65</td> <td>3,101</td> <td>5,31</td> <td></td> </tr> <tr> <td><math>V\rho</math> (c)</td> <td>-</td> <td>1.77</td> <td>1.76</td> <td></td> </tr> <tr> <td><math>\rho_b</math></td> <td>-</td> <td>1.74</td> <td>1.98</td> <td></td> </tr> <tr> <td><math>\gamma</math></td> <td>7.36</td> <td>-</td> <td>-</td> <td></td> </tr> </table> |  | 1,75 | 2,105 | D |  | M | Silt | 2 | 40 | Clay | 98 | 60 | Quartz | Tr | - | Mica | Tr | - | Clay | 10 | 50 | Foraminifers | 2 | - | Nannofossils | 88 | 50 |  | 1,50 | 1,101 | 1,127 | 2,50 | $V\rho$ (c) | - | 2.31 | - | - | $\rho_b$ | - | 1.85 | - | - | $\gamma$ | - | - | 19.25 | - | $T_c$ | 3.22 | - | - | 3.16 |  | 2,65 | 3,101 | 5,31 |  | $V\rho$ (c) | - | 1.77 | 1.76 |  | $\rho_b$ | - | 1.74 | 1.98 |  | $\gamma$ | 7.36 | - | - |  |
|                         |                                     | 1,75         | 2,105        |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         | D                                   |              | M            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         | Silt                                | 2            | 40           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         | Clay                                | 98           | 60           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| Quartz                  | Tr                                  | -            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| Mica                    | Tr                                  | -            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| Clay                    | 10                                  | 50           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| Foraminifers            | 2                                   | -            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| Nannofossils            | 88                                  | 50           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         | 1,50                                | 1,101        | 1,127        | 2,50    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| $V\rho$ (c)             | -                                   | 2.31         | -            | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| $\rho_b$                | -                                   | 1.85         | -            | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| $\gamma$                | -                                   | -            | 19.25        | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| $T_c$                   | 3.22                                | -            | -            | 3.16    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         | 2,65                                | 3,101        | 5,31         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| $V\rho$ (c)             | -                                   | 1.77         | 1.76         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| $\rho_b$                | -                                   | 1.74         | 1.98         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
| $\gamma$                | 7.36                                | -            | -            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         |                                     |              |              |         |                |                  |           | 1.0     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         | PL 2-PL 3                           | CN10C        | A/M          |         |                | 82 %             |           | 2       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         | A/M                                 | A/G          | B            |         |                | 85 % 70 % 83 %   |           | 3       |        | VOID              |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         |                                     |              |              |         |                |                  |           | 4       |        | VOID              |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |
|                         |                                     |              |              |         |                |                  |           | 5       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |       |   |  |   |      |   |    |      |    |    |        |    |   |      |    |   |      |    |    |              |   |   |              |    |    |  |      |       |       |      |             |   |      |   |   |          |   |      |   |   |          |   |   |       |   |       |      |   |   |      |  |      |       |      |  |             |   |      |      |  |          |   |      |      |  |          |      |   |   |  |

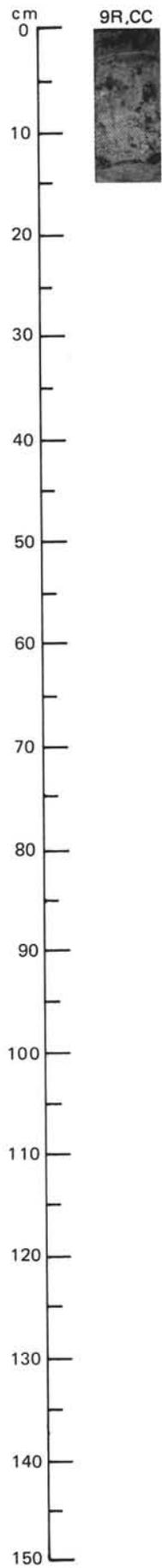




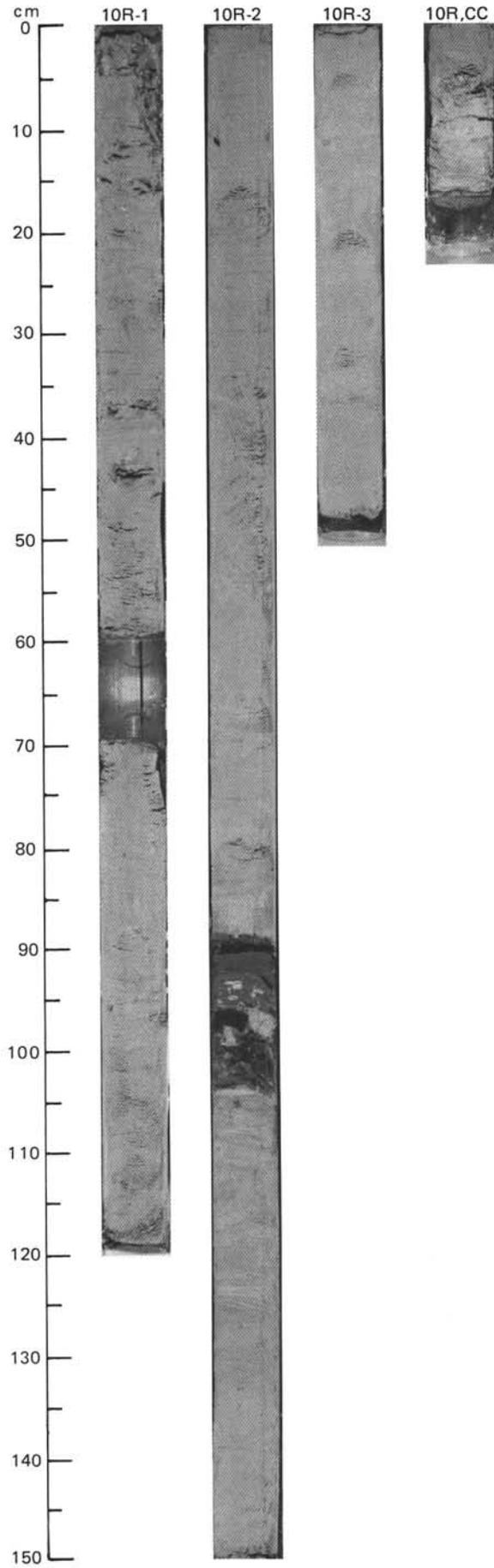


SITE 638 HOLE B CORE 9 R CORED INTERVAL 4736.3-4746.8 mbsl; 73.6-84.1 mbsf

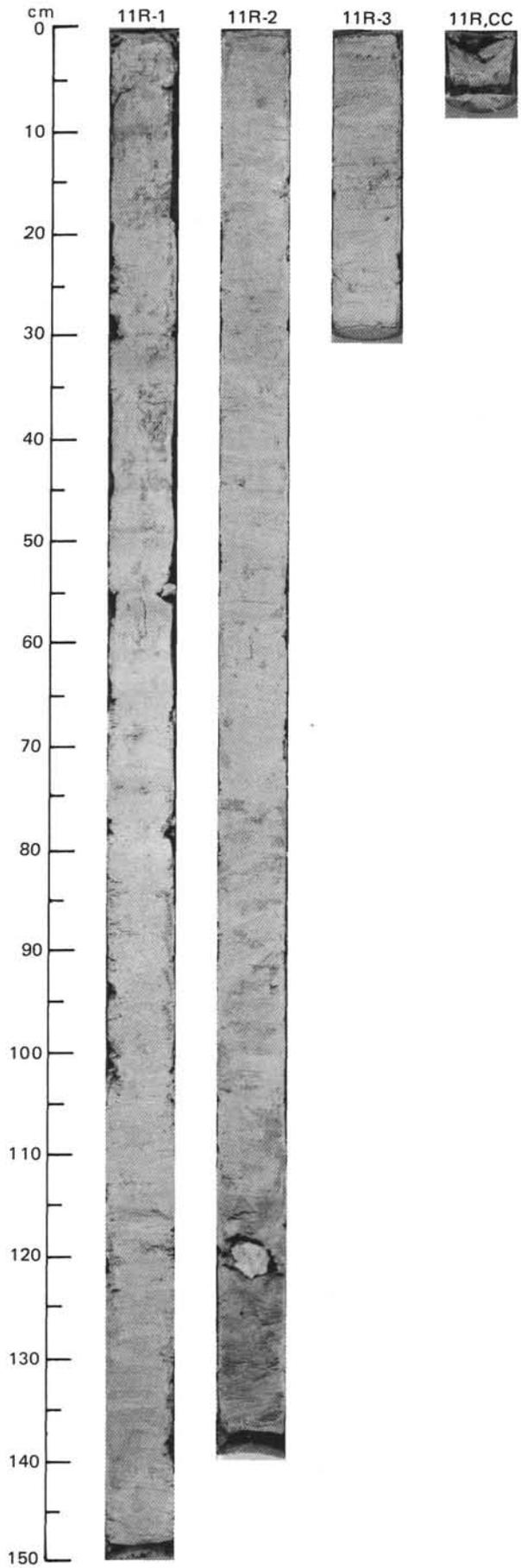
| TIME-ROCK UNIT        | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|----------------------|-------------------|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| EARLY/MIDDLE PLIOCENE | A/M                                 | A/G          | B            |         |                |                  |           | CC      |        |                      |                   |                 | *       | <p>WHITE CLAYEY NANNOFOSSIL OOZE</p> <p>Only a CC sample was recovered. It consists of 15 cm of white (5Y8/1) nannofossil ooze with 3 pyritized burrows.</p> <p>SMEAR SLIDE SUMMARY (%):</p> <p style="text-align: right;">CC<br/>M</p> <p>TEXTURE:</p> <p>Clay 100</p> <p>COMPOSITION:</p> <p>Quartz Tr<br/>Mica Tr<br/>Clay 30<br/>Calcite/Dolomite Tr<br/>Accessory Minerals Tr<br/>Foraminifers 1<br/>Nannofossils 40<br/>Micrite 29</p> |



| TIME-ROCK UNIT      | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | BED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
|---------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|------|------|-----------|--|---|---|---|---|--|------|---|----|---|---|----|------|----|----|----|---|----|------|----|----|----|-----|----|----------|---|----|---|---|---|------|---|----|----|----|---|----------------|---|----|---|---|---|---------------------|--|--|--|--|--|-----------------|---|----|----|---|---|----------|---|----|---|---|---|--------------|----|----|---|---|---|--------------|----|----|---|----|---|---------|---|---|---|---|----|-----------|---|---|---|---|---|---------|---|---|---|---|----|------------------|---|---|---|---|----|--|------|-------|-------|-------|--------------------|------|---|---|---|----------------|------|---|---|---|---|---|-------|---|-------|----------------|---|---|------|---|--|-------|------|------|--|--------------------|------|---|---|--|----------------|------|---|------|--|----------------|---|------|---|--|
|                     | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| EARLY PLIOCENE      | A/M                                 | R/P          | PL1 b        |         |                |                  |           |         | 0.5    |                   |                   |                 |         | <p><b>WHITE CLAYEY OOZE AND GREEN CLAYSTONE</b></p> <p>This core consists dominantly of white (5Y8/1) clayey nannofossil ooze like the cores above. Section 2, 90-105 cm consists of green (10G4/2) claystone with black zeolitic clay laminae at the top and 1-2 cm clasts of black clay, nannofossil ooze and green clay from 97-105 cm. The unit appears to be a debris flow composed of clay and altered volcanic material.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>2,83</td> <td>2,91</td> <td>2,93</td> <td>2,98</td> <td>2,119-123</td> </tr> <tr> <td></td> <td>D</td> <td>M</td> <td>M</td> <td>D</td> <td></td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>-</td> <td>20</td> <td>-</td> <td>-</td> <td>25</td> </tr> <tr> <td>Silt</td> <td>40</td> <td>40</td> <td>20</td> <td>-</td> <td>60</td> </tr> <tr> <td>Clay</td> <td>60</td> <td>40</td> <td>80</td> <td>100</td> <td>15</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Feldspar</td> <td>-</td> <td>10</td> <td>5</td> <td>-</td> <td>-</td> </tr> <tr> <td>Clay</td> <td>5</td> <td>10</td> <td>85</td> <td>10</td> <td>-</td> </tr> <tr> <td>Volcanic Glass</td> <td>-</td> <td>20</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Accessory Minerals:</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Opaque Minerals</td> <td>-</td> <td>20</td> <td>10</td> <td>-</td> <td>-</td> </tr> <tr> <td>  Zeolites</td> <td>-</td> <td>10</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Foraminifers</td> <td>10</td> <td>Tr</td> <td>-</td> <td>-</td> <td>1</td> </tr> <tr> <td>Nannofossils</td> <td>85</td> <td>30</td> <td>-</td> <td>90</td> <td>-</td> </tr> <tr> <td>Pellets</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>70</td> </tr> <tr> <td>Bioclasts</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>1</td> </tr> <tr> <td>Micrite</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>15</td> </tr> <tr> <td>Microspar cement</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>13</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,96</td> <td>1,105</td> <td>2,100</td> <td>1,125</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.45</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>1.80</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>γ</td> <td>-</td> <td>11.89</td> <td>-</td> <td>27.75</td> </tr> <tr> <td>T<sub>c</sub></td> <td>-</td> <td>-</td> <td>2.56</td> <td>-</td> </tr> <tr> <td></td> <td>2,131</td> <td>3,30</td> <td>3,31</td> <td></td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.52</td> <td>-</td> <td>-</td> <td></td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>1.85</td> <td>-</td> <td>1.84</td> <td></td> </tr> <tr> <td>T<sub>c</sub></td> <td>-</td> <td>2.89</td> <td>-</td> <td></td> </tr> </table> |  | 2,83 | 2,91 | 2,93 | 2,98 | 2,119-123 |  | D | M | M | D |  | Sand | - | 20 | - | - | 25 | Silt | 40 | 40 | 20 | - | 60 | Clay | 60 | 40 | 80 | 100 | 15 | Feldspar | - | 10 | 5 | - | - | Clay | 5 | 10 | 85 | 10 | - | Volcanic Glass | - | 20 | - | - | - | Accessory Minerals: |  |  |  |  |  | Opaque Minerals | - | 20 | 10 | - | - | Zeolites | - | 10 | - | - | - | Foraminifers | 10 | Tr | - | - | 1 | Nannofossils | 85 | 30 | - | 90 | - | Pellets | - | - | - | - | 70 | Bioclasts | - | - | - | - | 1 | Micrite | - | - | - | - | 15 | Microspar cement | - | - | - | - | 13 |  | 1,96 | 1,105 | 2,100 | 1,125 | V <sub>p</sub> (c) | 1.45 | - | - | - | ρ <sub>b</sub> | 1.80 | - | - | - | γ | - | 11.89 | - | 27.75 | T <sub>c</sub> | - | - | 2.56 | - |  | 2,131 | 3,30 | 3,31 |  | V <sub>p</sub> (c) | 1.52 | - | - |  | ρ <sub>b</sub> | 1.85 | - | 1.84 |  | T <sub>c</sub> | - | 2.89 | - |  |
|                     |                                     | 2,83         | 2,91         | 2,93    | 2,98           | 2,119-123        |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
|                     |                                     | D            | M            | M       | D              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
|                     | Sand                                | -            | 20           | -       | -              | 25               |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Silt                | 40                                  | 40           | 20           | -       | 60             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Clay                | 60                                  | 40           | 80           | 100     | 15             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Feldspar            | -                                   | 10           | 5            | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Clay                | 5                                   | 10           | 85           | 10      | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Volcanic Glass      | -                                   | 20           | -            | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Accessory Minerals: |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Opaque Minerals     | -                                   | 20           | 10           | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Zeolites            | -                                   | 10           | -            | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Foraminifers        | 10                                  | Tr           | -            | -       | 1              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Nannofossils        | 85                                  | 30           | -            | 90      | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Pellets             | -                                   | -            | -            | -       | 70             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Bioclasts           | -                                   | -            | -            | -       | 1              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Micrite             | -                                   | -            | -            | -       | 15             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| Microspar cement    | -                                   | -            | -            | -       | 13             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
|                     | 1,96                                | 1,105        | 2,100        | 1,125   |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| V <sub>p</sub> (c)  | 1.45                                | -            | -            | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| ρ <sub>b</sub>      | 1.80                                | -            | -            | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| γ                   | -                                   | 11.89        | -            | 27.75   |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| T <sub>c</sub>      | -                                   | -            | 2.56         | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
|                     | 2,131                               | 3,30         | 3,31         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| V <sub>p</sub> (c)  | 1.52                                | -            | -            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| ρ <sub>b</sub>      | 1.85                                | -            | 1.84         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
| T <sub>c</sub>      | -                                   | 2.89         | -            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
|                     | C/M                                 | C/P          | PL1 b        |         |                |                  |           |         | 1.0    |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
|                     |                                     |              |              | CN10 B? |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |
|                     |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |      |      |           |  |   |   |   |   |  |      |   |    |   |   |    |      |    |    |    |   |    |      |    |    |    |     |    |          |   |    |   |   |   |      |   |    |    |    |   |                |   |    |   |   |   |                     |  |  |  |  |  |                 |   |    |    |   |   |          |   |    |   |   |   |              |    |    |   |   |   |              |    |    |   |    |   |         |   |   |   |   |    |           |   |   |   |   |   |         |   |   |   |   |    |                  |   |   |   |   |    |  |      |       |       |       |                    |      |   |   |   |                |      |   |   |   |   |   |       |   |       |                |   |   |      |   |  |       |      |      |  |                    |      |   |   |  |                |      |   |      |  |                |   |      |   |  |

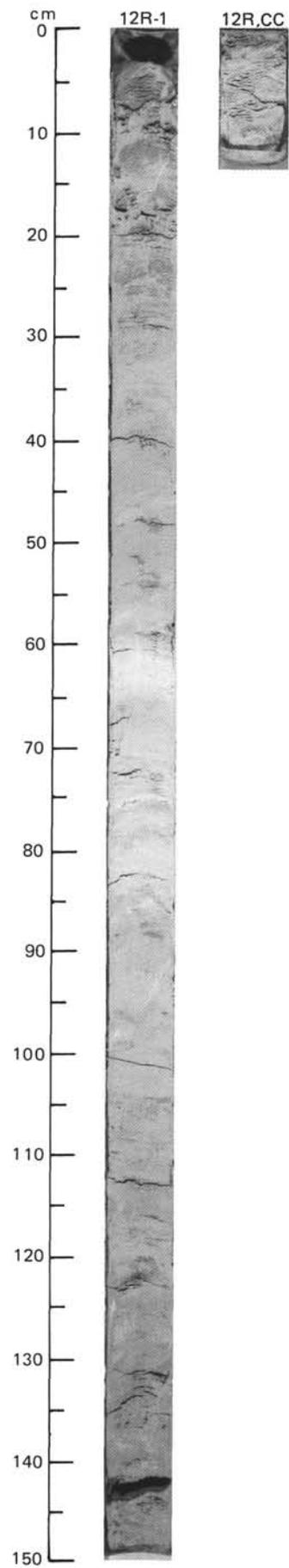


| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |           | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
|----------------|-------------------------------------|--------------|--------------|-----------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------|-------|-------|-------|-------|-----------|---|------|---|---|------|----------|---|------|---|---|------|----------|-------|---|---|-------|---|-------|---|---|------|---|---|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS   |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
| EARLY PLIOCENE | A/M                                 | PL1 a        | CN9 b / 10 a | CN10 b(?) |                |                  |           | 1       | 0.5    |                   |                   |                 |         | <p><b>WHITE CLAYEY NANNOFOSSIL OOZE</b></p> <p>This core consists of faintly laminated bluish white (N8 to 2.5Y8/0) clayey nannofossil ooze, slightly to moderately disturbed by drilling. Thin darker (2.5Y7/0) bands occur throughout. Subangular clasts (3-4 cm) of bioclastic packstone occur at Section 2, 118-123 cm.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <p style="text-align: right;">1,57<br/>D</p> <p><b>TEXTURE:</b></p> <p>Silt 10<br/>Clay 90</p> <p><b>COMPOSITION:</b></p> <p>Foraminifers 10<br/>Nannofossils 90</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>1,130</th> <th>1,131</th> <th>2,100</th> <th>2,128</th> <th>2,131</th> </tr> </thead> <tbody> <tr> <td><math>V_p</math> (c)</td> <td>—</td> <td>1.62</td> <td>—</td> <td>—</td> <td>1.62</td> </tr> <tr> <td><math>\rho_b</math></td> <td>—</td> <td>1.90</td> <td>—</td> <td>—</td> <td>1.90</td> </tr> <tr> <td><math>\gamma</math></td> <td>20.10</td> <td>—</td> <td>—</td> <td>15.60</td> <td>—</td> </tr> <tr> <td><math>T_c</math></td> <td>—</td> <td>—</td> <td>3.17</td> <td>—</td> <td>—</td> </tr> </tbody> </table> |  | 1,130 | 1,131 | 2,100 | 2,128 | 2,131 | $V_p$ (c) | — | 1.62 | — | — | 1.62 | $\rho_b$ | — | 1.90 | — | — | 1.90 | $\gamma$ | 20.10 | — | — | 15.60 | — | $T_c$ | — | — | 3.17 | — | — |
|                | 1,130                               | 1,131        | 2,100        | 2,128     | 2,131          |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
| $V_p$ (c)      | —                                   | 1.62         | —            | —         | 1.62           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
| $\rho_b$       | —                                   | 1.90         | —            | —         | 1.90           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
| $\gamma$       | 20.10                               | —            | —            | 15.60     | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
| $T_c$          | —                                   | —            | 3.17         | —         | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
|                |                                     |              |              |           |                |                  |           | 2       | 1.0    |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
|                |                                     |              |              |           |                |                  |           | 3       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |
|                |                                     |              |              |           |                |                  |           | CC      |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |       |       |       |       |       |           |   |      |   |   |      |          |   |      |   |   |      |          |       |   |   |       |   |       |   |   |      |   |   |



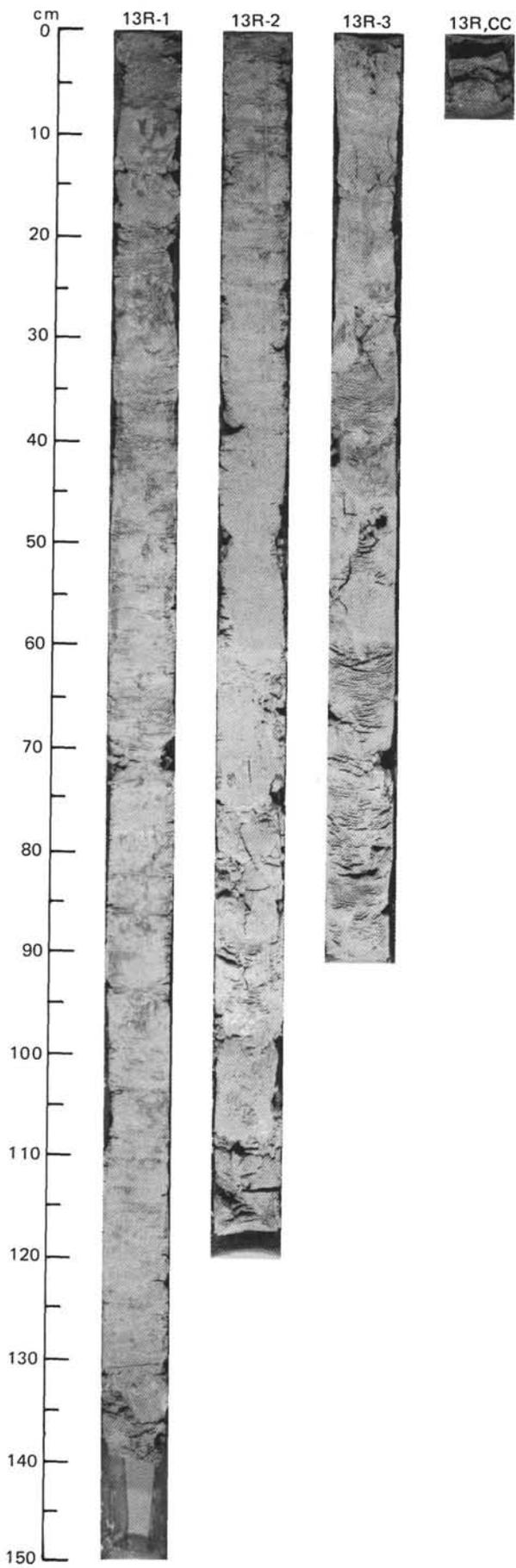
SITE 638 HOLE B CORE 12 R CORED INTERVAL 4766.1-4775.8 mbsl; 103.4-113.1 mbsf

| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS     | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |       |       |             |   |   |      |          |   |   |      |          |   |       |   |       |      |   |   |
|----------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|------------|----------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|-------|-------|-------------|---|---|------|----------|---|---|------|----------|---|-------|---|-------|------|---|---|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |       |       |             |   |   |      |          |   |   |      |          |   |       |   |       |      |   |   |
| LATE MIOCENE   | A/G                                 | C/M          | B            |         |                | ■ ■ ● 99 %       |           | 1       | 0.5<br>1.0 |                      |                   |                 | *       | <p>WHITE NANNOFOSSIL OOZE</p> <p>This core consists of white (2.5Y8/1) to light gray (2.5Y7.5/1) foram-bearing nannofossil ooze. Purplish dark gray streaks (?manganese rich) occur throughout. The core is highly disturbed by drilling.</p> <p>SMEAR SLIDE SUMMARY (%):</p> <p style="text-align: right;">1,94<br/>D</p> <p>TEXTURE:</p> <p>Sand 15<br/>Silt 5<br/>Clay 80</p> <p>COMPOSITION:</p> <p>Clay 15<br/>Foraminifers 20<br/>Nannofossils 65</p> <p>PHYSICAL PROPERTIES DATA:</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>1,95</td> <td>1,105</td> <td>1,107</td> </tr> <tr> <td><math>V\rho</math> (c)</td> <td>-</td> <td>-</td> <td>1.72</td> </tr> <tr> <td><math>\rho_b</math></td> <td>-</td> <td>-</td> <td>1.80</td> </tr> <tr> <td><math>\gamma</math></td> <td>-</td> <td>17.60</td> <td>-</td> </tr> <tr> <td><math>T_c</math></td> <td>3.03</td> <td>-</td> <td>-</td> </tr> </table> |  | 1,95 | 1,105 | 1,107 | $V\rho$ (c) | - | - | 1.72 | $\rho_b$ | - | - | 1.80 | $\gamma$ | - | 17.60 | - | $T_c$ | 3.03 | - | - |
|                | 1,95                                | 1,105        | 1,107        |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |       |       |             |   |   |      |          |   |   |      |          |   |       |   |       |      |   |   |
| $V\rho$ (c)    | -                                   | -            | 1.72         |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |       |       |             |   |   |      |          |   |   |      |          |   |       |   |       |      |   |   |
| $\rho_b$       | -                                   | -            | 1.80         |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |       |       |             |   |   |      |          |   |   |      |          |   |       |   |       |      |   |   |
| $\gamma$       | -                                   | 17.60        | -            |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |       |       |             |   |   |      |          |   |   |      |          |   |       |   |       |      |   |   |
| $T_c$          | 3.03                                | -            | -            |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |       |       |             |   |   |      |          |   |   |      |          |   |       |   |       |      |   |   |



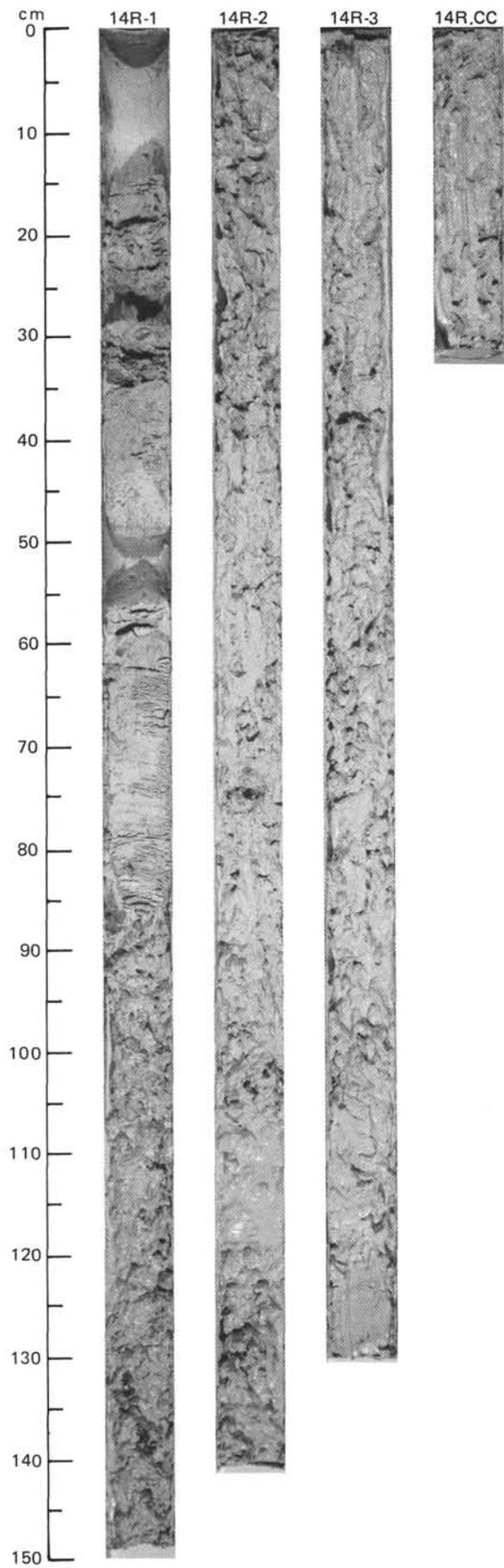
SITE 638 HOLE B CORE 13 R CORED INTERVAL 4775.8-4785.6 mbsl; 113.1-122.9 mbsf

| TIME-ROCK UNIT     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS     | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | BED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
|--------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|------------|----------------------|-------------------|-----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|---|---|---|------|---|---|------|---|---|------|----|----|------|----|----|------------------|----|---|--------------|---|---|--------------|----|----|--|------|-------|------|--------------------|------|---|---|----------------|------|---|---|---|---|-------|---|----------------|---|---|------|
|                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| LATE MIOCENE       | A/G                                 | C/M          | B            |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
|                    | N18                                 | CN9 b/10 a   |              |         | ■              | ● 85 %           |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
|                    |                                     |              |              |         |                |                  |           | 1       | 0.5<br>1.0 |                      |                   |                 | *       | <p>WHITE CLAYEY NANNOFOSSIL OOZE</p> <p>This core consists of white (7.5YR8/0) clayey nannofossil ooze. Moderate to high drilling disturbance has obscured much of the structure; faint parallel lamination is discernible.</p> <p>SMEAR SLIDE SUMMARY (%):</p> <table border="0"> <tr> <td></td> <td>1,83</td> <td>2,90</td> </tr> <tr> <td>D</td> <td>D</td> <td>D</td> </tr> </table> <p>TEXTURE:</p> <table border="0"> <tr> <td>Sand</td> <td>5</td> <td>5</td> </tr> <tr> <td>Silt</td> <td>2</td> <td>2</td> </tr> <tr> <td>Clay</td> <td>93</td> <td>93</td> </tr> </table> <p>COMPOSITION:</p> <table border="0"> <tr> <td>Clay</td> <td>15</td> <td>10</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Foraminifers</td> <td>7</td> <td>7</td> </tr> <tr> <td>Nannofossils</td> <td>78</td> <td>83</td> </tr> </table> <p>PHYSICAL PROPERTIES DATA:</p> <table border="0"> <tr> <td></td> <td>1,80</td> <td>1,126</td> <td>3,46</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.73</td> <td>-</td> <td>-</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>1.99</td> <td>-</td> <td>-</td> </tr> <tr> <td>γ</td> <td>-</td> <td>26.60</td> <td>-</td> </tr> <tr> <td>T<sub>c</sub></td> <td>-</td> <td>-</td> <td>3.06</td> </tr> </table> |  | 1,83 | 2,90 | D | D | D | Sand | 5 | 5 | Silt | 2 | 2 | Clay | 93 | 93 | Clay | 15 | 10 | Calcite/Dolomite | Tr | - | Foraminifers | 7 | 7 | Nannofossils | 78 | 83 |  | 1,80 | 1,126 | 3,46 | V <sub>p</sub> (c) | 1.73 | - | - | ρ <sub>b</sub> | 1.99 | - | - | γ | - | 26.60 | - | T <sub>c</sub> | - | - | 3.06 |
|                    | 1,83                                | 2,90         |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| D                  | D                                   | D            |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| Sand               | 5                                   | 5            |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| Silt               | 2                                   | 2            |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| Clay               | 93                                  | 93           |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| Clay               | 15                                  | 10           |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| Calcite/Dolomite   | Tr                                  | -            |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| Foraminifers       | 7                                   | 7            |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| Nannofossils       | 78                                  | 83           |              |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
|                    | 1,80                                | 1,126        | 3,46         |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| V <sub>p</sub> (c) | 1.73                                | -            | -            |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| ρ <sub>b</sub>     | 1.99                                | -            | -            |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| γ                  | -                                   | 26.60        | -            |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
| T <sub>c</sub>     | -                                   | -            | 3.06         |         |                |                  |           |         |            |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
|                    |                                     |              |              |         |                |                  |           | 2       |            |                      |                   |                 | *       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |
|                    |                                     |              |              |         |                |                  |           | 3       |            |                      |                   |                 | OG      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |      |      |   |   |   |      |   |   |      |   |   |      |    |    |      |    |    |                  |    |   |              |   |   |              |    |    |  |      |       |      |                    |      |   |   |                |      |   |   |   |   |       |   |                |   |   |      |

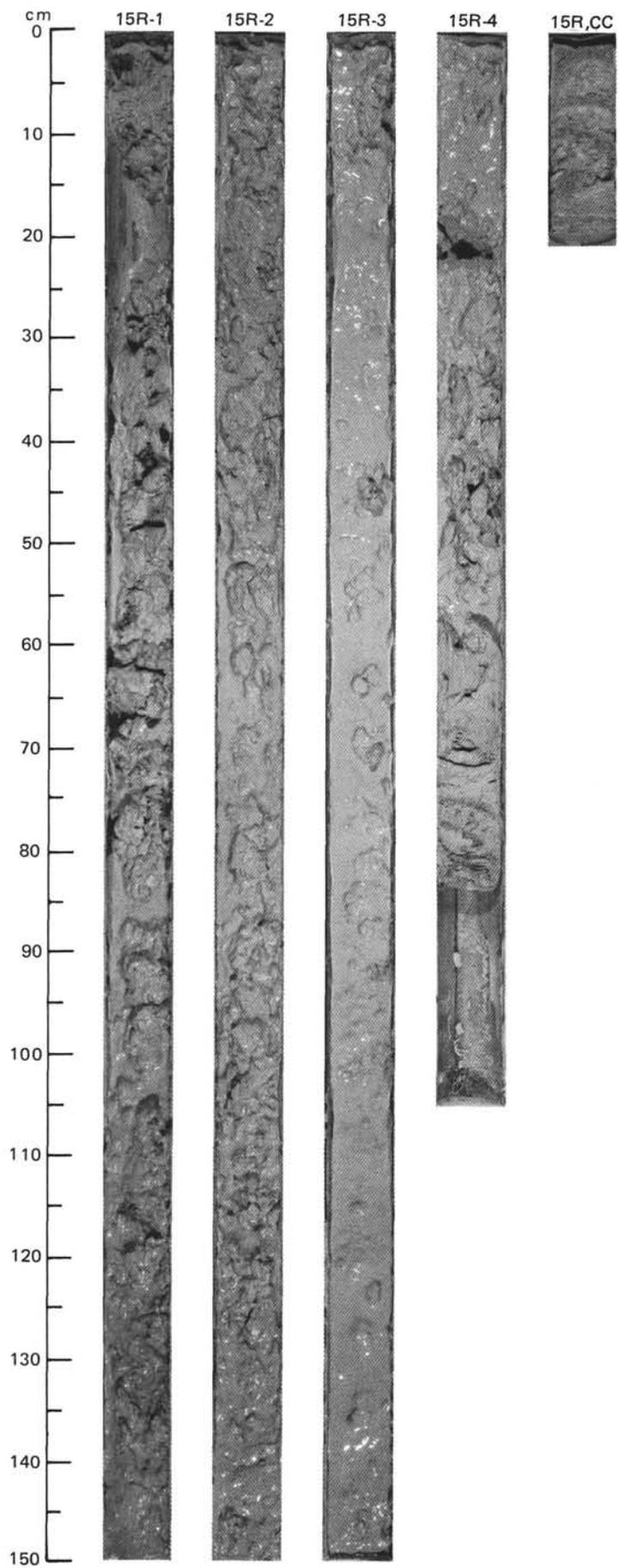


SITE 638 HOLE B CORE 14 R CORED INTERVAL 4785.6-4795.3 mbsl; 122.9-132.6 mbsf

| TIME-ROCK UNIT     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | BED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
|--------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|-------|------|--|---|---|---|---|------|---|---|----|---|------|----|----|----|---|------|----|----|----|----|--------|---|---|---|----|------|----|---|---|---|------|----|----|----|----|------------------|---|---|----|---|--------------------|----|---|---|---|--------------|---|---|---|---|--------------|----|----|----|----|--------------|---|----|---|---|--|------|------|------|
|                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| LATE MIOCENE       | C/P                                 | N18          |              |         |                |                  |           | 1       | 0.5    | VOID              |                   |                 | *       | <p><b>WHITE CLAYEY NANNOFOSSIL OOZE</b></p> <p>Much of this core consists of a soupy drilling mixture of nannofossil ooze lumps. The upper part of Section 1 consists of stiff, white (5Y8/1) clayey nannofossil ooze. A band of pale yellow (2.5Y8/2) foraminiferal nannofossil ooze occurs at Section 1, 35-45 cm. Several clasts of dark greenish gray (5GY4/1) marl occur at Section 1, 133-140 cm. Drilling has destroyed any fine-scale structure.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>1,19</td> <td>1,87</td> <td>1,139</td> <td>2,85</td> </tr> <tr> <td></td> <td>D</td> <td>M</td> <td>M</td> <td>D</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>—</td> <td>5</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Silt</td> <td>10</td> <td>35</td> <td>15</td> <td>7</td> </tr> <tr> <td>Clay</td> <td>90</td> <td>60</td> <td>85</td> <td>93</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Quartz</td> <td>—</td> <td>1</td> <td>2</td> <td>Tr</td> </tr> <tr> <td>Mica</td> <td>Tr</td> <td>5</td> <td>1</td> <td>—</td> </tr> <tr> <td>Clay</td> <td>25</td> <td>52</td> <td>65</td> <td>15</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>—</td> <td>5</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Accessory Minerals</td> <td>Tr</td> <td>2</td> <td>5</td> <td>—</td> </tr> </table> <p>(Opales, Zeolites, Aggregated clays= shale chips?)</p> <table border="1"> <tr> <td>Foraminifers</td> <td>1</td> <td>5</td> <td>2</td> <td>7</td> </tr> <tr> <td>Nannofossils</td> <td>74</td> <td>30</td> <td>25</td> <td>78</td> </tr> <tr> <td>Fish Remains</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,40</td> <td>2,90</td> <td>3,50</td> </tr> </table> <p><math>V\rho</math> (c) 1.71 — —</p> <p><math>\rho_b</math> 1.94 — —</p> <p><math>T_c</math> — 2.80 2.86</p> |  | 1,19 | 1,87 | 1,139 | 2,85 |  | D | M | M | D | Sand | — | 5 | Tr | — | Silt | 10 | 35 | 15 | 7 | Clay | 90 | 60 | 85 | 93 | Quartz | — | 1 | 2 | Tr | Mica | Tr | 5 | 1 | — | Clay | 25 | 52 | 65 | 15 | Calcite/Dolomite | — | 5 | Tr | — | Accessory Minerals | Tr | 2 | 5 | — | Foraminifers | 1 | 5 | 2 | 7 | Nannofossils | 74 | 30 | 25 | 78 | Fish Remains | — | Tr | — | — |  | 1,40 | 2,90 | 3,50 |
|                    |                                     | 1,19         | 1,87         | 1,139   | 2,85           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
|                    |                                     | D            | M            | M       | D              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
|                    | Sand                                | —            | 5            | Tr      | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Silt               | 10                                  | 35           | 15           | 7       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Clay               | 90                                  | 60           | 85           | 93      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Quartz             | —                                   | 1            | 2            | Tr      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Mica               | Tr                                  | 5            | 1            | —       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Clay               | 25                                  | 52           | 65           | 15      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Calcite/Dolomite   | —                                   | 5            | Tr           | —       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Accessory Minerals | Tr                                  | 2            | 5            | —       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Foraminifers       | 1                                   | 5            | 2            | 7       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Nannofossils       | 74                                  | 30           | 25           | 78      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
| Fish Remains       | —                                   | Tr           | —            | —       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
|                    | 1,40                                | 2,90         | 3,50         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
|                    | A/M                                 | CN9 b/10 a   |              |         |                |                  |           | 2       | 1.0    |                   |                   |                 | *       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
|                    | B                                   |              |              |         |                |                  |           | 3       |        |                   |                   |                 | W       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |
|                    |                                     |              |              |         |                |                  |           | CC      |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |  |   |   |   |   |      |   |   |    |   |      |    |    |    |   |      |    |    |    |    |        |   |   |   |    |      |    |   |   |   |      |    |    |    |    |                  |   |   |    |   |                    |    |   |   |   |              |   |   |   |   |              |    |    |    |    |              |   |    |   |   |  |      |      |      |

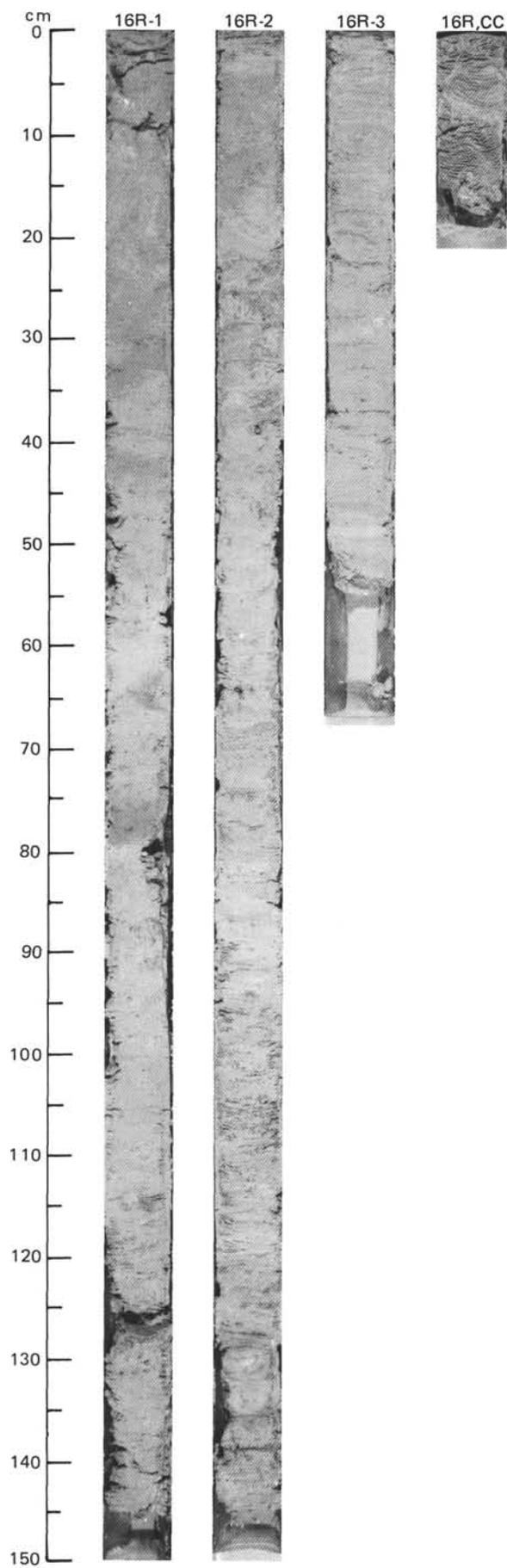




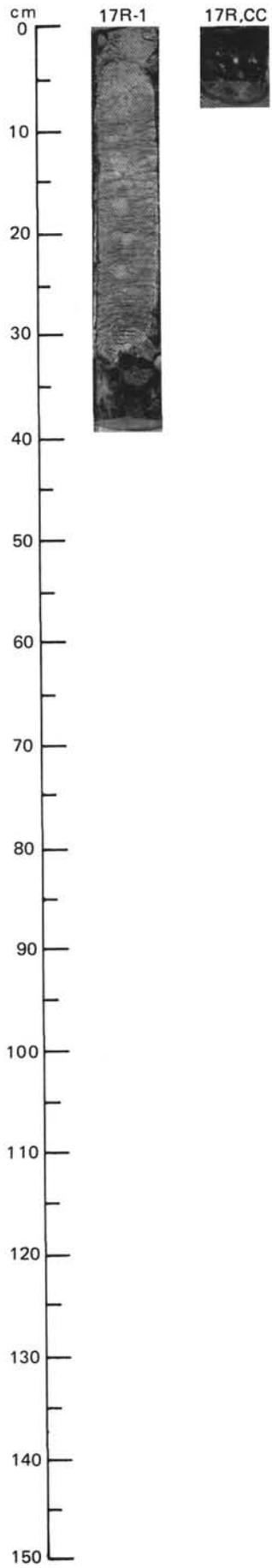


SITE 638 HOLE B CORE 16 R CORED INTERVAL 4804.9-4814.5 mbsl; 142.2-151.8 mbsf

| TIME-ROCK UNIT                            | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS     | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
|-------------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|------------|-------------------|-------------------|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|---|---|---|------|----|---|------|----|----|----------|----|----|------|---|---|-------------------------------------------|----|----|--------------|---|---|--------------|----|----|--|------|------|-------|-----------|---|------|---|----------|---|------|---|----------|---|---|-------|-------|------|---|---|
|                                           | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| LATE MIOCENE                              | A/M                                 | A/G          | B            |         |                |                  |           | 1       | 0.5<br>1.0 |                   |                   |                 | *       | <p>WHITE CLAYEY OOZE</p> <p>This core consists of stiff, white (2.5Y8/0) clayey nannofossil ooze, faintly laminated in greenish and grayish shades. Drilling disturbance is slight to moderate.</p> <p>SMEAR SLIDE SUMMARY (%):</p> <table style="margin-left: 40px;"> <tr> <td></td> <td>1,78</td> <td>2,90</td> </tr> <tr> <td>D</td> <td>D</td> <td>D</td> </tr> </table> <p>TEXTURE:</p> <table style="margin-left: 40px;"> <tr> <td>Silt</td> <td>30</td> <td>5</td> </tr> <tr> <td>Clay</td> <td>70</td> <td>95</td> </tr> </table> <p>COMPOSITION:</p> <table style="margin-left: 40px;"> <tr> <td>Feldspar</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Clay</td> <td>-</td> <td>5</td> </tr> <tr> <td>Accessory Minerals<br/>(Zeolites, Opaques)</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Foraminifers</td> <td>5</td> <td>5</td> </tr> <tr> <td>Nannofossils</td> <td>95</td> <td>90</td> </tr> </table> <p>PHYSICAL PROPERTIES DATA:</p> <table style="margin-left: 40px;"> <tr> <td></td> <td>2,65</td> <td>2,82</td> <td>2,125</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>-</td> <td>1.75</td> <td>-</td> </tr> <tr> <td><math>\rho_b</math></td> <td>-</td> <td>2.03</td> <td>-</td> </tr> <tr> <td><math>\gamma</math></td> <td>-</td> <td>-</td> <td>15.07</td> </tr> <tr> <td><math>T_c</math></td> <td>3.42</td> <td>-</td> <td>-</td> </tr> </table> |  | 1,78 | 2,90 | D | D | D | Silt | 30 | 5 | Clay | 70 | 95 | Feldspar | Tr | Tr | Clay | - | 5 | Accessory Minerals<br>(Zeolites, Opaques) | Tr | Tr | Foraminifers | 5 | 5 | Nannofossils | 95 | 90 |  | 2,65 | 2,82 | 2,125 | $V_p$ (c) | - | 1.75 | - | $\rho_b$ | - | 2.03 | - | $\gamma$ | - | - | 15.07 | $T_c$ | 3.42 | - | - |
|                                           | 1,78                                | 2,90         |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| D                                         | D                                   | D            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| Silt                                      | 30                                  | 5            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| Clay                                      | 70                                  | 95           |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| Feldspar                                  | Tr                                  | Tr           |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| Clay                                      | -                                   | 5            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| Accessory Minerals<br>(Zeolites, Opaques) | Tr                                  | Tr           |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| Foraminifers                              | 5                                   | 5            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| Nannofossils                              | 95                                  | 90           |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
|                                           | 2,65                                | 2,82         | 2,125        |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| $V_p$ (c)                                 | -                                   | 1.75         | -            |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| $\rho_b$                                  | -                                   | 2.03         | -            |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| $\gamma$                                  | -                                   | -            | 15.07        |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
| $T_c$                                     | 3.42                                | -            | -            |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
|                                           |                                     |              |              |         |                | ● 81%            |           | 2       |            |                   |                   |                 | *       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
|                                           |                                     |              |              |         |                |                  |           | 3       |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |
|                                           |                                     |              |              |         |                |                  | CC        |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |   |   |   |      |    |   |      |    |    |          |    |    |      |   |   |                                           |    |    |              |   |   |              |    |    |  |      |      |       |           |   |      |   |          |   |      |   |          |   |   |       |       |      |   |   |

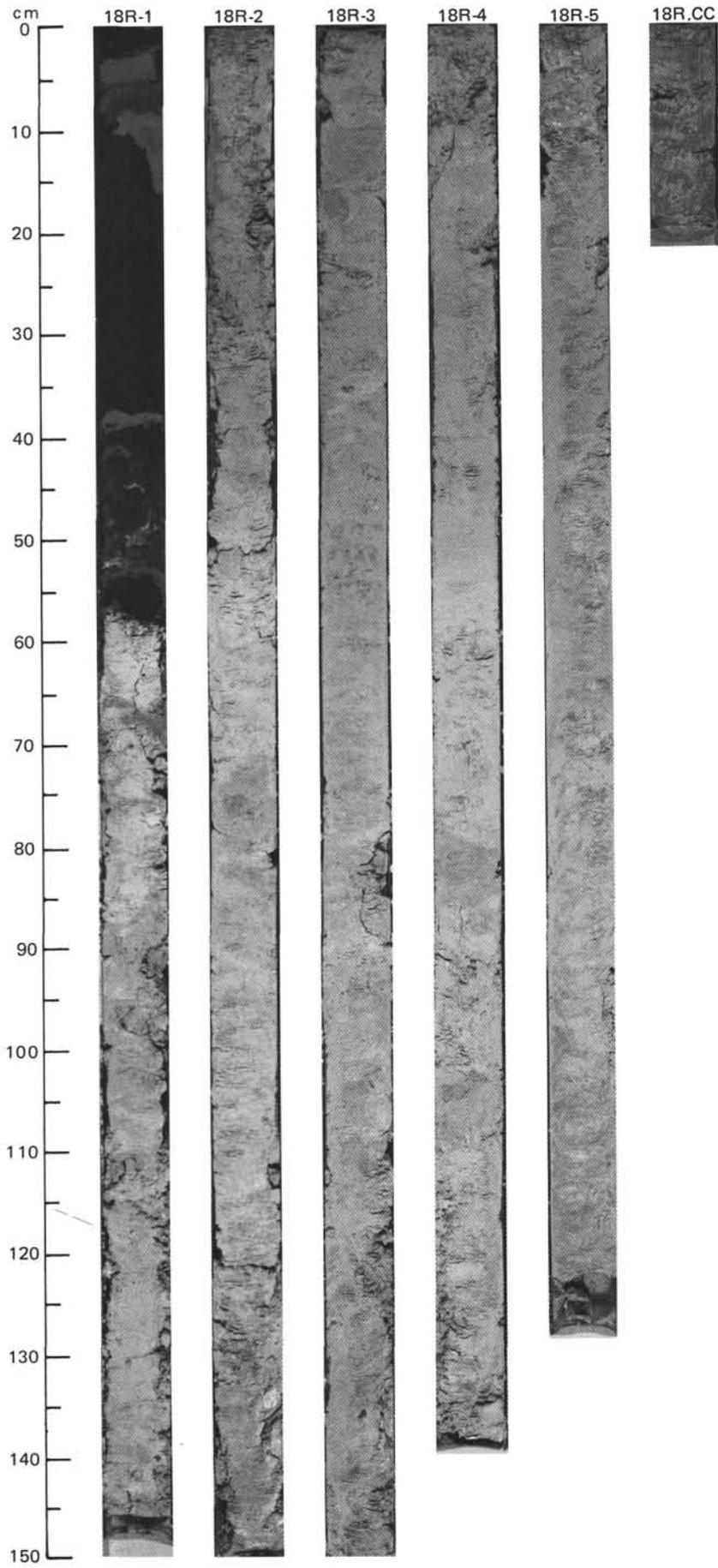


| TIME-ROCK UNIT                           | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC<br>LITHOLOGY                                                              | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
|------------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-----------------------------------------------------------------------------------|-------------------|-----------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|----|----|--|---|---|---|------|---|---|---|------|-----|----|----|--------|---|---|---|----------------|---|---|---|------|----|---|----|------|---|----|---|------------------------------------------|---|---|----|--------------|---|---|---|--------------|----|----|----|--------------|---|----|---|--|------|-----------|------|----------|------|
|                                          | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| LATE MIOCENE                             | N18                                 | C/M          | C/M          | C/M     |                |                  | 85 X ●    | 1       |        |  |                   |                 |         | <p><b>GRAY CLAYEY OOZE</b></p> <p>This core consists of 33 cm of pale gray (5Y7/11), structureless clayey nannofossil ooze. A 5 cm sandstone cobble was found at the bottom of the core resting in some patches of dark yellow-brown (10YR4/4) clay.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="0"> <tr> <td></td> <td>1,16</td> <td>CC</td> <td>CC</td> </tr> <tr> <td></td> <td>D</td> <td>D</td> <td>M</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="0"> <tr> <td>Silt</td> <td>—</td> <td>3</td> <td>2</td> </tr> <tr> <td>Clay</td> <td>100</td> <td>97</td> <td>98</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="0"> <tr> <td>Quartz</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td>Rock Fragments</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td>Mica</td> <td>Tr</td> <td>—</td> <td>88</td> </tr> <tr> <td>Clay</td> <td>5</td> <td>20</td> <td>—</td> </tr> <tr> <td>Accessory Minerals<br/>(Pyrite, Zeolites)</td> <td>—</td> <td>2</td> <td>Tr</td> </tr> <tr> <td>Foraminifers</td> <td>—</td> <td>3</td> <td>—</td> </tr> <tr> <td>Nannofossils</td> <td>95</td> <td>75</td> <td>10</td> </tr> <tr> <td>Fish Remains</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="0"> <tr> <td></td> <td>1,21</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>1.67</td> </tr> <tr> <td><math>\rho_b</math></td> <td>1.98</td> </tr> </table> |  | 1,16 | CC | CC |  | D | D | M | Silt | — | 3 | 2 | Clay | 100 | 97 | 98 | Quartz | — | — | 1 | Rock Fragments | — | — | 1 | Mica | Tr | — | 88 | Clay | 5 | 20 | — | Accessory Minerals<br>(Pyrite, Zeolites) | — | 2 | Tr | Foraminifers | — | 3 | — | Nannofossils | 95 | 75 | 10 | Fish Remains | — | Tr | — |  | 1,21 | $V_p$ (c) | 1.67 | $\rho_b$ | 1.98 |
|                                          | 1,16                                | CC           | CC           |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
|                                          | D                                   | D            | M            |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Silt                                     | —                                   | 3            | 2            |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Clay                                     | 100                                 | 97           | 98           |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Quartz                                   | —                                   | —            | 1            |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Rock Fragments                           | —                                   | —            | 1            |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Mica                                     | Tr                                  | —            | 88           |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Clay                                     | 5                                   | 20           | —            |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Accessory Minerals<br>(Pyrite, Zeolites) | —                                   | 2            | Tr           |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Foraminifers                             | —                                   | 3            | —            |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Nannofossils                             | 95                                  | 75           | 10           |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| Fish Remains                             | —                                   | Tr           | —            |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
|                                          | 1,21                                |              |              |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| $V_p$ (c)                                | 1.67                                |              |              |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |
| $\rho_b$                                 | 1.98                                |              |              |         |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |    |    |  |   |   |   |      |   |   |   |      |     |    |    |        |   |   |   |                |   |   |   |      |    |   |    |      |   |    |   |                                          |   |   |    |              |   |   |   |              |    |    |    |              |   |    |   |  |      |           |      |          |      |



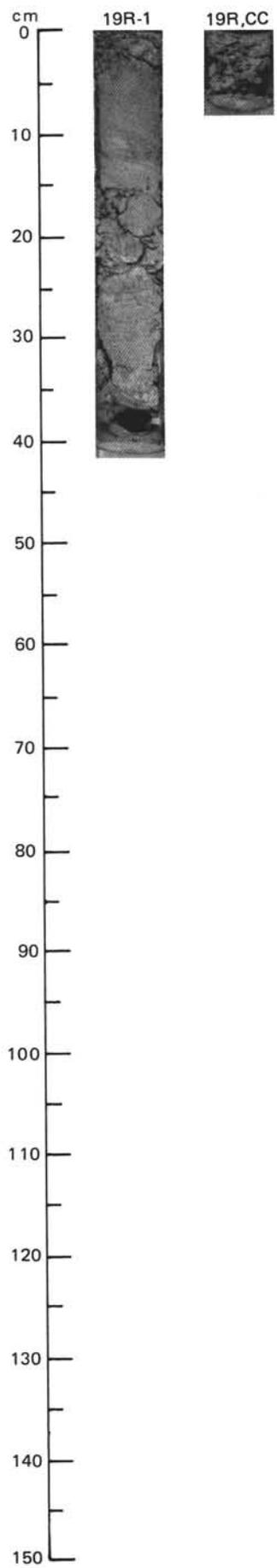
SITE 638 HOLE B CORE 18 R CORED INTERVAL 4824.2-4833.8 mbsl; 161.5-171.1 mbsf

| TIME-ROCK UNIT                           | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|------------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|------|------|------|------|--|---|---|---|---|---|---|------|----|----|----|----|----|----|------|----|----|----|----|----|----|--------|---|---|---|----|---|----|----------|---|---|----|---|---|---|------|---|---|---|----|---|---|------|----|----|----|----|---|---|----------------|---|---|---|---|---|---|------------------------------------------|---|----|----|---|---|----|--------------|---|---|---|---|---|----|--------------|---|----|----|----|----|----|--------------|---|---|---|---|---|---|--|------|------|------|-------|-------|------|--------------------|---|---|------|------|---|---|----------------|---|---|------|------|------|---|---|-------|---|---|---|---|-------|----------------|---|------|---|---|---|---|--|-------|-------|------|-------|-------|--|--------------------|------|------|---|---|------|--|----------------|------|------|---|---|------|--|---|---|---|-------|---|---|--|----------------|---|---|---|------|---|--|
|                                          | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| LATE MIOCENE                             | R/P B                               |              |              |         |                |                  |           |         |        |                   |                   |                 |         | <p><b>WHITE CLAYEY OOZE and BROWN CLAYSTONE</b></p> <p>This core consists of 65 cm of reddish brown (10YR5/2) claystone overlying structureless, white (5GY8/1) clayey nannofossil ooze. In patches the ooze is sufficiently lithified to be considered a chalk.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>1,25</td> <td>1,36</td> <td>1,39</td> <td>1,56</td> <td>1,62</td> <td>4,94</td> </tr> <tr> <td></td> <td>D</td> <td>D</td> <td>M</td> <td>M</td> <td>D</td> <td>D</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Silt</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>30</td> <td>15</td> </tr> <tr> <td>Clay</td> <td>90</td> <td>90</td> <td>90</td> <td>90</td> <td>70</td> <td>85</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Quartz</td> <td>-</td> <td>-</td> <td>-</td> <td>Tr</td> <td>-</td> <td>Tr</td> </tr> <tr> <td>Feldspar</td> <td>5</td> <td>-</td> <td>Tr</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Mica</td> <td>-</td> <td>-</td> <td>-</td> <td>Tr</td> <td>-</td> <td>-</td> </tr> <tr> <td>Clay</td> <td>90</td> <td>80</td> <td>65</td> <td>78</td> <td>5</td> <td>5</td> </tr> <tr> <td>Volcanic Glass</td> <td>-</td> <td>-</td> <td>5</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Accessory Minerals (Fe Oxides, Zeolites)</td> <td>5</td> <td>20</td> <td>10</td> <td>2</td> <td>-</td> <td>Tr</td> </tr> <tr> <td>Foraminifers</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>15</td> </tr> <tr> <td>Nannofossils</td> <td>-</td> <td>Tr</td> <td>20</td> <td>20</td> <td>95</td> <td>80</td> </tr> <tr> <td>Radiolarians</td> <td>-</td> <td>-</td> <td>-</td> <td>1</td> <td>-</td> <td>-</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,27</td> <td>1,30</td> <td>1,31</td> <td>1,121</td> <td>2,121</td> <td>3,99</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>-</td> <td>-</td> <td>2.22</td> <td>1.11</td> <td>-</td> <td>-</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>-</td> <td>-</td> <td>1.79</td> <td>1.86</td> <td>1.93</td> <td>-</td> </tr> <tr> <td>γ</td> <td>72.07</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>13.81</td> </tr> <tr> <td>T<sub>c</sub></td> <td>-</td> <td>2.58</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td></td> <td>3,121</td> <td>4,121</td> <td>5,99</td> <td>5,100</td> <td>5,121</td> <td></td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.15</td> <td>1.51</td> <td>-</td> <td>-</td> <td>1.50</td> <td></td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>1.93</td> <td>2.00</td> <td>-</td> <td>-</td> <td>1.97</td> <td></td> </tr> <tr> <td>γ</td> <td>-</td> <td>-</td> <td>45.70</td> <td>-</td> <td>-</td> <td></td> </tr> <tr> <td>T<sub>c</sub></td> <td>-</td> <td>-</td> <td>-</td> <td>3.40</td> <td>-</td> <td></td> </tr> </table> |  | 1,25 | 1,36 | 1,39 | 1,56 | 1,62 | 4,94 |  | D | D | M | M | D | D | Silt | 10 | 10 | 10 | 10 | 30 | 15 | Clay | 90 | 90 | 90 | 90 | 70 | 85 | Quartz | - | - | - | Tr | - | Tr | Feldspar | 5 | - | Tr | - | - | - | Mica | - | - | - | Tr | - | - | Clay | 90 | 80 | 65 | 78 | 5 | 5 | Volcanic Glass | - | - | 5 | - | - | - | Accessory Minerals (Fe Oxides, Zeolites) | 5 | 20 | 10 | 2 | - | Tr | Foraminifers | - | - | - | - | - | 15 | Nannofossils | - | Tr | 20 | 20 | 95 | 80 | Radiolarians | - | - | - | 1 | - | - |  | 1,27 | 1,30 | 1,31 | 1,121 | 2,121 | 3,99 | V <sub>p</sub> (c) | - | - | 2.22 | 1.11 | - | - | ρ <sub>b</sub> | - | - | 1.79 | 1.86 | 1.93 | - | γ | 72.07 | - | - | - | - | 13.81 | T <sub>c</sub> | - | 2.58 | - | - | - | - |  | 3,121 | 4,121 | 5,99 | 5,100 | 5,121 |  | V <sub>p</sub> (c) | 1.15 | 1.51 | - | - | 1.50 |  | ρ <sub>b</sub> | 1.93 | 2.00 | - | - | 1.97 |  | γ | - | - | 45.70 | - | - |  | T <sub>c</sub> | - | - | - | 3.40 | - |  |
|                                          |                                     | 1,25         | 1,36         | 1,39    | 1,56           | 1,62             | 4,94      |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          |                                     | D            | D            | M       | M              | D                | D         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          | Silt                                | 10           | 10           | 10      | 10             | 30               | 15        |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          | Clay                                | 90           | 90           | 90      | 90             | 70               | 85        |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Quartz                                   | -                                   | -            | -            | Tr      | -              | Tr               |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Feldspar                                 | 5                                   | -            | Tr           | -       | -              | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Mica                                     | -                                   | -            | -            | Tr      | -              | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Clay                                     | 90                                  | 80           | 65           | 78      | 5              | 5                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Volcanic Glass                           | -                                   | -            | 5            | -       | -              | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Accessory Minerals (Fe Oxides, Zeolites) | 5                                   | 20           | 10           | 2       | -              | Tr               |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Foraminifers                             | -                                   | -            | -            | -       | -              | 15               |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Nannofossils                             | -                                   | Tr           | 20           | 20      | 95             | 80               |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| Radiolarians                             | -                                   | -            | -            | 1       | -              | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          | 1,27                                | 1,30         | 1,31         | 1,121   | 2,121          | 3,99             |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| V <sub>p</sub> (c)                       | -                                   | -            | 2.22         | 1.11    | -              | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| ρ <sub>b</sub>                           | -                                   | -            | 1.79         | 1.86    | 1.93           | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| γ                                        | 72.07                               | -            | -            | -       | -              | 13.81            |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| T <sub>c</sub>                           | -                                   | 2.58         | -            | -       | -              | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          | 3,121                               | 4,121        | 5,99         | 5,100   | 5,121          |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| V <sub>p</sub> (c)                       | 1.15                                | 1.51         | -            | -       | 1.50           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| ρ <sub>b</sub>                           | 1.93                                | 2.00         | -            | -       | 1.97           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| γ                                        | -                                   | -            | 45.70        | -       | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
| T <sub>c</sub>                           | -                                   | -            | -            | 3.40    | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          | CN9 A                               |              |              |         |                | 5%               | 1         | 0.5     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          |                                     |              |              |         |                | 83%              | 2         | 1.0     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          |                                     |              |              |         |                | 88%              | 3         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          |                                     |              |              |         |                | 84%              | 4         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          |                                     |              |              |         |                | 87%              | 5         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |
|                                          |                                     |              |              |         |                | 84%              | CC        |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |      |      |      |      |      |      |  |   |   |   |   |   |   |      |    |    |    |    |    |    |      |    |    |    |    |    |    |        |   |   |   |    |   |    |          |   |   |    |   |   |   |      |   |   |   |    |   |   |      |    |    |    |    |   |   |                |   |   |   |   |   |   |                                          |   |    |    |   |   |    |              |   |   |   |   |   |    |              |   |    |    |    |    |    |              |   |   |   |   |   |   |  |      |      |      |       |       |      |                    |   |   |      |      |   |   |                |   |   |      |      |      |   |   |       |   |   |   |   |       |                |   |      |   |   |   |   |  |       |       |      |       |       |  |                    |      |      |   |   |      |  |                |      |      |   |   |      |  |   |   |   |       |   |   |  |                |   |   |   |      |   |  |



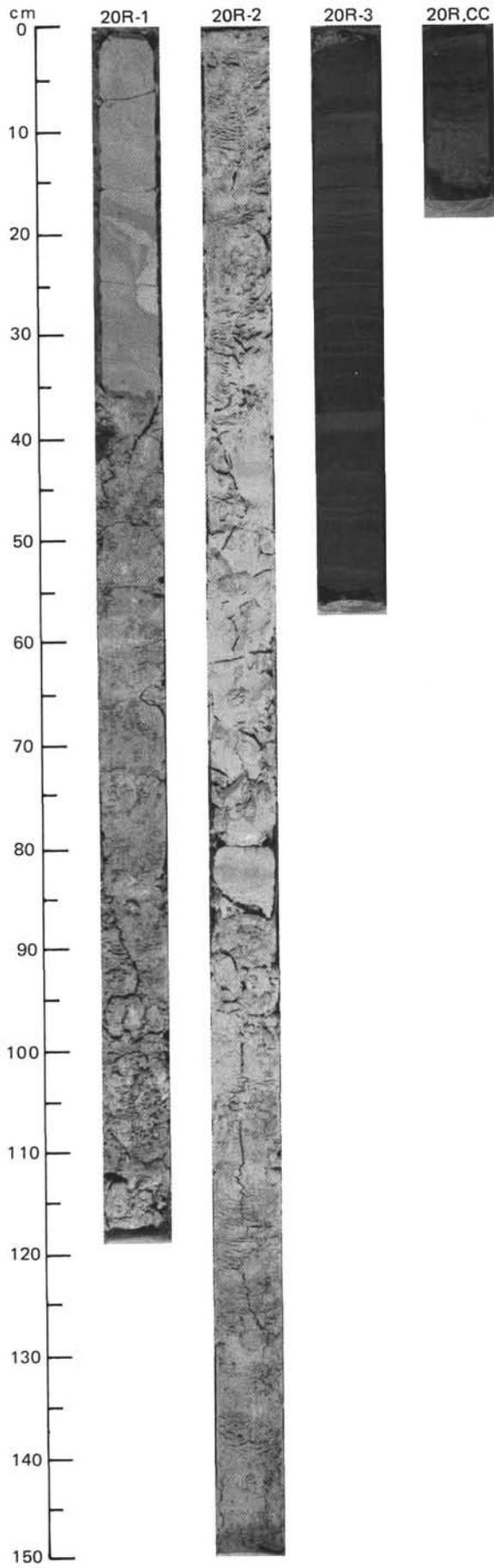
SITE 638 HOLE B CORE 19 R CORED INTERVAL 4833.8-4843.3 mbsl; 171.1-180.6 mbsf

| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|----------------------|-------------------|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| LATE MIOCENE   | N18                                 | CN8          |              |         |                | ■ ●              | 88 % ●    | 1       |        |                      |                   |                 | *       | <p><b>CLAYEY CHALK</b></p> <p>This core consists of 35 cm of pale gray (5Y8/0) clayey nannofossil chalk with fine laminations dipping approximately 10 degrees.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <p style="text-align: right;">1,10<br/>D</p> <p><b>TEXTURE:</b></p> <p>Silt                    20<br/>Clay                    80</p> <p><b>COMPOSITION:</b></p> <p>Calcite/Dolomite    45<br/>Accessory Minerals<br/>(Pyrite)                5<br/>Nannofossils           50</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <p style="text-align: right;">1,13</p> <p><math>V_p</math>                    1.71<br/><math>\rho_b</math>                    2.01</p> |

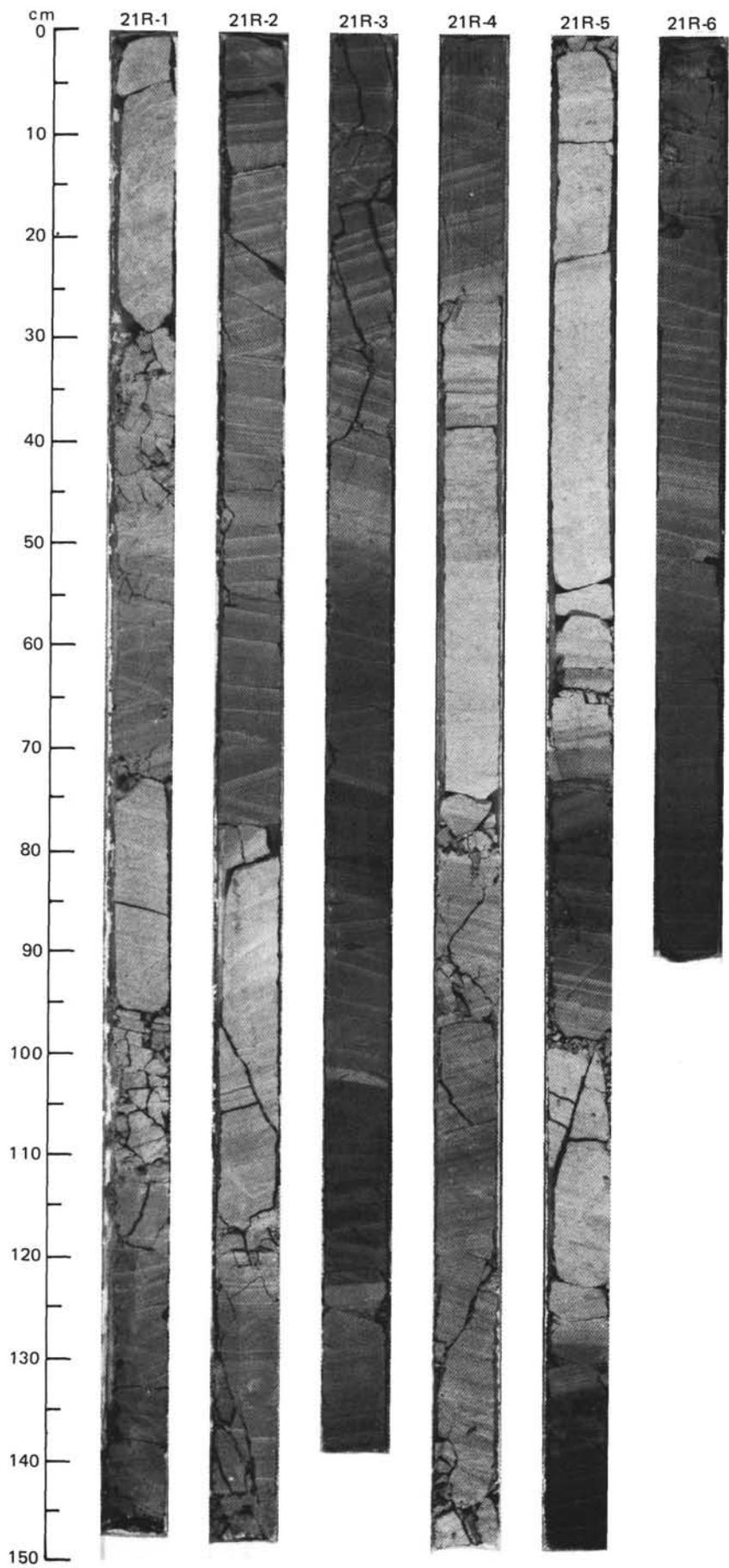


SITE 638 HOLE B CORE 20 R CORED INTERVAL 4843.3-4852.8 mbsl; 180.6-190.1 mbsf

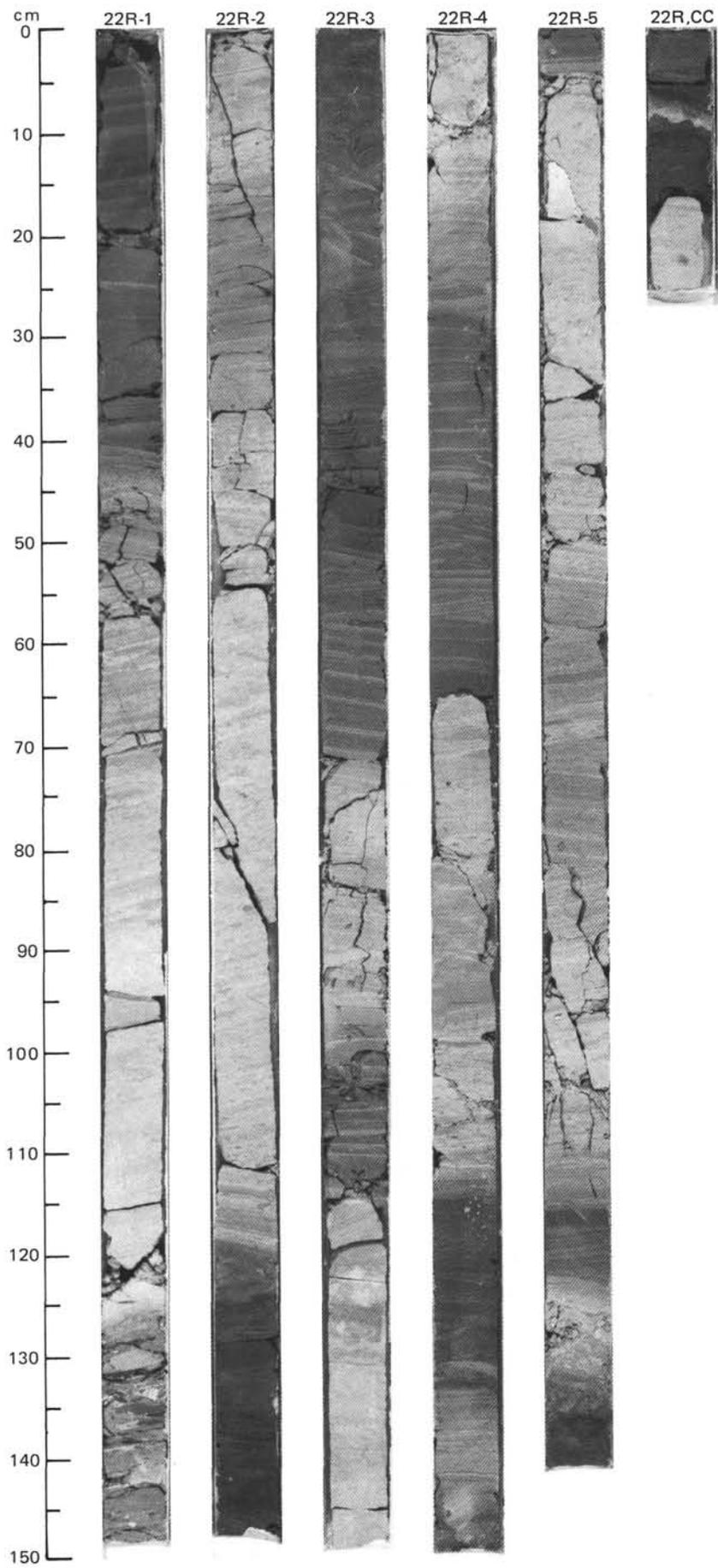
| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER     |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
|----------------|-----------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|-------|------|------|-----------|------|---|------|---|------|----------|------|---|------|---|------|-------|---|------|---|------|---|
|                | FORAMINIFERS                            | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
| LATE BARREMIAN |                                         |              |              |         |                |                  |           |         |        |                   |                   |                 |         | <p><b>WHITE CLAYEY CHALK and GRAY CLASTIC TURBIDITES</b></p> <p>This core shows a sequence of laminated, white (5Y7/1) clayey chalk overlying gray (5Y5/1), finely laminated turbidites. The laminations in the chalk dip ~15°. The turbidites consist of dark gray fine-silt layers that grade upwards into pale gray claystone and marl. Plant debris is common. The turbidites are horizontal laminated and are up to 4 cm thick. The contact between the turbidite unit and the overlying ooze is sharp with no sign of manganese pavement or a lag deposit.</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,55</td> <td>2,30</td> <td>2,109</td> <td>3,20</td> <td>3,39</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>1.67</td> <td>—</td> <td>1.65</td> <td>—</td> <td>1.58</td> </tr> <tr> <td><math>\rho_b</math></td> <td>1.97</td> <td>—</td> <td>2.00</td> <td>—</td> <td>1.94</td> </tr> <tr> <td><math>T_c</math></td> <td>—</td> <td>2.68</td> <td>—</td> <td>2.84</td> <td>—</td> </tr> </table> |  | 1,55 | 2,30 | 2,109 | 3,20 | 3,39 | $V_p$ (c) | 1.67 | — | 1.65 | — | 1.58 | $\rho_b$ | 1.97 | — | 2.00 | — | 1.94 | $T_c$ | — | 2.68 | — | 2.84 | — |
|                | 1,55                                    | 2,30         | 2,109        | 3,20    | 3,39           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
| $V_p$ (c)      | 1.67                                    | —            | 1.65         | —       | 1.58           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
| $\rho_b$       | 1.97                                    | —            | 2.00         | —       | 1.94           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
| $T_c$          | —                                       | 2.68         | —            | 2.84    | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
| LATE MIOCENE   |                                         |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
|                | C/P C11i                                |              |              |         |                | 85 %             | 1         | 0.5     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
|                |                                         |              |              |         |                | 88 %             | 2         | 1.0     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
|                | C/P R/P                                 |              |              |         |                | 62 %             | 3         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |
|                | <i>Micrantholithus hoshulaji</i> (CC-6) |              |              |         |                |                  | CC        |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |      |      |       |      |      |           |      |   |      |   |      |          |      |   |      |   |      |       |   |      |   |      |   |



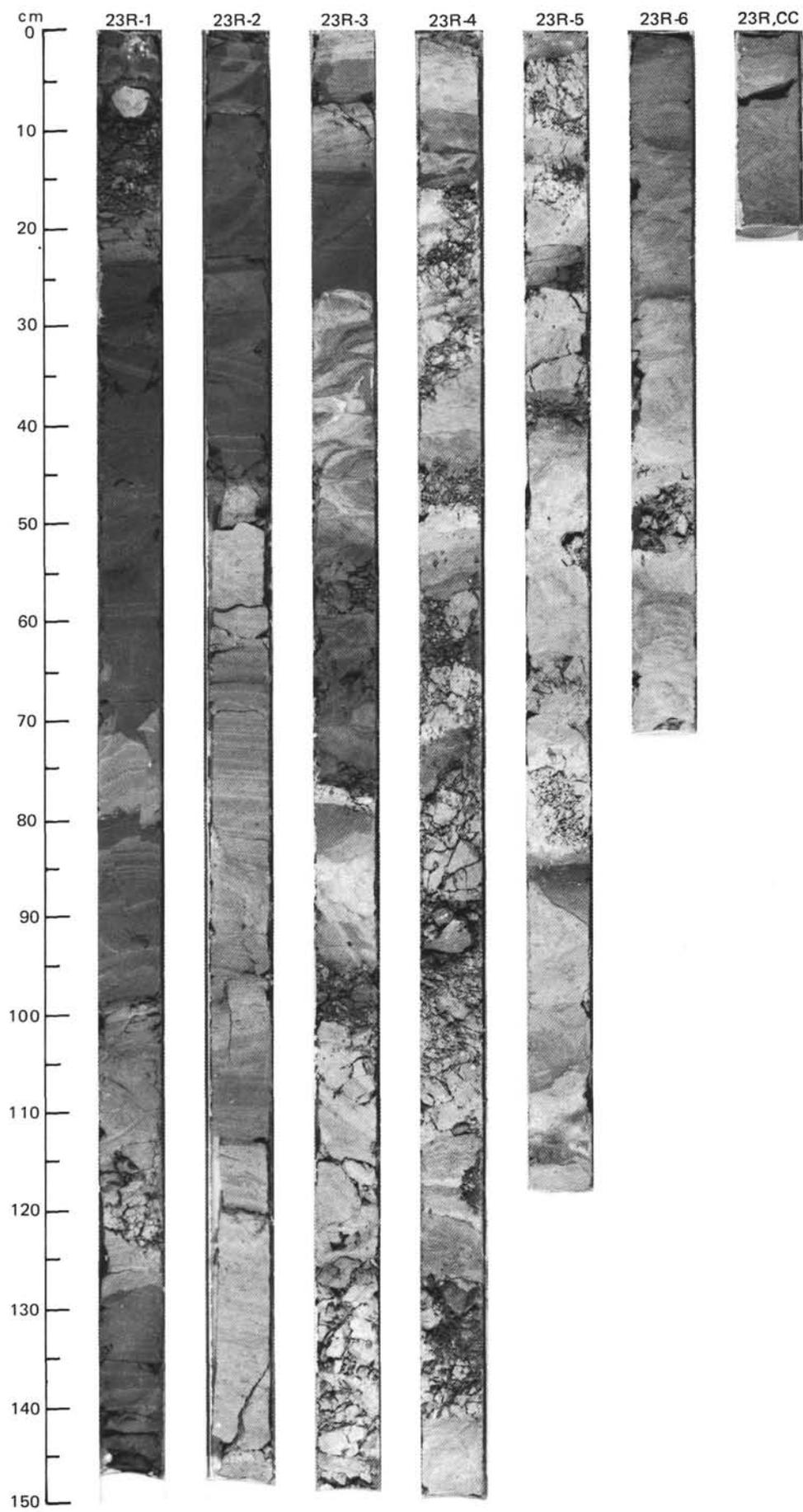




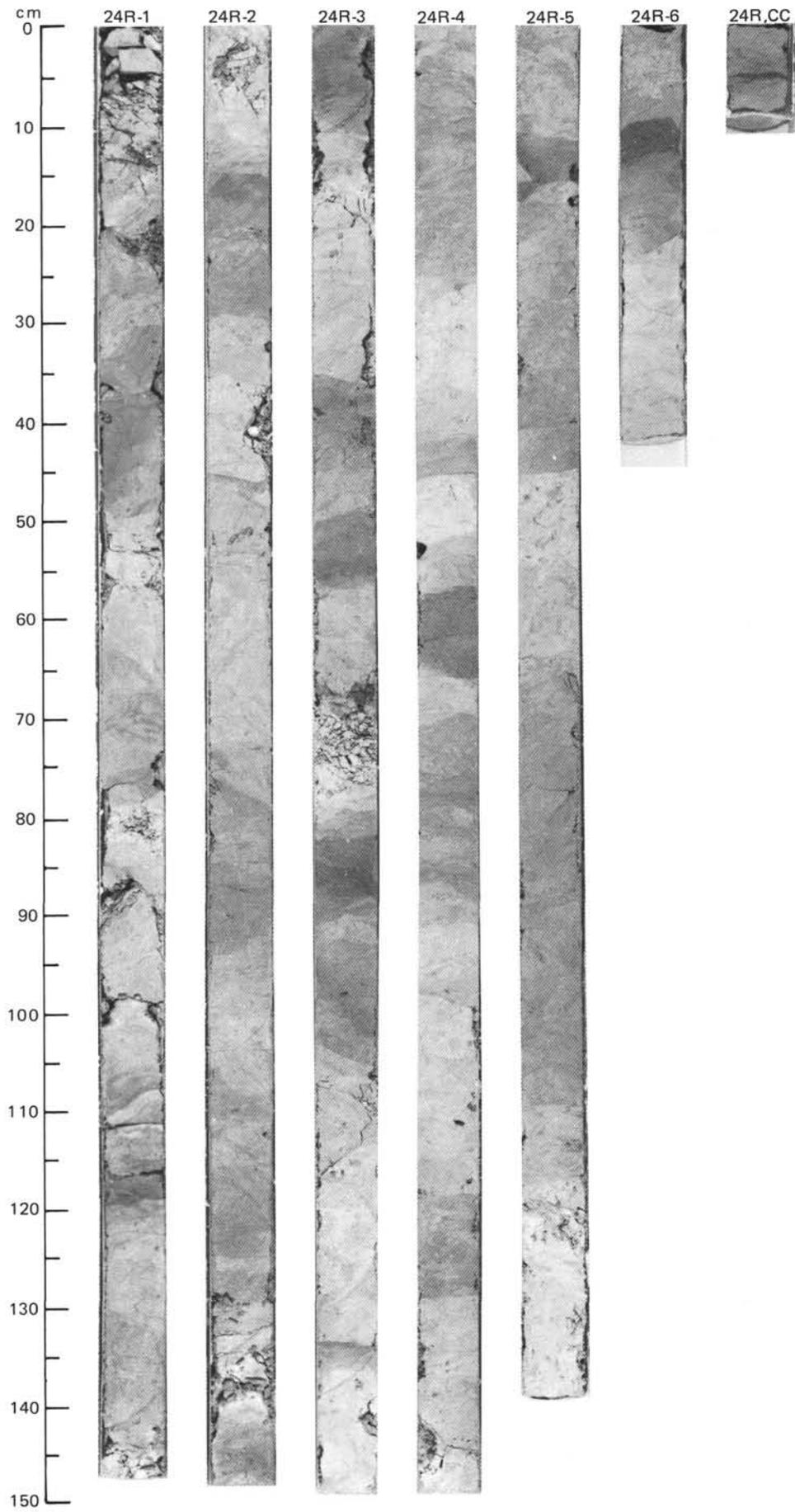




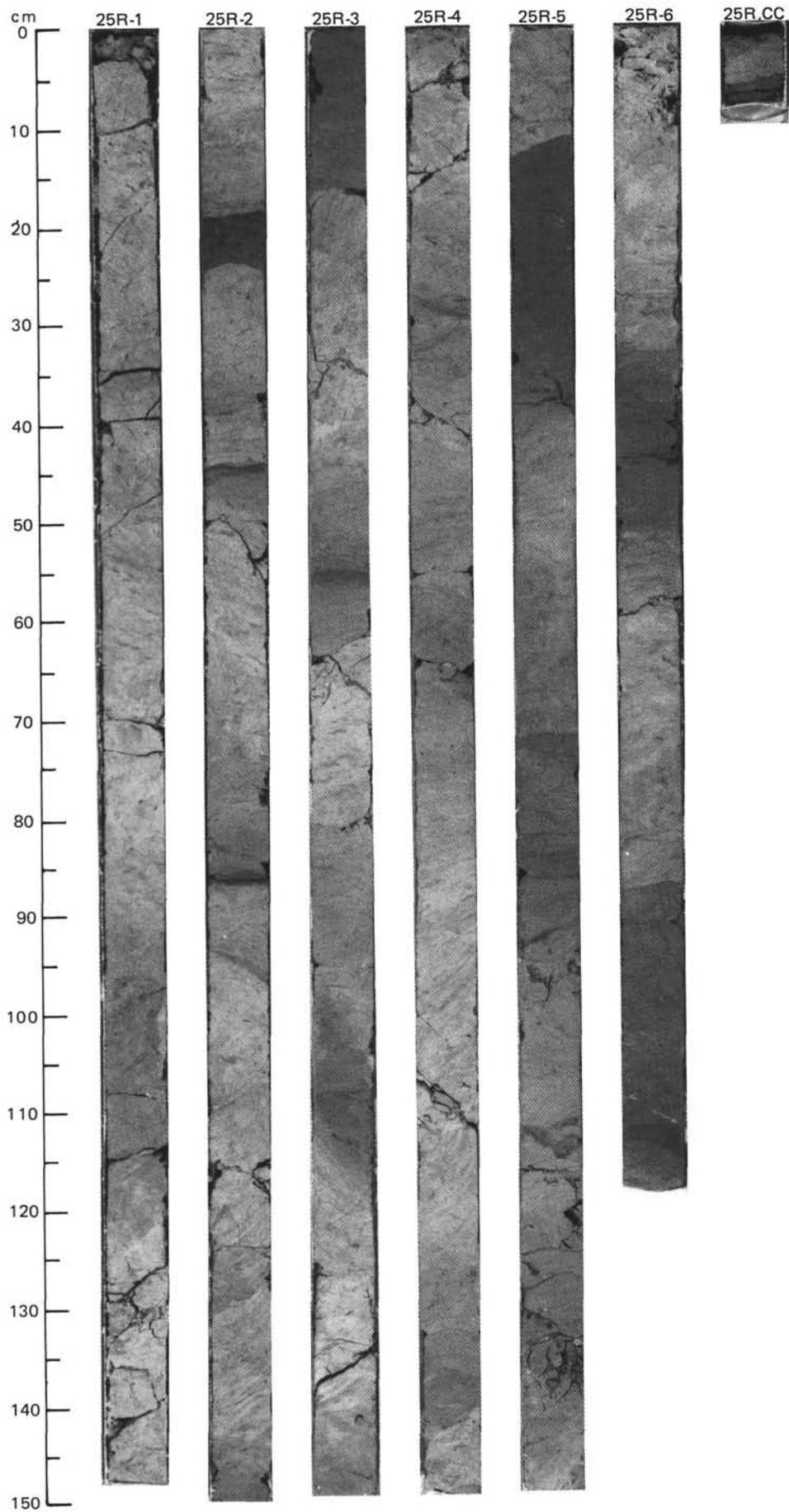




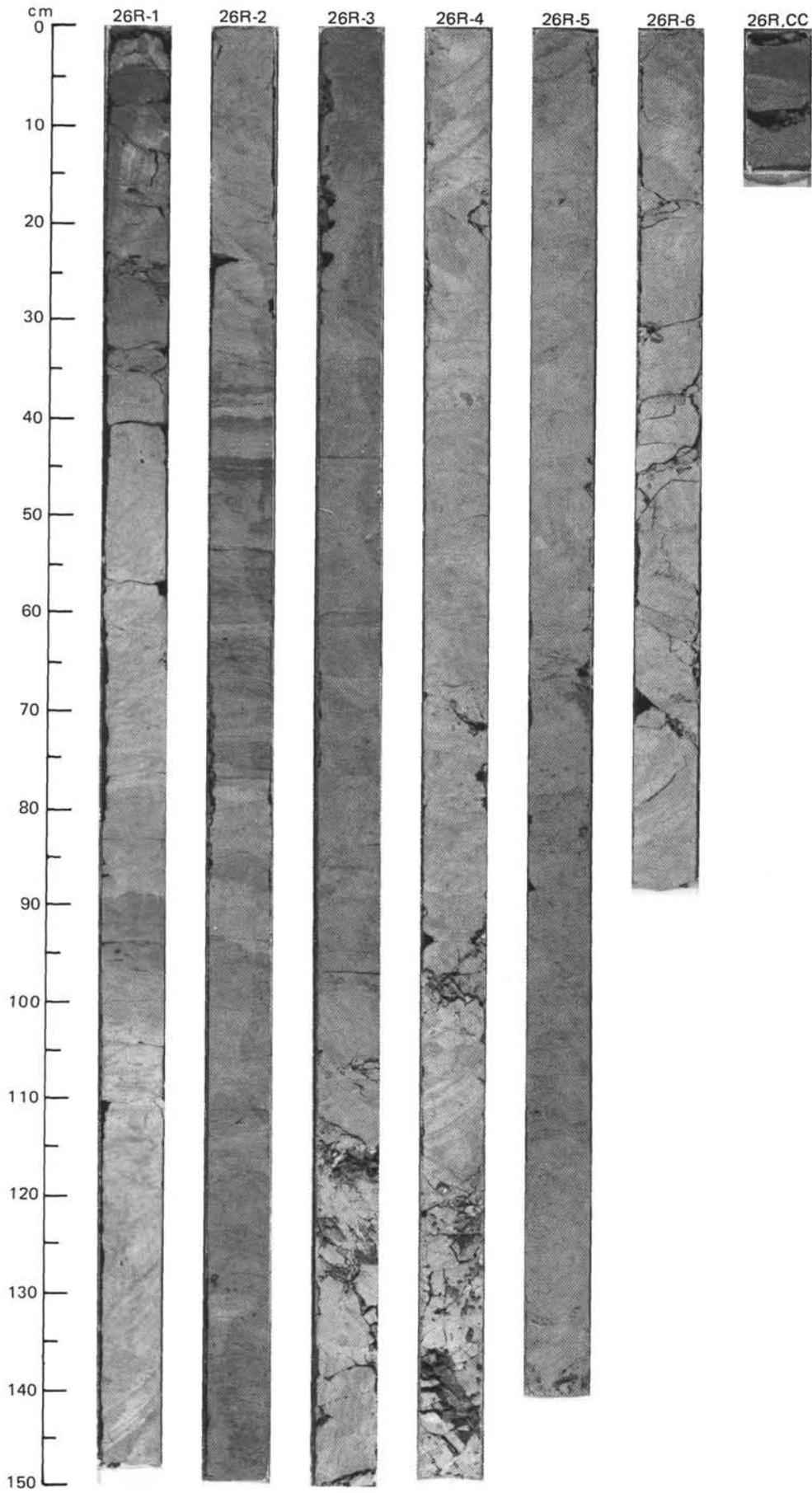
| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER     |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
|----------------|-----------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|------|-------|------|------|-----------|---|------|---|------|------|---|----------|---|------|---|------|------|---|-------|------|---|------|---|---|------|
|                | FORAMINIFERS                            | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
| HAUTERIVIAN    |                                         |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
| R/M            | C6-C8                                   |              |              |         |                | ■ ● 65 %         |           | 1       | 0.5    |                   |                   |                 |         | <p><b>LIGHT GRAY, BIOTURBATED NANNOFOSSIL MARLSTONE</b></p> <p>Light greenish to greenish gray (5Y4/1 to 5/1 to 6/1), bioturbated nannofossil marlstone and calcareous claystone, alternating in a cyclic fashion. Convolute and plastically deformed beds occur in Sections 1 and 2 (slumped bed). Drilling disturbance is severe throughout the core.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <p style="text-align: right;">1,120<br/>M</p> <p><b>TEXTURE:</b></p> <p>Clay 100</p> <p><b>COMPOSITION:</b></p> <p>Quartz Tr<br/>Clay 62<br/>Calcite/Dolomite 1<br/>Accessory Minerals:<br/>Opales 4<br/>Nannofossils 33<br/>Fish Remains Tr</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">2,35</td> <td style="text-align: center;">2,70</td> <td style="text-align: center;">4,35</td> <td style="text-align: center;">4,106</td> <td style="text-align: center;">6,34</td> <td style="text-align: center;">6,35</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td style="text-align: center;">-</td> <td style="text-align: center;">1.74</td> <td style="text-align: center;">-</td> <td style="text-align: center;">1.68</td> <td style="text-align: center;">1.75</td> <td style="text-align: center;">-</td> </tr> <tr> <td><math>\rho_b</math></td> <td style="text-align: center;">-</td> <td style="text-align: center;">2.00</td> <td style="text-align: center;">-</td> <td style="text-align: center;">1.98</td> <td style="text-align: center;">2.05</td> <td style="text-align: center;">-</td> </tr> <tr> <td><math>T_c</math></td> <td style="text-align: center;">3.43</td> <td style="text-align: center;">-</td> <td style="text-align: center;">3.50</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">3.44</td> </tr> </table> |  | 2,35 | 2,70 | 4,35 | 4,106 | 6,34 | 6,35 | $V_p$ (c) | - | 1.74 | - | 1.68 | 1.75 | - | $\rho_b$ | - | 2.00 | - | 1.98 | 2.05 | - | $T_c$ | 3.43 | - | 3.50 | - | - | 3.44 |
|                | 2,35                                    | 2,70         | 4,35         | 4,106   | 6,34           | 6,35             |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
| $V_p$ (c)      | -                                       | 1.74         | -            | 1.68    | 1.75           | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
| $\rho_b$       | -                                       | 2.00         | -            | 1.98    | 2.05           | -                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
| $T_c$          | 3.43                                    | -            | 3.50         | -       | -              | 3.44             |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
| A/M            | <i>Cretarhabdus lorei</i> Zone (CC-4 b) |              |              |         |                | ■ ● 62 %         |           | 2       | 1.0    |                   | *                 |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
| R/P            |                                         |              |              |         |                | ■ ● 61 %         |           | 3       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
|                |                                         |              |              |         |                | ■ ● 61 %         |           | 4       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
|                |                                         |              |              |         |                | ■ ● 61 %         |           | 5       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
|                |                                         |              |              |         |                | ■ ● 61 %         |           | 6       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |
|                |                                         |              |              |         |                | ■ ● 61 %         |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |       |      |      |           |   |      |   |      |      |   |          |   |      |   |      |      |   |       |      |   |      |   |   |      |



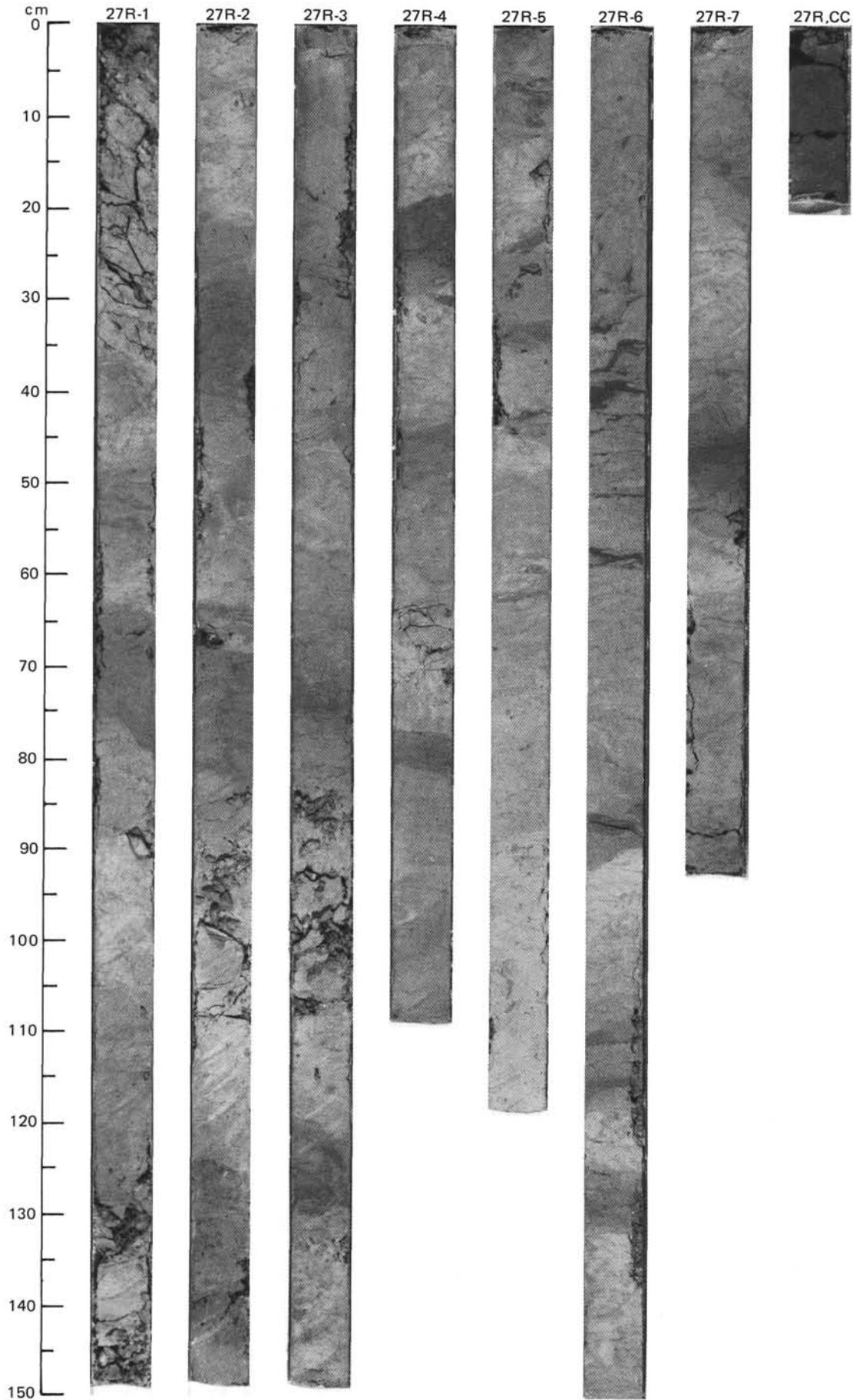




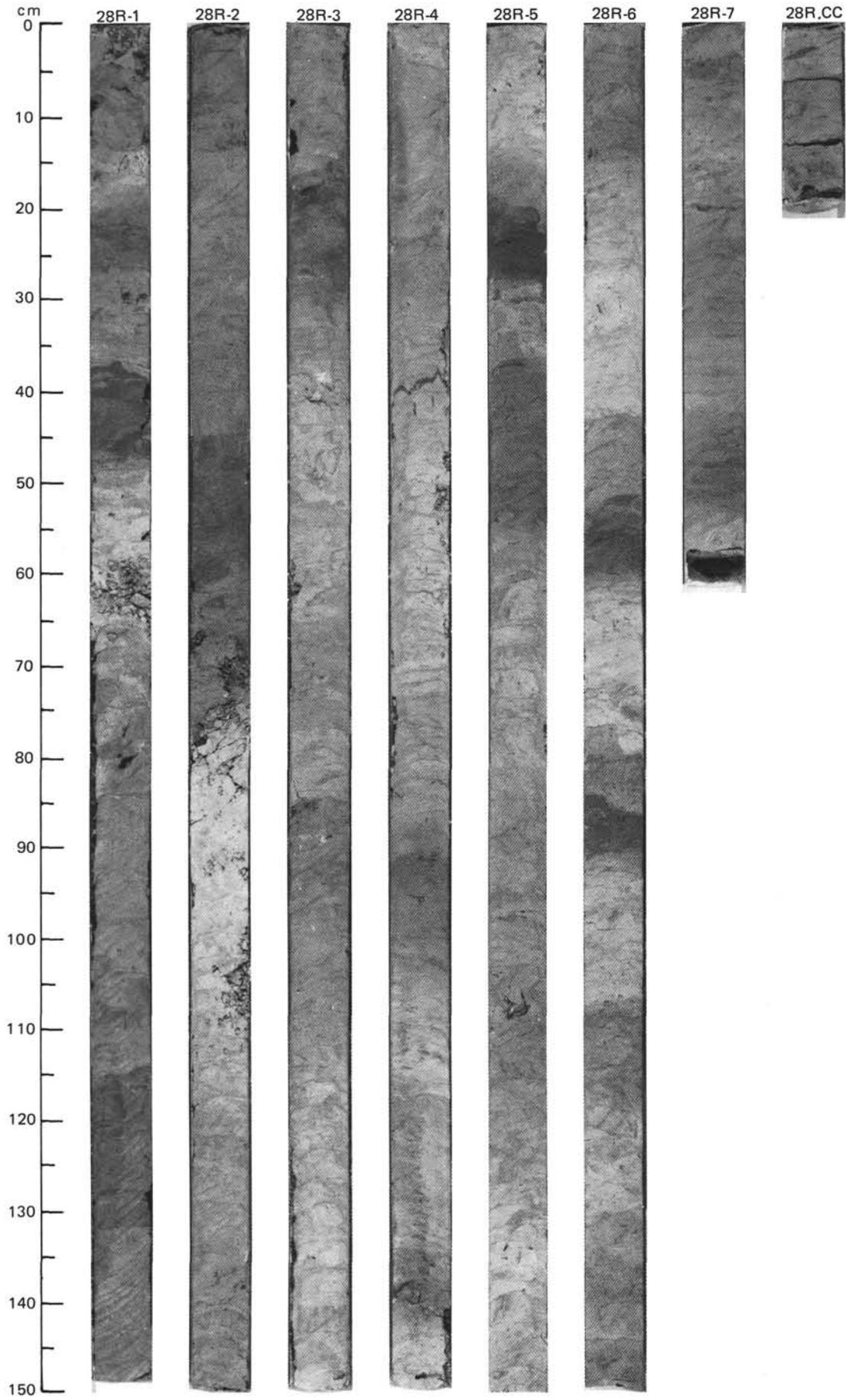
| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |                        |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
|----------------|-------------------------------------|------------------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------|-------|------|------|-----------|------|------|------|---|----------|------|------|------|---|-------|---|---|---|------|--|-------|-------|------|------|-----------|------|------|---|------|----------|------|------|---|------|-------|---|---|------|---|
|                | FORAMINIFERS                        | NANNOFOSSILS           | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| HAUTERIVIAN    | C6-C8                               | C. lorei Zone (CC-4 b) | F/M          |         |                |                  |           |         |        |                   |                   |                 |         | <p>LIGHT GRAY, BIOTURBATED NANNOFOSSIL MARLSTONE</p> <p>Dominantly gray to light gray (5Y5/1 to 5Y7/1), slightly greenish (5GY 5/1 to 6/1) nannofossil marlstone alternating in a cyclic fashion with minor dark gray (5Y4/1) laminated calcareous claystone. Bioturbation is moderate to strong. Chondrites burrows are locally present. Scattered, illite-rich patches and blebs occur locally. Drilling disturbance is severe and 'drilling-biscuit' deformation is extensive throughout. In places, disruption of the bedding and 'in situ' brecciation is possibly due to slumping.</p> <p>SMEAR SLIDE SUMMARY (%):</p> <p style="text-align: right;">1,96<br/>M</p> <p>TEXTURE:</p> <p>Silt 20<br/>Clay 80</p> <p>COMPOSITON:</p> <p>Mica Tr<br/>Clay 50<br/>Accessory Minerals:<br/>  Opaque-green 9<br/>  Pyrite 20<br/>  Zeolite 1<br/>Nannofossils 20</p> <p>PHYSICAL PROPERTIES DATA:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td style="text-align: center;">1,107</td> <td style="text-align: center;">2,107</td> <td style="text-align: center;">3,98</td> <td style="text-align: center;">4,50</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td style="text-align: center;">1.71</td> <td style="text-align: center;">2.39</td> <td style="text-align: center;">1.66</td> <td style="text-align: center;">-</td> </tr> <tr> <td><math>\rho_b</math></td> <td style="text-align: center;">2.12</td> <td style="text-align: center;">1.97</td> <td style="text-align: center;">1.97</td> <td style="text-align: center;">-</td> </tr> <tr> <td><math>T_c</math></td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">3.44</td> </tr> <tr> <td></td> <td style="text-align: center;">4,106</td> <td style="text-align: center;">5,101</td> <td style="text-align: center;">6,50</td> <td style="text-align: center;">6,51</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td style="text-align: center;">1.63</td> <td style="text-align: center;">1.56</td> <td style="text-align: center;">-</td> <td style="text-align: center;">1.78</td> </tr> <tr> <td><math>\rho_b</math></td> <td style="text-align: center;">1.97</td> <td style="text-align: center;">1.87</td> <td style="text-align: center;">-</td> <td style="text-align: center;">1.98</td> </tr> <tr> <td><math>T_c</math></td> <td style="text-align: center;">-</td> <td style="text-align: center;">-</td> <td style="text-align: center;">3.12</td> <td style="text-align: center;">-</td> </tr> </table> |  | 1,107 | 2,107 | 3,98 | 4,50 | $V_p$ (c) | 1.71 | 2.39 | 1.66 | - | $\rho_b$ | 2.12 | 1.97 | 1.97 | - | $T_c$ | - | - | - | 3.44 |  | 4,106 | 5,101 | 6,50 | 6,51 | $V_p$ (c) | 1.63 | 1.56 | - | 1.78 | $\rho_b$ | 1.97 | 1.87 | - | 1.98 | $T_c$ | - | - | 3.12 | - |
|                | 1,107                               | 2,107                  | 3,98         | 4,50    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| $V_p$ (c)      | 1.71                                | 2.39                   | 1.66         | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| $\rho_b$       | 2.12                                | 1.97                   | 1.97         | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| $T_c$          | -                                   | -                      | -            | 3.44    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
|                | 4,106                               | 5,101                  | 6,50         | 6,51    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| $V_p$ (c)      | 1.63                                | 1.56                   | -            | 1.78    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| $\rho_b$       | 1.97                                | 1.87                   | -            | 1.98    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| $T_c$          | -                                   | -                      | 3.12         | -       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| R/M            |                                     |                        |              |         |                |                  |           |         | 0.5    |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| A/P            |                                     |                        |              |         |                |                  |           |         | 1      |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
| B              |                                     |                        |              |         |                |                  |           |         | 1.0    |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
|                |                                     |                        |              |         |                |                  |           |         | 2      |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
|                |                                     |                        |              |         |                |                  |           |         | 3      |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
|                |                                     |                        |              |         |                |                  |           |         | 4      |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
|                |                                     |                        |              |         |                |                  |           |         | 5      |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
|                |                                     |                        |              |         |                |                  |           |         | 6      |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |
|                |                                     |                        |              |         |                |                  |           |         | CC     |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |      |           |      |      |      |   |          |      |      |      |   |       |   |   |   |      |  |       |       |      |      |           |      |      |   |      |          |      |      |   |      |       |   |   |      |   |



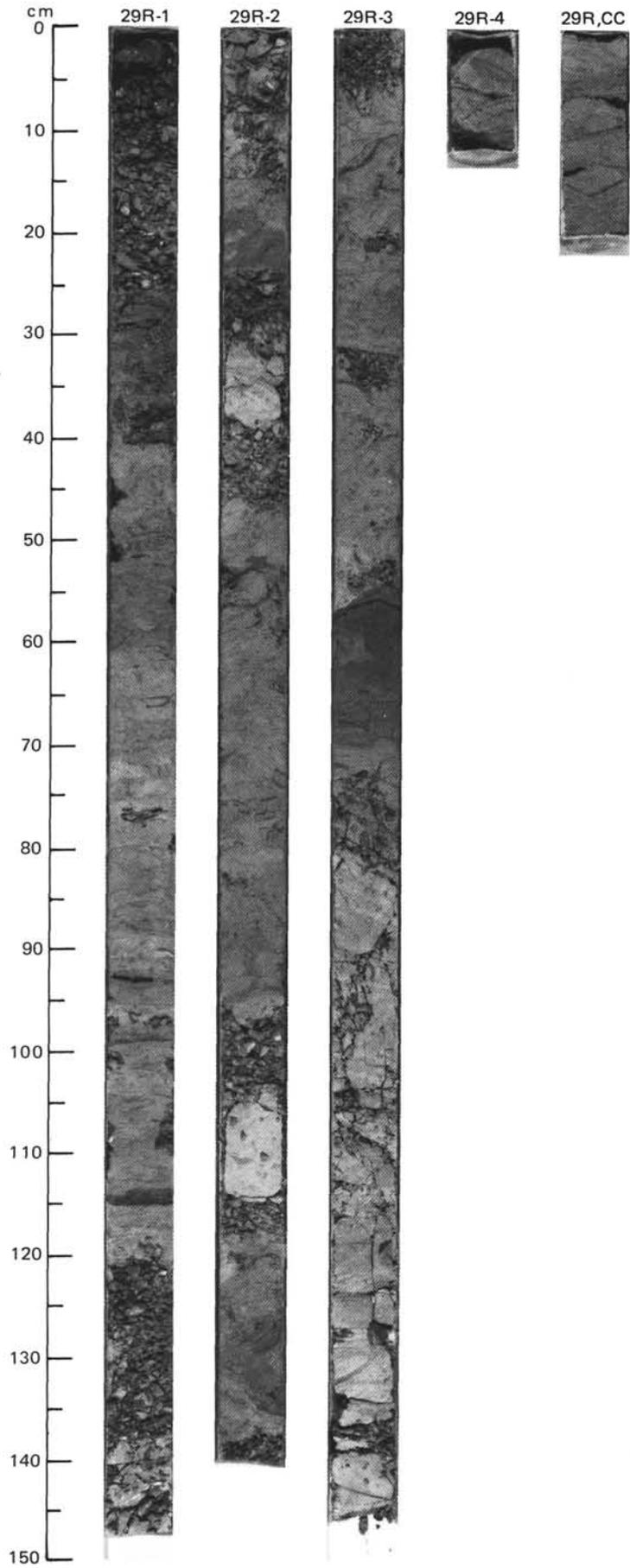
| TIME-ROCK UNIT      | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY                                                                    | DRILLING DISTURB.                | SED. STRUCTURES      | SAMPLES      | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|---------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|--------------------------------------------------------------------------------------|----------------------------------|----------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|------|---|---|---|---|------|---|----|---|------|----|----|----|------|----|----|----|----------|----|---|----|------|---|---|----|------|----|----|----|------------------|---|---|----|---------------------|--|--|--|----------|---|---|---|--------|---|---|----|--------------|----|----|----|--------------|----|---|----|--|-------|------|------|-------|------|--------------------|------|---|------|------|---|----------------|---|---|------|---|---|----------------|---|------|---|---|------|--|------|-------|------|-------|-------|--------------------|------|------|---|------|------|----------------|------|---|---|------|------|----------------|---|---|------|---|---|
|                     | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| HAUTERIVIAN         | B                                   | A/G          | C/M          |         |                |                  |           | 1       | 0.5    | [Lithology: Light gray to light greenish nannofossil marlstone with clayey horizons] | [Disturbance: Severe throughout] | [Structures: Cyclic] | [Samples: *] | <p><b>LIGHT GRAY, BIOTURBATED NANNOFOSSIL LIMESTONE</b></p> <p>Dominantly gray to light gray (5Y6/1 to 7/1), slightly greenish (5GY5/1 to 6/1) nannofossil marlstone alternating in a cyclic fashion with a few, 10-cm-thick horizons of faintly laminated, darker gray (5Y5/1 to 4/1) clayey marlstone. Bioturbation is moderate to strong. Scattered, illite-rich green patches, specks and laminae occur. Pyrite-rich blebs, large wood fragments (up to 1 cm) and plant-material-rich layers are also present. Drilling disturbance is severe throughout.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>1,67</td> <td>1,90</td> <td>6,40</td> </tr> <tr> <td>D</td> <td>D</td> <td>D</td> <td>D</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>—</td> <td>10</td> <td>—</td> </tr> <tr> <td>Silt</td> <td>40</td> <td>30</td> <td>30</td> </tr> <tr> <td>Clay</td> <td>60</td> <td>60</td> <td>70</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Feldspar</td> <td>Tr</td> <td>—</td> <td>10</td> </tr> <tr> <td>Mica</td> <td>5</td> <td>—</td> <td>10</td> </tr> <tr> <td>Clay</td> <td>40</td> <td>35</td> <td>30</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>—</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Accessory Minerals:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Zeolites</td> <td>5</td> <td>—</td> <td>—</td> </tr> <tr> <td>  Pyrite</td> <td>—</td> <td>5</td> <td>Tr</td> </tr> <tr> <td>Nannofossils</td> <td>40</td> <td>60</td> <td>40</td> </tr> <tr> <td>Plant Debris</td> <td>10</td> <td>—</td> <td>10</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,111</td> <td>2,50</td> <td>2,99</td> <td>3,113</td> <td>4,50</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.77</td> <td>—</td> <td>1.60</td> <td>1.68</td> <td>—</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>—</td> <td>—</td> <td>2.04</td> <td>—</td> <td>—</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>3.15</td> <td>—</td> <td>—</td> <td>2.99</td> </tr> <tr> <td></td> <td>4,99</td> <td>5,101</td> <td>6,50</td> <td>6,136</td> <td>7,119</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.72</td> <td>1.82</td> <td>—</td> <td>1.73</td> <td>1.74</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>1.93</td> <td>—</td> <td>—</td> <td>1.97</td> <td>1.96</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>—</td> <td>3.32</td> <td>—</td> <td>—</td> </tr> </table> |  | 1,67 | 1,90 | 6,40 | D | D | D | D | Sand | — | 10 | — | Silt | 40 | 30 | 30 | Clay | 60 | 60 | 70 | Feldspar | Tr | — | 10 | Mica | 5 | — | 10 | Clay | 40 | 35 | 30 | Calcite/Dolomite | — | — | Tr | Accessory Minerals: |  |  |  | Zeolites | 5 | — | — | Pyrite | — | 5 | Tr | Nannofossils | 40 | 60 | 40 | Plant Debris | 10 | — | 10 |  | 1,111 | 2,50 | 2,99 | 3,113 | 4,50 | V <sub>p</sub> (c) | 1.77 | — | 1.60 | 1.68 | — | ρ <sub>b</sub> | — | — | 2.04 | — | — | T <sub>c</sub> | — | 3.15 | — | — | 2.99 |  | 4,99 | 5,101 | 6,50 | 6,136 | 7,119 | V <sub>p</sub> (c) | 1.72 | 1.82 | — | 1.73 | 1.74 | ρ <sub>b</sub> | 1.93 | — | — | 1.97 | 1.96 | T <sub>c</sub> | — | — | 3.32 | — | — |
|                     |                                     | 1,67         | 1,90         | 6,40    |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     | D                                   | D            | D            | D       |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     | Sand                                | —            | 10           | —       |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     | Silt                                | 40           | 30           | 30      |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     | Clay                                | 60           | 60           | 70      |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     | Feldspar                            | Tr           | —            | 10      |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| Mica                | 5                                   | —            | 10           |         |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| Clay                | 40                                  | 35           | 30           |         |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| Calcite/Dolomite    | —                                   | —            | Tr           |         |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| Accessory Minerals: |                                     |              |              |         |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| Zeolites            | 5                                   | —            | —            |         |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| Pyrite              | —                                   | 5            | Tr           |         |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| Nannofossils        | 40                                  | 60           | 40           |         |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| Plant Debris        | 10                                  | —            | 10           |         |                |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     | 1,111                               | 2,50         | 2,99         | 3,113   | 4,50           |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| V <sub>p</sub> (c)  | 1.77                                | —            | 1.60         | 1.68    | —              |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| ρ <sub>b</sub>      | —                                   | —            | 2.04         | —       | —              |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| T <sub>c</sub>      | —                                   | 3.15         | —            | —       | 2.99           |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     | 4,99                                | 5,101        | 6,50         | 6,136   | 7,119          |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| V <sub>p</sub> (c)  | 1.72                                | 1.82         | —            | 1.73    | 1.74           |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| ρ <sub>b</sub>      | 1.93                                | —            | —            | 1.97    | 1.96           |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
| T <sub>c</sub>      | —                                   | —            | 3.32         | —       | —              |                  |           |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     |                                     |              |              |         | 87 %           |                  | 2         | 1.0     |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     |                                     |              |              |         |                |                  | 3         |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     |                                     |              |              |         |                |                  | 4         |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     |                                     |              |              |         |                |                  | 5         |         | VOID   |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     |                                     |              |              |         |                |                  | 6         |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     |                                     |              |              |         |                |                  | 7         |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |
|                     |                                     |              |              |         |                |                  | CC        |         |        |                                                                                      |                                  |                      |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |   |   |   |   |      |   |    |   |      |    |    |    |      |    |    |    |          |    |   |    |      |   |   |    |      |    |    |    |                  |   |   |    |                     |  |  |  |          |   |   |   |        |   |   |    |              |    |    |    |              |    |   |    |  |       |      |      |       |      |                    |      |   |      |      |   |                |   |   |      |   |   |                |   |      |   |   |      |  |      |       |      |       |       |                    |      |      |   |      |      |                |      |   |   |      |      |                |   |   |      |   |   |



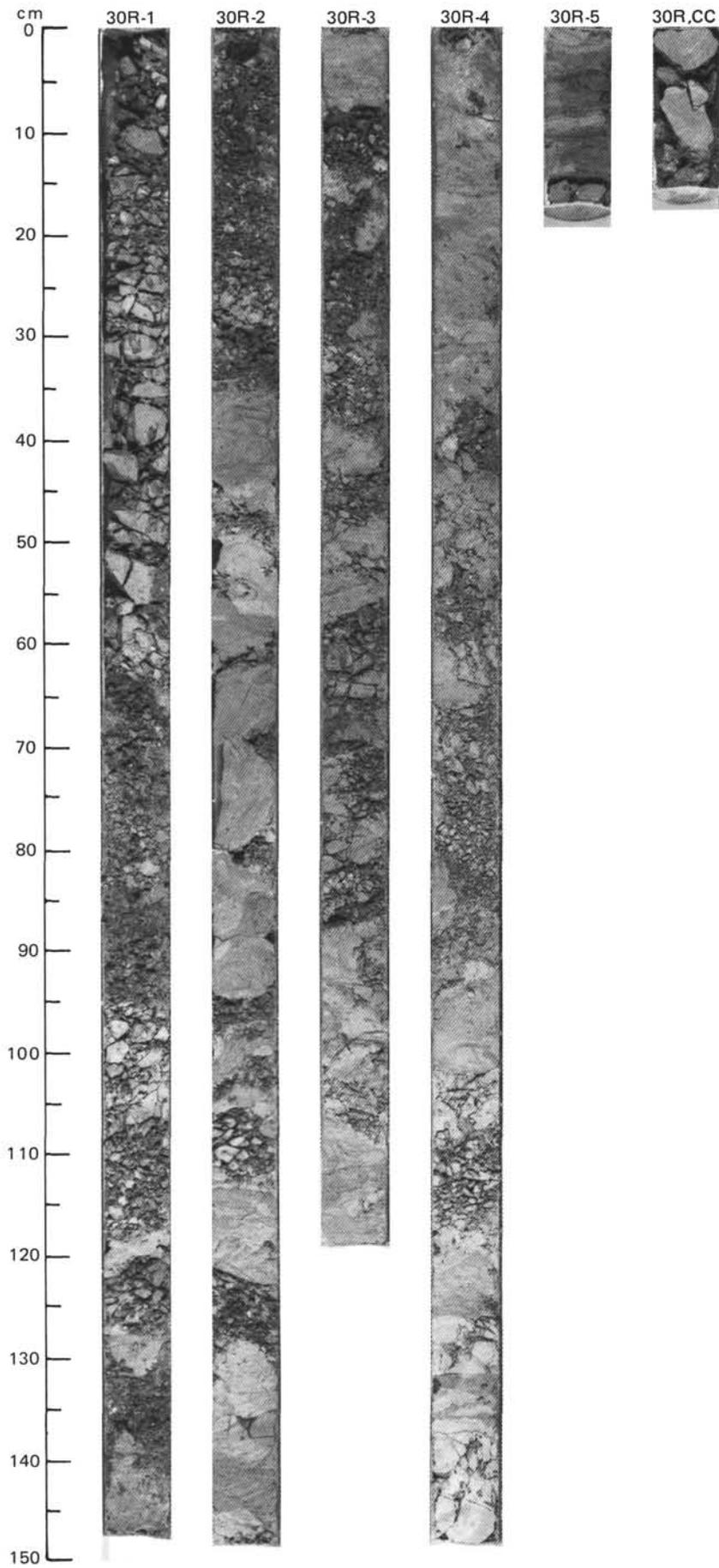
| TIME-ROCK UNIT     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |                        | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|--------------------|-------------------------------------|--------------|--------------|------------------------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|------|---|---|---|------|----|---|------|----|----|------|----|----|--------|---|---|----------|---|---|------|---|---|------|----|----|--------------|----|----|-----------------|----|---|--------------|----|----|--|-------|------|-------|-------|------|--------------------|------|---|------|------|---|----------------|------|---|------|---|---|----------------|---|------|---|---|------|--|-------|-------|------|-------|------|--------------------|------|------|---|------|------|----------------|------|------|---|---|---|----------------|---|---|------|---|---|
|                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS                |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| HAUTERIVIAN        | C3-C5                               | F/P          | R/P          | C. lorei Zone (CC-4 b) | ■              | ●                | 44 %      | 1       | 0.5    |                   |                   |                 |         | <p><b>LIGHT GRAY, BIOTURBATED NANNOFOSSIL MARLSTONE</b></p> <p>The core consists of extensively bioturbated light greenish gray (5Y-5GY 6/1, 5Y-5GY7/1) nannofossil marlstone, alternating in a cyclic fashion with darker gray horizons (5Y5/1) that are richer in clay and plant material. Darker horizons range in thickness from 10 to 20 cm. Pyrite-rich blebs and specks, as well as large coalified wood fragments are scattered throughout the core. Two slumped beds with convolute and plastically deformed layers occur in Sections 1, 115-135 cm and 2, 40-60 cm. Drilling deformation is intense; 'drilling biscuits' are present throughout the core.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>1,126</td> <td>2,34</td> </tr> <tr> <td>D</td> <td>D</td> <td>D</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>10</td> <td>—</td> </tr> <tr> <td>Silt</td> <td>30</td> <td>30</td> </tr> <tr> <td>Clay</td> <td>60</td> <td>70</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Quartz</td> <td>3</td> <td>—</td> </tr> <tr> <td>Feldspar</td> <td>3</td> <td>—</td> </tr> <tr> <td>Mica</td> <td>4</td> <td>—</td> </tr> <tr> <td>Clay</td> <td>30</td> <td>55</td> </tr> <tr> <td>Nannofossils</td> <td>40</td> <td>40</td> </tr> <tr> <td>Sponge Spicules</td> <td>Tr</td> <td>5</td> </tr> <tr> <td>Plant Debris</td> <td>20</td> <td>Tr</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,133</td> <td>2,50</td> <td>2,133</td> <td>3,133</td> <td>4,50</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.66</td> <td>—</td> <td>1.75</td> <td>1.80</td> <td>—</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>1.93</td> <td>—</td> <td>1.97</td> <td>—</td> <td>—</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>3.14</td> <td>—</td> <td>—</td> <td>2.87</td> </tr> <tr> <td></td> <td>4,141</td> <td>5,141</td> <td>6,50</td> <td>6,141</td> <td>7,40</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.55</td> <td>1.61</td> <td>—</td> <td>1.59</td> <td>1.18</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>1.95</td> <td>2.00</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>—</td> <td>3.27</td> <td>—</td> <td>—</td> </tr> </table> |      | 1,126 | 2,34 | D | D | D | Sand | 10 | — | Silt | 30 | 30 | Clay | 60 | 70 | Quartz | 3 | — | Feldspar | 3 | — | Mica | 4 | — | Clay | 30 | 55 | Nannofossils | 40 | 40 | Sponge Spicules | Tr | 5 | Plant Debris | 20 | Tr |  | 1,133 | 2,50 | 2,133 | 3,133 | 4,50 | V <sub>p</sub> (c) | 1.66 | — | 1.75 | 1.80 | — | ρ <sub>b</sub> | 1.93 | — | 1.97 | — | — | T <sub>c</sub> | — | 3.14 | — | — | 2.87 |  | 4,141 | 5,141 | 6,50 | 6,141 | 7,40 | V <sub>p</sub> (c) | 1.55 | 1.61 | — | 1.59 | 1.18 | ρ <sub>b</sub> | 1.95 | 2.00 | — | — | — | T <sub>c</sub> | — | — | 3.27 | — | — |
|                    |                                     |              |              |                        |                |                  |           |         | 1,126  |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2,34 |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | D       | D      |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | D    |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | Sand    | 10     |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | —    |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | Silt    | 30     |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 30   |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | Clay    | 60     |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 70   |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | Quartz  | 3      |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | —    |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| Feldspar           | 3                                   | —            |              |                        |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| Mica               | 4                                   | —            |              |                        |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| Clay               | 30                                  | 55           |              |                        |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| Nannofossils       | 40                                  | 40           |              |                        |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| Sponge Spicules    | Tr                                  | 5            |              |                        |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| Plant Debris       | 20                                  | Tr           |              |                        |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    | 1,133                               | 2,50         | 2,133        | 3,133                  | 4,50           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| V <sub>p</sub> (c) | 1.66                                | —            | 1.75         | 1.80                   | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| ρ <sub>b</sub>     | 1.93                                | —            | 1.97         | —                      | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| T <sub>c</sub>     | —                                   | 3.14         | —            | —                      | 2.87           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    | 4,141                               | 5,141        | 6,50         | 6,141                  | 7,40           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| V <sub>p</sub> (c) | 1.55                                | 1.61         | —            | 1.59                   | 1.18           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| ρ <sub>b</sub>     | 1.95                                | 2.00         | —            | —                      | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
| T <sub>c</sub>     | —                                   | —            | 3.27         | —                      | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | 2       | 1.0    |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | 3       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | 4       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | 5       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | 6       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | 7       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |
|                    |                                     |              |              |                        |                |                  |           | CC      |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |       |      |   |   |   |      |    |   |      |    |    |      |    |    |        |   |   |          |   |   |      |   |   |      |    |    |              |    |    |                 |    |   |              |    |    |  |       |      |       |       |      |                    |      |   |      |      |   |                |      |   |      |   |   |                |   |      |   |   |      |  |       |       |      |       |      |                    |      |      |   |      |      |                |      |      |   |   |   |                |   |   |      |   |   |



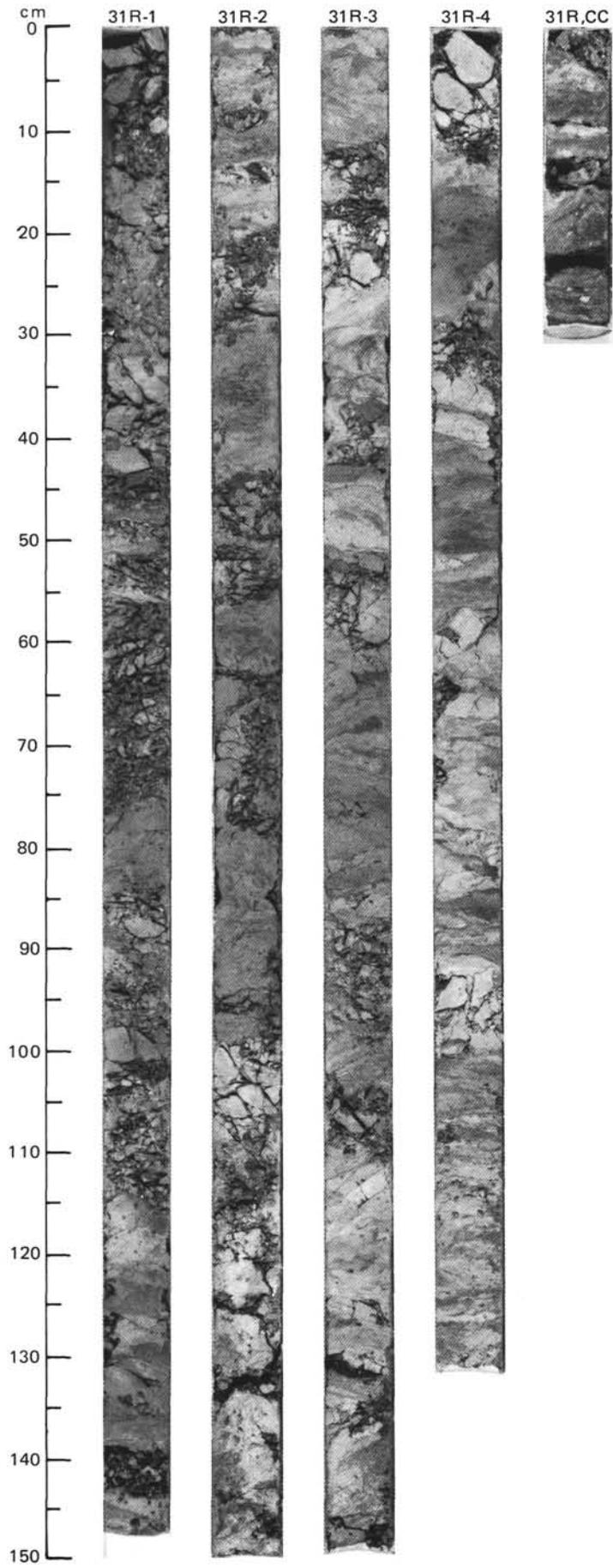
| TIME-ROCK UNIT   | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |                        |              | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
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|                  | FORAMINIFERS                        | NANNOFOSSILS           | RADIOLARIANS |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | DIATOMS |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| HAUTERIVIAN      |                                     |                        |              |                |                  | ● 82 %    |         |        |                      |                   |                 |         | <p><b>LIGHT GRAY, BIOTURBATED NANNOFOSSIL MARLSTONE</b></p> <p>The core consists of extensively bioturbated light greenish gray (5Y-5GY6/1, 5Y-5GY7/1) nannofossil marlstone. Palygorskite-rich blebs and plant-rich layers, as well as large (up to 1 cm) coalified wood fragments are scattered throughout the core. Plastically deformed layers occur in Section 3, 10 to 20 cm. Drilling deformation is intense; 'drilling biscuits' are present throughout the core.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>1,29</td> <td>2,110-113</td> <td>3,61</td> </tr> <tr> <td>M</td> <td></td> <td>D</td> <td>M</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>—</td> <td>10</td> <td>—</td> </tr> <tr> <td>Silt</td> <td>10</td> <td>—</td> <td>10</td> </tr> <tr> <td>Clay</td> <td>90</td> <td>90</td> <td>90</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Quartz</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Feldspar</td> <td>Tr</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Mica</td> <td>Tr</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Clay</td> <td>70</td> <td>—</td> <td>70</td> </tr> <tr> <td>Volcanic Glass</td> <td>3</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>Tr</td> <td>—</td> <td>Tr</td> </tr> </table> <p><b>Accessory Minerals:</b></p> <table border="1"> <tr> <td>Opauques</td> <td>Tr</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Zeolites</td> <td>5</td> <td>—</td> <td>5</td> </tr> <tr> <td>Nannofossils</td> <td>15</td> <td>—</td> <td>20</td> </tr> <tr> <td>Radiolarians</td> <td>—</td> <td>11</td> <td>—</td> </tr> <tr> <td>Plant Debris</td> <td>6</td> <td>1</td> <td>5</td> </tr> <tr> <td>Micrite</td> <td>—</td> <td>88</td> <td>—</td> </tr> <tr> <td>Glauconite</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,80</td> <td>1,143</td> <td>2,106</td> <td>3,81</td> <td>3,116</td> </tr> </table> <p><math>V_p</math> (c) — 1,87 3,10 — 1,47</p> <p><math>\rho_b</math> — 2.19 2.45 — 1.99</p> <p><math>T_c</math> 3.13 — — 3.07 —</p> |         | 1,29 | 2,110-113 | 3,61 | M |  | D | M | Sand | — | 10 | — | Silt | 10 | — | 10 | Clay | 90 | 90 | 90 | Quartz | — | Tr | — | Feldspar | Tr | Tr | Tr | Mica | Tr | Tr | Tr | Clay | 70 | — | 70 | Volcanic Glass | 3 | — | Tr | Calcite/Dolomite | Tr | — | Tr | Opauques | Tr | — | Tr | Zeolites | 5 | — | 5 | Nannofossils | 15 | — | 20 | Radiolarians | — | 11 | — | Plant Debris | 6 | 1 | 5 | Micrite | — | 88 | — | Glauconite | — | Tr | — |  | 1,80 | 1,143 | 2,106 | 3,81 | 3,116 |
|                  |                                     | 1,29                   | 2,110-113    | 3,61           |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
|                  | M                                   |                        | D            | M              |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
|                  | Sand                                | —                      | 10           | —              |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Silt             | 10                                  | —                      | 10           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Clay             | 90                                  | 90                     | 90           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Quartz           | —                                   | Tr                     | —            |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Feldspar         | Tr                                  | Tr                     | Tr           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Mica             | Tr                                  | Tr                     | Tr           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Clay             | 70                                  | —                      | 70           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Volcanic Glass   | 3                                   | —                      | Tr           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Calcite/Dolomite | Tr                                  | —                      | Tr           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Opauques         | Tr                                  | —                      | Tr           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Zeolites         | 5                                   | —                      | 5            |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Nannofossils     | 15                                  | —                      | 20           |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Radiolarians     | —                                   | 11                     | —            |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Plant Debris     | 6                                   | 1                      | 5            |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Micrite          | —                                   | 88                     | —            |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
| Glauconite       | —                                   | Tr                     | —            |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
|                  | 1,80                                | 1,143                  | 2,106        | 3,81           | 3,116            |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
|                  | C3-C5                               |                        |              |                |                  | ● 76 %    |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
|                  | R/P                                 | A/G                    | B            |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |
|                  |                                     | C. lorei Zone (CC-4 b) |              |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |      |           |      |   |  |   |   |      |   |    |   |      |    |   |    |      |    |    |    |        |   |    |   |          |    |    |    |      |    |    |    |      |    |   |    |                |   |   |    |                  |    |   |    |          |    |   |    |          |   |   |   |              |    |   |    |              |   |    |   |              |   |   |   |         |   |    |   |            |   |    |   |  |      |       |       |      |       |



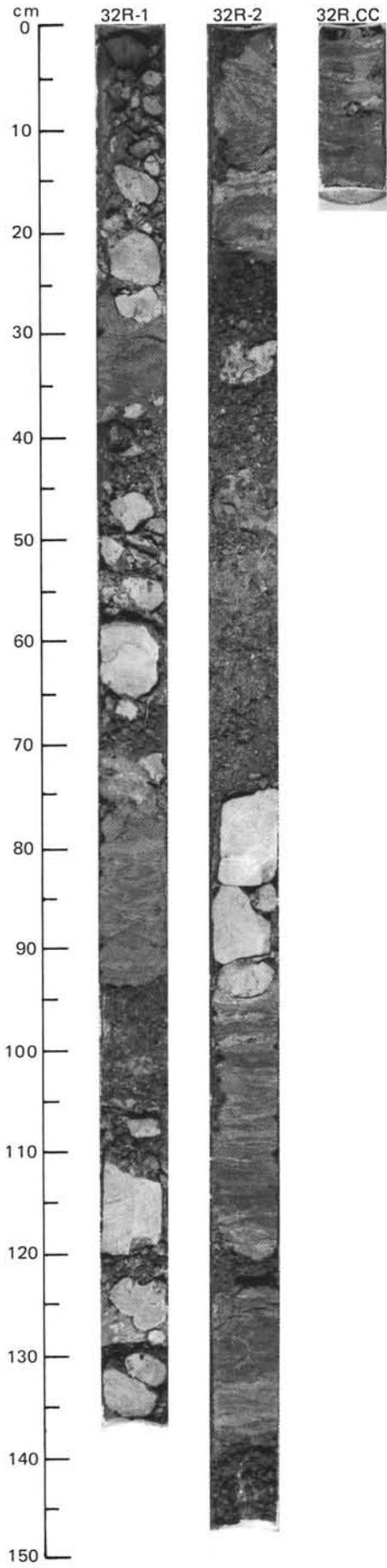
| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER                      |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
|------------------------------------|----------------------------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|--|---|---|------|---|---|------|-----|----|------|----|----|---------------------|--|--|----------|---|----|--------|---|---|--------------|----|----|--------------|---|---|---------|---|---|--|------|------|------|------|-------|-----------|---|------|------|---|------|----------|---|------|------|---|------|-------|------|---|---|------|---|
|                                    | FORAMINIFERS                                             | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| LATE VALANGINIAN/EARLY HAUTERIVIAN |                                                          |              |              |         |                |                  |           |         |        |                   |                   |                 |         | <p><b>LIGHT GRAY, BIOTURBATED NANNOFOSSIL MARLSTONE</b></p> <p>The core consists of variegated light gray (5Y6/1 to 7/1) and gray (5Y5/1), bioturbated nannofossil marlstone. The core is highly disturbed by drilling. The rocks are either crushed or intensely fractured. Brittle deformation seems to be chiefly related to the process of coring, while folding of layers seems to be a syn-sedimentary slump feature (Sections 2, 70 to 90 cm; Section 3, 115 to 120 cm; Section 4, 30 to 38 cm).</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="0"> <tr> <td></td> <td>2,53</td> <td>2,87</td> </tr> <tr> <td></td> <td>M</td> <td>D</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="0"> <tr> <td>Silt</td> <td>—</td> <td>5</td> </tr> <tr> <td>Clay</td> <td>100</td> <td>95</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="0"> <tr> <td>Clay</td> <td>40</td> <td>60</td> </tr> <tr> <td>Accessory Minerals:</td> <td></td> <td></td> </tr> <tr> <td>  Zeolites</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>  Opales</td> <td>—</td> <td>2</td> </tr> <tr> <td>  Nannofossils</td> <td>51</td> <td>35</td> </tr> <tr> <td>  Plant Debris</td> <td>1</td> <td>3</td> </tr> <tr> <td>  Micrite</td> <td>8</td> <td>—</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="0"> <tr> <td></td> <td>2,50</td> <td>2,68</td> <td>4,32</td> <td>4,50</td> <td>4,145</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>—</td> <td>1,67</td> <td>1,71</td> <td>—</td> <td>2,05</td> </tr> <tr> <td><math>\rho_b</math></td> <td>—</td> <td>1,91</td> <td>1,92</td> <td>—</td> <td>2,21</td> </tr> <tr> <td><math>T_c</math></td> <td>3,44</td> <td>—</td> <td>—</td> <td>3,22</td> <td>—</td> </tr> </table> |  | 2,53 | 2,87 |  | M | D | Silt | — | 5 | Clay | 100 | 95 | Clay | 40 | 60 | Accessory Minerals: |  |  | Zeolites | — | Tr | Opales | — | 2 | Nannofossils | 51 | 35 | Plant Debris | 1 | 3 | Micrite | 8 | — |  | 2,50 | 2,68 | 4,32 | 4,50 | 4,145 | $V_p$ (c) | — | 1,67 | 1,71 | — | 2,05 | $\rho_b$ | — | 1,91 | 1,92 | — | 2,21 | $T_c$ | 3,44 | — | — | 3,22 | — |
|                                    | 2,53                                                     | 2,87         |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
|                                    | M                                                        | D            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Silt                               | —                                                        | 5            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Clay                               | 100                                                      | 95           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Clay                               | 40                                                       | 60           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Accessory Minerals:                |                                                          |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Zeolites                           | —                                                        | Tr           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Opales                             | —                                                        | 2            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Nannofossils                       | 51                                                       | 35           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Plant Debris                       | 1                                                        | 3            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| Micrite                            | 8                                                        | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
|                                    | 2,50                                                     | 2,68         | 4,32         | 4,50    | 4,145          |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| $V_p$ (c)                          | —                                                        | 1,67         | 1,71         | —       | 2,05           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| $\rho_b$                           | —                                                        | 1,91         | 1,92         | —       | 2,21           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| $T_c$                              | 3,44                                                     | —            | —            | 3,22    | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| B                                  |                                                          |              |              |         |                | 44 %             | 1         | 0.5     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| C/M                                | <i>Calicalathina oblongata/C. lorei</i> Zone (CC-3/CC4a) |              |              |         |                |                  |           | 2       | 1.0    |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
| B                                  |                                                          |              |              |         |                | 48 %             |           | 3       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
|                                    |                                                          |              |              |         |                | 68 %             |           | 4       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |
|                                    |                                                          |              |              |         |                |                  |           | 5       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |  |   |   |      |   |   |      |     |    |      |    |    |                     |  |  |          |   |    |        |   |   |              |    |    |              |   |   |         |   |   |  |      |      |      |      |       |           |   |      |      |   |      |          |   |      |      |   |      |       |      |   |   |      |   |



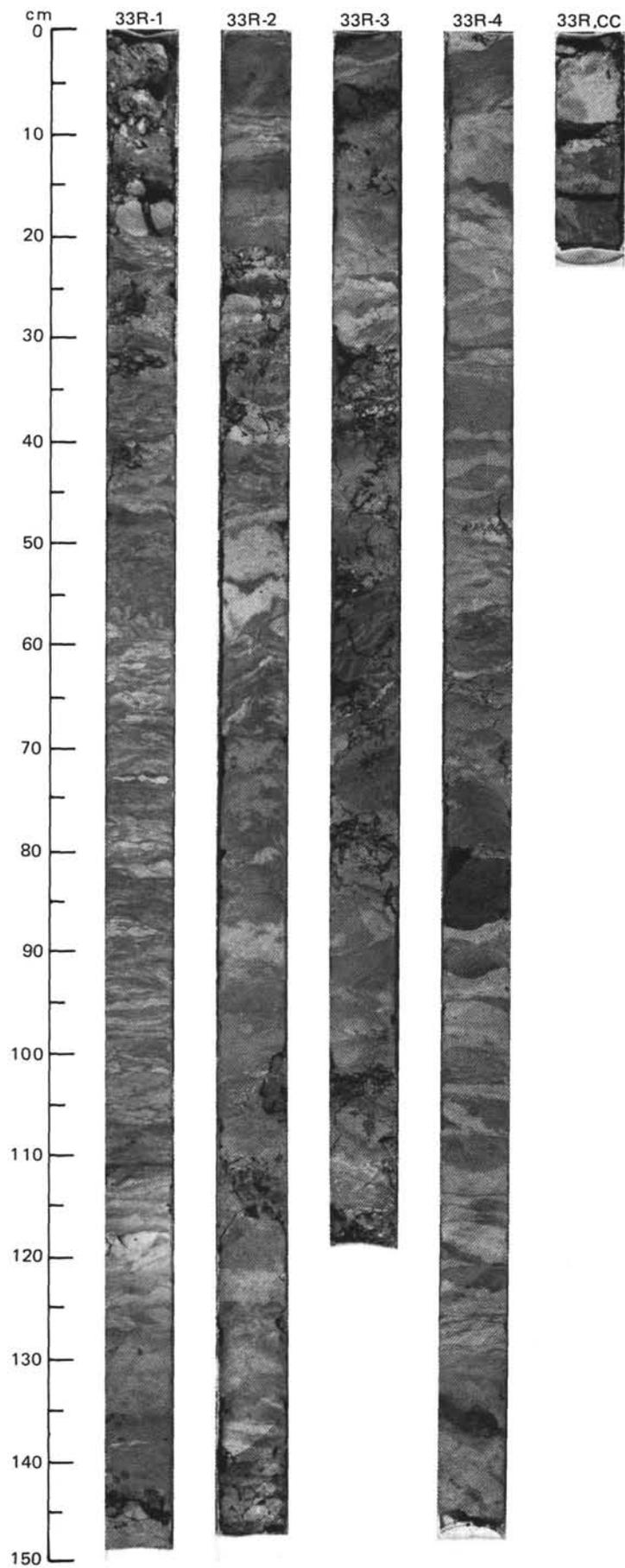




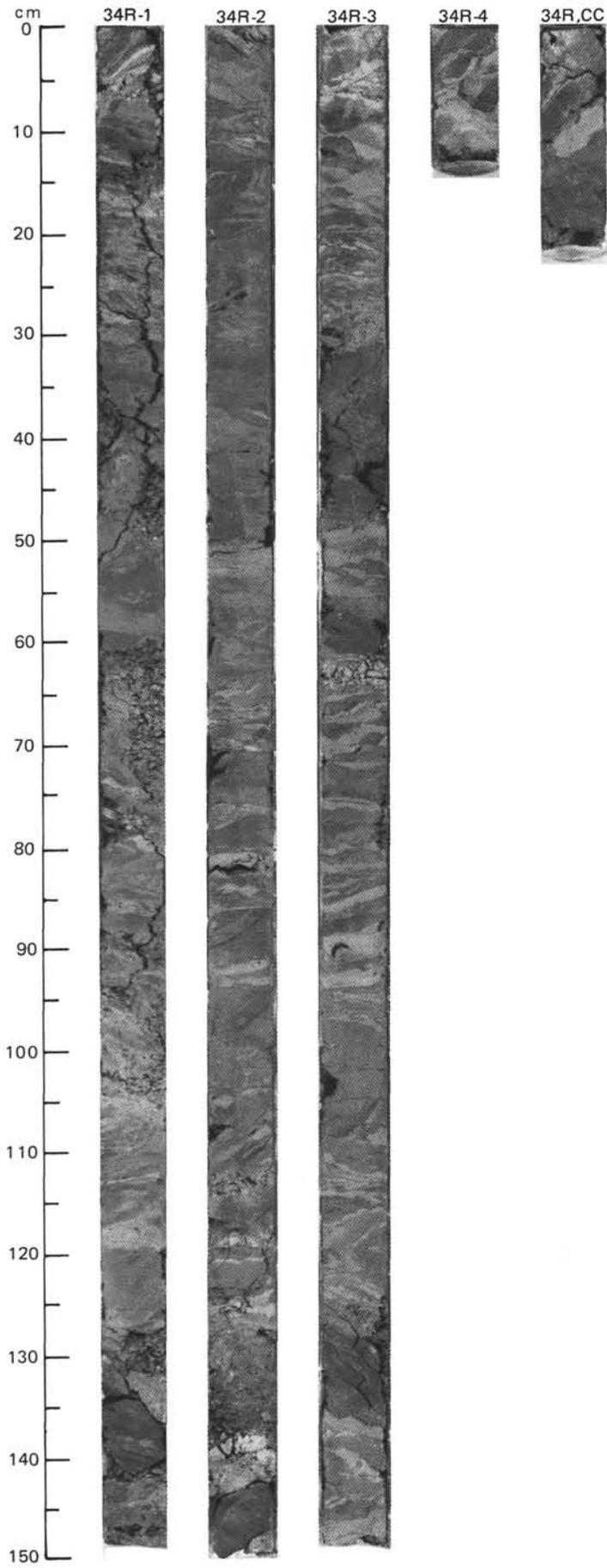
| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |                | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS     | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
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|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS        |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | R/P                                 | C/M          | F/P          | CC-3 / CC 4 a  |                | ■ ● 25 %         |           | 1       | 0.5<br>1.0 |                   | X                 | *               |         | <p><b>INTERBEDDED CLAYEY LIMESTONE, MARLSTONE AND CALCAREOUS CLAYSTONE</b></p> <p>The core is highly disturbed by drilling: about 50% of it consists of drilling breccia; the remainder contains isolated blocks of the above-mentioned lithologies. The calcareous claystone and marlstone are gray to dark gray in color (5Y4/1, 5Y5/1), locally with a brownish tint (5Y4/2). Lamination is broadly parallel, frequently plastically deformed. Clayey limestone is light gray in color (5Y6/1, 5Y7/1), bioturbated and sometimes fractured, with veins filled with calcite.</p> <p>Interpretation of apparent syn-sedimentary, soft-sediment deformation is ambiguous due to high drilling disturbance.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,37<br/>M</th> <th>1,91<br/>D</th> <th>2,17<br/>M</th> <th>1,119-121<br/>M</th> <th>2,81-82<br/>M</th> </tr> </thead> <tbody> <tr> <td>Sand</td> <td>3</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Silt</td> <td>18</td> <td>5</td> <td>15</td> <td>1</td> <td>1</td> </tr> <tr> <td>Clay</td> <td>79</td> <td>95</td> <td>85</td> <td>99</td> <td>99</td> </tr> </tbody> </table> <p><b>TEXTURE:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,37<br/>M</th> <th>1,91<br/>D</th> <th>2,17<br/>M</th> <th>1,119-121<br/>M</th> <th>2,81-82<br/>M</th> </tr> </thead> <tbody> <tr> <td>Quartz</td> <td>12</td> <td>Tr</td> <td>5</td> <td>Tr</td> <td>1</td> </tr> <tr> <td>Mica</td> <td>—</td> <td>Tr</td> <td>1</td> <td>—</td> <td>—</td> </tr> <tr> <td>Clay</td> <td>52</td> <td>82</td> <td>76</td> <td>—</td> <td>—</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>Tr</td> <td>2</td> <td>1</td> <td>—</td> <td>—</td> </tr> </tbody> </table> <p><b>Accessory Minerals:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,37<br/>M</th> <th>1,91<br/>D</th> <th>2,17<br/>M</th> <th>1,119-121<br/>M</th> <th>2,81-82<br/>M</th> </tr> </thead> <tbody> <tr> <td>Opauques</td> <td>4</td> <td>1</td> <td>2</td> <td>1</td> <td>2</td> </tr> <tr> <td>Zircon, rutile</td> <td>—</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> </tr> <tr> <td>Phosphate</td> <td>—</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> </tr> <tr> <td>Nannofossils</td> <td>25</td> <td>15</td> <td>15</td> <td>—</td> <td>5</td> </tr> <tr> <td>Radiolarians</td> <td>—</td> <td>—</td> <td>—</td> <td>2</td> <td>2</td> </tr> <tr> <td>Plant Debris</td> <td>2</td> <td>—</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Micrite</td> <td>5</td> <td>—</td> <td>—</td> <td>97</td> <td>90</td> </tr> </tbody> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,78</th> <th>2,78</th> <th>2,104</th> </tr> </thead> <tbody> <tr> <td>V<sub>p</sub> (a)</td> <td>—</td> <td>3.52</td> <td>—</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>—</td> <td>3.58</td> <td>—</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.68</td> <td>3.30</td> <td>—</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>1.96</td> <td>2.61</td> <td>—</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>—</td> <td>3.29</td> </tr> </tbody> </table> |  | 1,37<br>M | 1,91<br>D | 2,17<br>M | 1,119-121<br>M | 2,81-82<br>M | Sand | 3 | — | — | — | — | Silt | 18 | 5 | 15 | 1 | 1 | Clay | 79 | 95 | 85 | 99 | 99 |  | 1,37<br>M | 1,91<br>D | 2,17<br>M | 1,119-121<br>M | 2,81-82<br>M | Quartz | 12 | Tr | 5 | Tr | 1 | Mica | — | Tr | 1 | — | — | Clay | 52 | 82 | 76 | — | — | Calcite/Dolomite | Tr | 2 | 1 | — | — |  | 1,37<br>M | 1,91<br>D | 2,17<br>M | 1,119-121<br>M | 2,81-82<br>M | Opauques | 4 | 1 | 2 | 1 | 2 | Zircon, rutile | — | — | Tr | — | — | Phosphate | — | — | Tr | — | — | Nannofossils | 25 | 15 | 15 | — | 5 | Radiolarians | — | — | — | 2 | 2 | Plant Debris | 2 | — | — | Tr | — | Micrite | 5 | — | — | 97 | 90 |  | 1,78 | 2,78 | 2,104 | V <sub>p</sub> (a) | — | 3.52 | — | V <sub>p</sub> (b) | — | 3.58 | — | V <sub>p</sub> (c) | 1.68 | 3.30 | — | ρ <sub>b</sub> | 1.96 | 2.61 | — | T <sub>c</sub> | — | — | 3.29 |
|                                    | 1,37<br>M                           | 1,91<br>D    | 2,17<br>M    | 1,119-121<br>M | 2,81-82<br>M   |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Sand                               | 3                                   | —            | —            | —              | —              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Silt                               | 18                                  | 5            | 15           | 1              | 1              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Clay                               | 79                                  | 95           | 85           | 99             | 99             |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
|                                    | 1,37<br>M                           | 1,91<br>D    | 2,17<br>M    | 1,119-121<br>M | 2,81-82<br>M   |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Quartz                             | 12                                  | Tr           | 5            | Tr             | 1              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Mica                               | —                                   | Tr           | 1            | —              | —              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Clay                               | 52                                  | 82           | 76           | —              | —              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Calcite/Dolomite                   | Tr                                  | 2            | 1            | —              | —              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
|                                    | 1,37<br>M                           | 1,91<br>D    | 2,17<br>M    | 1,119-121<br>M | 2,81-82<br>M   |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Opauques                           | 4                                   | 1            | 2            | 1              | 2              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Zircon, rutile                     | —                                   | —            | Tr           | —              | —              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Phosphate                          | —                                   | —            | Tr           | —              | —              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Nannofossils                       | 25                                  | 15           | 15           | —              | 5              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Radiolarians                       | —                                   | —            | —            | 2              | 2              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Plant Debris                       | 2                                   | —            | —            | Tr             | —              |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Micrite                            | 5                                   | —            | —            | 97             | 90             |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
|                                    | 1,78                                | 2,78         | 2,104        |                |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| V <sub>p</sub> (a)                 | —                                   | 3.52         | —            |                |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| V <sub>p</sub> (b)                 | —                                   | 3.58         | —            |                |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| V <sub>p</sub> (c)                 | 1.68                                | 3.30         | —            |                |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| ρ <sub>b</sub>                     | 1.96                                | 2.61         | —            |                |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| T <sub>c</sub>                     | —                                   | —            | 3.29         |                |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |
|                                    |                                     |              |              |                |                | ■ ● 74 %         |           | 2       |            |                   | X                 | *               |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |           |           |           |                |              |      |   |   |   |   |   |      |    |   |    |   |   |      |    |    |    |    |    |  |           |           |           |                |              |        |    |    |   |    |   |      |   |    |   |   |   |      |    |    |    |   |   |                  |    |   |   |   |   |  |           |           |           |                |              |          |   |   |   |   |   |                |   |   |    |   |   |           |   |   |    |   |   |              |    |    |    |   |   |              |   |   |   |   |   |              |   |   |   |    |   |         |   |   |   |    |    |  |      |      |       |                    |   |      |   |                    |   |      |   |                    |      |      |   |                |      |      |   |                |   |   |      |



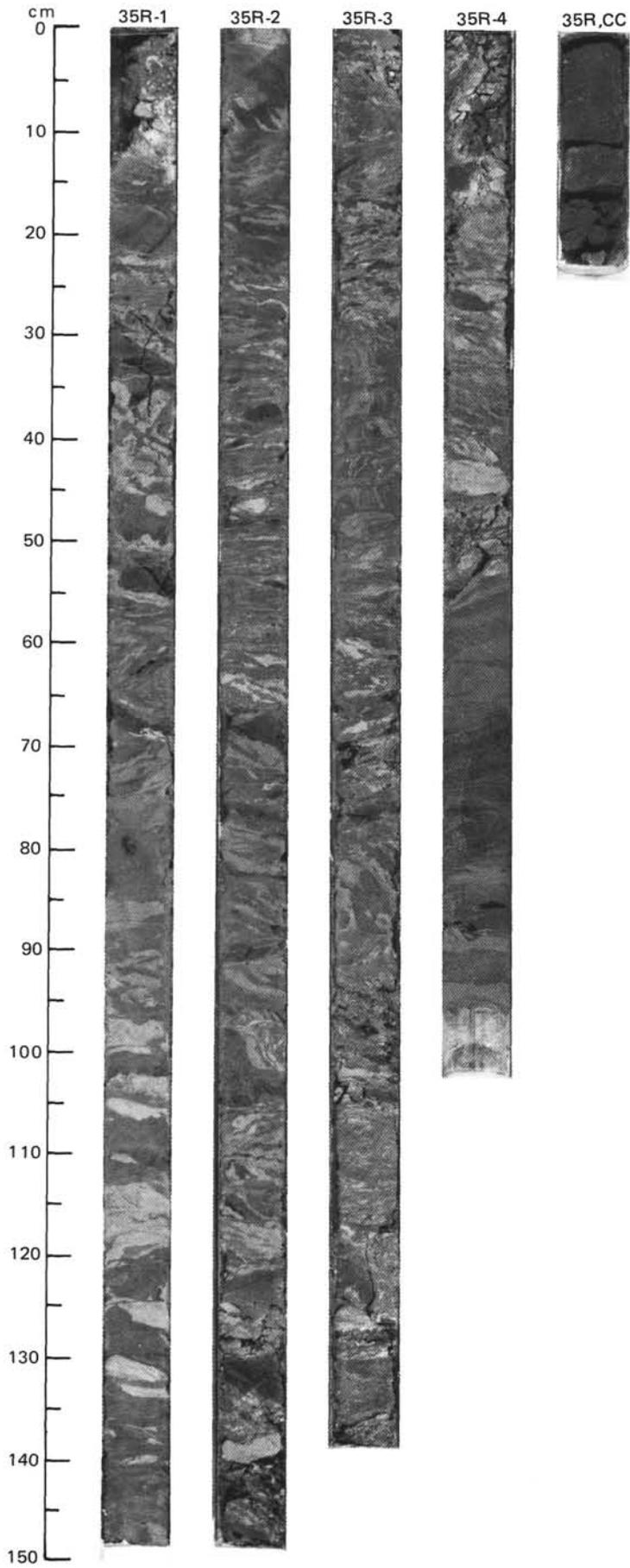




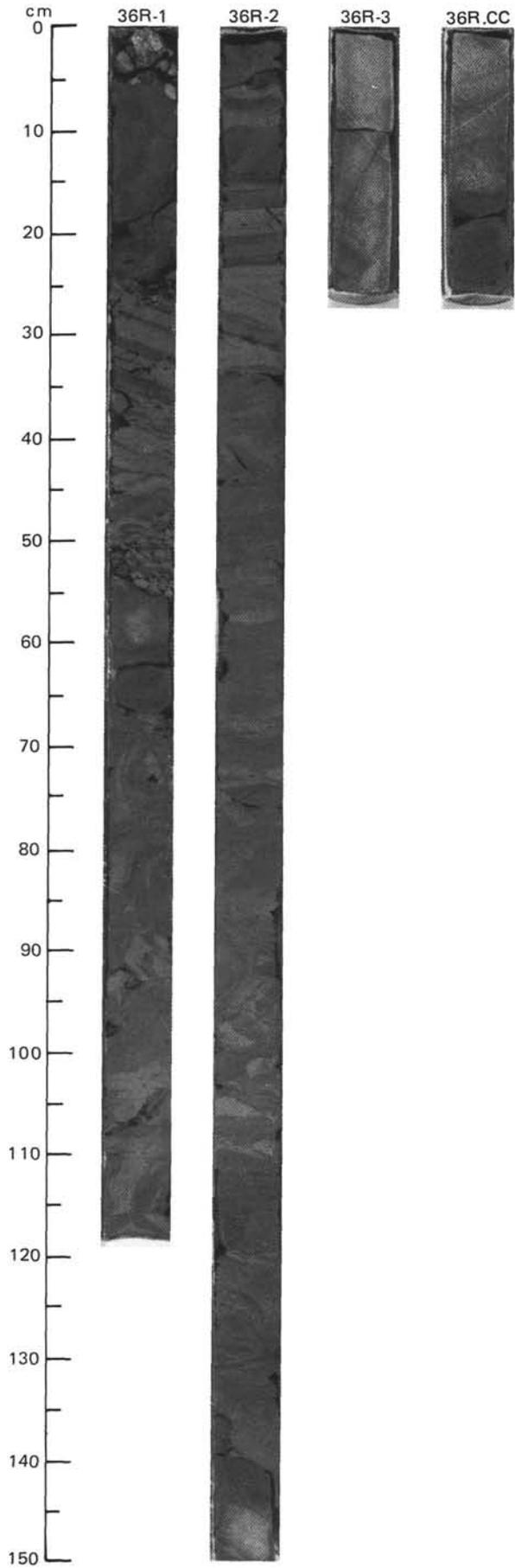
| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------|------|------|---|---|---|---|--|-----------|------|------|------|----|----|----|------|----|----|----|--|-----------|------|------|--------|----|---|---|----------|---|---|----|------|---|---|----|------|---|----|----|----------------|---|----|---|------------------|---|---|---|---------------------|--|--|--|----------|---|----|----|--------|---|----|----|--------|----|---|---|--------------|---|----|----|-----------------|---|---|----|--------------|---|---|----|--------------------|----|---|---|--|-------|------|------|-------|------|--------------------|------|---|---|------|---|--------------------|------|---|---|------|---|--------------------|------|---|------|------|---|----------------|------|---|------|------|---|----------------|---|------|---|---|------|
|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   | A/M          | B            |         |                |                  |           |         |        |                   |                   |                 |         | <p><b>INTERBEDDED DARK GRAY CLAYSTONE and LIGHT GREENISH GRAY MARLSTONE</b></p> <p>The core contains alternating, cm-thick layers of dark gray (N/4) claystone and silty claystone and light greenish gray (5Y6/1) nannofossil marlstone, intensely deformed and microfaulted by drilling. (symbols given in 'Graphic lithology' column are schematic, because thickness of couplets is too small to accurately display at this scale). Drilling deformation is chiefly brittle and includes a) 'biscuiting' and b) small-scale microfaulting within each biscuit. Other sediment deformation is interpreted as a syn-sedimentary feature related to slumping or 'creeping'. Medium- to fine-grained, wood-fragment-rich sandstone/claystone couplets, 5 to 20 cm thick, showing normal size grading and parallel lamination at their base (Ta-e and Tb-e beds of the Bouma sequence), occur. Sand/shale ratio is 1:4.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,136-138</th> <th>2,48</th> <th>2,82</th> </tr> </thead> <tbody> <tr> <td>D</td> <td>D</td> <td>D</td> <td>D</td> </tr> </tbody> </table> <p><b>TEXTURE:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,136-138</th> <th>2,48</th> <th>2,82</th> </tr> </thead> <tbody> <tr> <td>Silt</td> <td>40</td> <td>15</td> <td>40</td> </tr> <tr> <td>Clay</td> <td>60</td> <td>85</td> <td>60</td> </tr> </tbody> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,136-138</th> <th>2,48</th> <th>2,82</th> </tr> </thead> <tbody> <tr> <td>Quartz</td> <td>30</td> <td>3</td> <td>-</td> </tr> <tr> <td>Feldspar</td> <td>7</td> <td>2</td> <td>Tr</td> </tr> <tr> <td>Mica</td> <td>-</td> <td>3</td> <td>Tr</td> </tr> <tr> <td>Clay</td> <td>-</td> <td>73</td> <td>40</td> </tr> <tr> <td>Volcanic Glass</td> <td>-</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>-</td> <td>2</td> <td>-</td> </tr> <tr> <td>Accessory Minerals:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Zeolites</td> <td>-</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>  Opales</td> <td>-</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>  Zircon</td> <td>Tr</td> <td>-</td> <td>-</td> </tr> <tr> <td>Nannofossils</td> <td>-</td> <td>10</td> <td>60</td> </tr> <tr> <td>Sponge Spicules</td> <td>-</td> <td>-</td> <td>Tr</td> </tr> <tr> <td>Plant Debris</td> <td>3</td> <td>7</td> <td>Tr</td> </tr> <tr> <td>Microspar and Clay</td> <td>60</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,115</th> <th>2,45</th> <th>2,47</th> <th>2,146</th> <th>3,56</th> </tr> </thead> <tbody> <tr> <td>V<sub>p</sub> (a)</td> <td>1.40</td> <td>-</td> <td>-</td> <td>3.68</td> <td>-</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>1.67</td> <td>-</td> <td>-</td> <td>4.18</td> <td>-</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.71</td> <td>-</td> <td>1.69</td> <td>4.16</td> <td>-</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.05</td> <td>-</td> <td>2.02</td> <td>2.65</td> <td>-</td> </tr> <tr> <td>T<sub>c</sub></td> <td>-</td> <td>3.59</td> <td>-</td> <td>-</td> <td>3.56</td> </tr> </tbody> </table> |  | 1,136-138 | 2,48 | 2,82 | D | D | D | D |  | 1,136-138 | 2,48 | 2,82 | Silt | 40 | 15 | 40 | Clay | 60 | 85 | 60 |  | 1,136-138 | 2,48 | 2,82 | Quartz | 30 | 3 | - | Feldspar | 7 | 2 | Tr | Mica | - | 3 | Tr | Clay | - | 73 | 40 | Volcanic Glass | - | Tr | - | Calcite/Dolomite | - | 2 | - | Accessory Minerals: |  |  |  | Zeolites | - | Tr | Tr | Opales | - | Tr | Tr | Zircon | Tr | - | - | Nannofossils | - | 10 | 60 | Sponge Spicules | - | - | Tr | Plant Debris | 3 | 7 | Tr | Microspar and Clay | 60 | - | - |  | 1,115 | 2,45 | 2,47 | 2,146 | 3,56 | V <sub>p</sub> (a) | 1.40 | - | - | 3.68 | - | V <sub>p</sub> (b) | 1.67 | - | - | 4.18 | - | V <sub>p</sub> (c) | 1.71 | - | 1.69 | 4.16 | - | ρ <sub>b</sub> | 2.05 | - | 2.02 | 2.65 | - | T <sub>c</sub> | - | 3.59 | - | - | 3.56 |
|                                    | 1,136-138                           | 2,48         | 2,82         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| D                                  | D                                   | D            | D            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|                                    | 1,136-138                           | 2,48         | 2,82         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Silt                               | 40                                  | 15           | 40           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Clay                               | 60                                  | 85           | 60           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|                                    | 1,136-138                           | 2,48         | 2,82         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Quartz                             | 30                                  | 3            | -            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Feldspar                           | 7                                   | 2            | Tr           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Mica                               | -                                   | 3            | Tr           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Clay                               | -                                   | 73           | 40           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Volcanic Glass                     | -                                   | Tr           | -            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Calcite/Dolomite                   | -                                   | 2            | -            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Accessory Minerals:                |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Zeolites                           | -                                   | Tr           | Tr           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Opales                             | -                                   | Tr           | Tr           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Zircon                             | Tr                                  | -            | -            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Nannofossils                       | -                                   | 10           | 60           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Sponge Spicules                    | -                                   | -            | Tr           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Plant Debris                       | 3                                   | 7            | Tr           |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| Microspar and Clay                 | 60                                  | -            | -            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|                                    | 1,115                               | 2,45         | 2,47         | 2,146   | 3,56           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| V <sub>p</sub> (a)                 | 1.40                                | -            | -            | 3.68    | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| V <sub>p</sub> (b)                 | 1.67                                | -            | -            | 4.18    | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| V <sub>p</sub> (c)                 | 1.71                                | -            | 1.69         | 4.16    | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| ρ <sub>b</sub>                     | 2.05                                | -            | 2.02         | 2.65    | -              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
| T <sub>c</sub>                     | -                                   | 3.59         | -            | -       | 3.56           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|                                    |                                     |              |              |         |                |                  |           | 1       | 0.5    |                   | X                 |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|                                    |                                     |              |              |         |                |                  |           | 2       | 1.0    |                   | X                 |                 | #       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|                                    |                                     |              |              |         |                |                  |           | 3       | 2.4    |                   | X                 |                 | *       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|                                    |                                     |              |              |         |                |                  |           | 4       |        |                   | X                 |                 | *       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |
|                                    |                                     |              |              |         |                |                  |           | CC      |        |                   | X                 |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |           |      |      |   |   |   |   |  |           |      |      |      |    |    |    |      |    |    |    |  |           |      |      |        |    |   |   |          |   |   |    |      |   |   |    |      |   |    |    |                |   |    |   |                  |   |   |   |                     |  |  |  |          |   |    |    |        |   |    |    |        |    |   |   |              |   |    |    |                 |   |   |    |              |   |   |    |                    |    |   |   |  |       |      |      |       |      |                    |      |   |   |      |   |                    |      |   |   |      |   |                    |      |   |      |      |   |                |      |   |      |      |   |                |   |      |   |   |      |



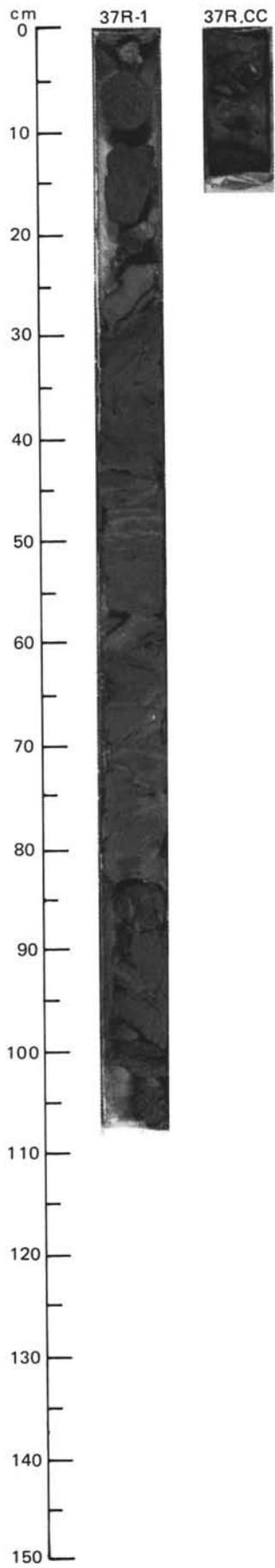




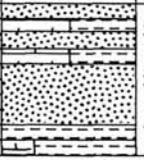
| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |             | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS     | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS     |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   | C/G          | B            | R/P         |                |                  |           | 1       | 0.5<br>1.0 |                   |                   |                 |         | <p><b>INTERBEDDED SANDSTONE and CLAYSTONE/MARLSTONE COUPLETS</b></p> <p>The core consists of thin-bedded siltstone and fine- to medium-grained sandstone turbidites in alternating claystone, silty claystone and marlstone background sediments (symbols given in 'Graphic lithology' column are schematic, because thickness of couplets is too small to accurately display at this scale). Sandstone beds are dark gray (N/4), dark greenish and bluish gray (5Y4/1, 5B4/1), contain large amounts (up to 7%) of terrestrial plant debris and are carbonate cemented. They are normally graded, either massive or parallel laminated at the base and grade upwards to structureless or finely laminated dark greenish gray claystone (Bouma sequences Ta-e and Tb-e). These sandstones range in thickness from a few to 40 cm, but there are indications that there are uncemented portions which have been largely washed by drilling (recovery less than 30%). Background sediments are cm-scale alternations of dark gray (N/4) claystone and light greenish gray to greenish gray (5Y6/1, 5Y5/1) nannofossil marlstone (microturbidites). Sandstone/shale ratio is about 2:5.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,11<br/>D</th> <th>1,30<br/>D</th> <th>3,7-8<br/>D</th> <th>CC,4-5<br/>D</th> </tr> </thead> <tbody> <tr> <td><b>TEXTURE:</b></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sand</td> <td>—</td> <td>—</td> <td>80</td> <td>80</td> </tr> <tr> <td>Silt</td> <td>10</td> <td>20</td> <td>20</td> <td>20</td> </tr> <tr> <td>Clay</td> <td>90</td> <td>80</td> <td>—</td> <td>—</td> </tr> <tr> <td><b>COMPOSITION:</b></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Quartz</td> <td>Tr</td> <td>Tr</td> <td>40</td> <td>45</td> </tr> <tr> <td>Feldspar</td> <td>—</td> <td>—</td> <td>23</td> <td>20</td> </tr> <tr> <td>Mica</td> <td>3</td> <td>5</td> <td>4</td> <td>5</td> </tr> <tr> <td>Clay</td> <td>80</td> <td>45</td> <td>—</td> <td>—</td> </tr> <tr> <td>Volcanic Glass</td> <td>2</td> <td>5</td> <td>—</td> <td>—</td> </tr> <tr> <td>Calcite Cement</td> <td>—</td> <td>—</td> <td>25</td> <td>25</td> </tr> <tr> <td><b>Accessory Minerals:</b></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Epidote</td> <td>—</td> <td>—</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Pyrite</td> <td>5</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Rutile</td> <td>—</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Heavy Minerals</td> <td>—</td> <td>—</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Foraminifers</td> <td>—</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Nannofossils</td> <td>10</td> <td>45</td> <td>—</td> <td>—</td> </tr> <tr> <td>Sponge Spicules</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> </tr> <tr> <td>Plant Debris</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> </tr> <tr> <td><b>Rock Fragments:</b></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mica Schist</td> <td>—</td> <td>—</td> <td>3</td> <td>1</td> </tr> <tr> <td>Acid Plutonic</td> <td>—</td> <td>—</td> <td>3</td> <td>1</td> </tr> <tr> <td>Quartzite</td> <td>—</td> <td>—</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Micrite</td> <td>—</td> <td>—</td> <td>2</td> <td>2</td> </tr> <tr> <td>Bioclasts</td> <td>—</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td><b>PHYSICAL PROPERTIES DATA:</b></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>1,98</td> <td>2,50</td> <td>2,111</td> <td>CC,25</td> </tr> <tr> <td>V<sub>p</sub> (a)</td> <td>—</td> <td>—</td> <td>—</td> <td>4.52</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>—</td> <td>—</td> <td>—</td> <td>4.21</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.68</td> <td>—</td> <td>1.54</td> <td>4.21</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.02</td> <td>—</td> <td>1.97</td> <td>3.04</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>3.79</td> <td>—</td> <td>—</td> </tr> </tbody> </table> |  | 1,11<br>D | 1,30<br>D | 3,7-8<br>D | CC,4-5<br>D | <b>TEXTURE:</b> |  |  |  |  | Sand | — | — | 80 | 80 | Silt | 10 | 20 | 20 | 20 | Clay | 90 | 80 | — | — | <b>COMPOSITION:</b> |  |  |  |  | Quartz | Tr | Tr | 40 | 45 | Feldspar | — | — | 23 | 20 | Mica | 3 | 5 | 4 | 5 | Clay | 80 | 45 | — | — | Volcanic Glass | 2 | 5 | — | — | Calcite Cement | — | — | 25 | 25 | <b>Accessory Minerals:</b> |  |  |  |  | Epidote | — | — | — | Tr | Pyrite | 5 | — | Tr | — | Rutile | — | — | Tr | — | Heavy Minerals | — | — | — | Tr | Foraminifers | — | — | Tr | — | Nannofossils | 10 | 45 | — | — | Sponge Spicules | — | Tr | — | — | Plant Debris | — | Tr | — | — | <b>Rock Fragments:</b> |  |  |  |  | Mica Schist | — | — | 3 | 1 | Acid Plutonic | — | — | 3 | 1 | Quartzite | — | — | Tr | Tr | Micrite | — | — | 2 | 2 | Bioclasts | — | — | — | 1 | <b>PHYSICAL PROPERTIES DATA:</b> |  |  |  |  |  | 1,98 | 2,50 | 2,111 | CC,25 | V <sub>p</sub> (a) | — | — | — | 4.52 | V <sub>p</sub> (b) | — | — | — | 4.21 | V <sub>p</sub> (c) | 1.68 | — | 1.54 | 4.21 | ρ <sub>b</sub> | 2.02 | — | 1.97 | 3.04 | T <sub>c</sub> | — | 3.79 | — | — |
|                                    | 1,11<br>D                           | 1,30<br>D    | 3,7-8<br>D   | CC,4-5<br>D |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| <b>TEXTURE:</b>                    |                                     |              |              |             |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| Sand                               | —                                   | —            | 80           | 80          |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Silt                               | 10                                  | 20           | 20           | 20          |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Clay                               | 90                                  | 80           | —            | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| <b>COMPOSITION:</b>                |                                     |              |              |             |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Quartz                             | Tr                                  | Tr           | 40           | 45          |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Feldspar                           | —                                   | —            | 23           | 20          |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Mica                               | 3                                   | 5            | 4            | 5           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Clay                               | 80                                  | 45           | —            | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Volcanic Glass                     | 2                                   | 5            | —            | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Calcite Cement                     | —                                   | —            | 25           | 25          |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| <b>Accessory Minerals:</b>         |                                     |              |              |             |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Epidote                            | —                                   | —            | —            | Tr          |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Pyrite                             | 5                                   | —            | Tr           | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Rutile                             | —                                   | —            | Tr           | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Heavy Minerals                     | —                                   | —            | —            | Tr          |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Foraminifers                       | —                                   | —            | Tr           | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Nannofossils                       | 10                                  | 45           | —            | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Sponge Spicules                    | —                                   | Tr           | —            | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Plant Debris                       | —                                   | Tr           | —            | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| <b>Rock Fragments:</b>             |                                     |              |              |             |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Mica Schist                        | —                                   | —            | 3            | 1           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Acid Plutonic                      | —                                   | —            | 3            | 1           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Quartzite                          | —                                   | —            | Tr           | Tr          |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Micrite                            | —                                   | —            | 2            | 2           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| Bioclasts                          | —                                   | —            | —            | 1           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| <b>PHYSICAL PROPERTIES DATA:</b>   |                                     |              |              |             |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
|                                    | 1,98                                | 2,50         | 2,111        | CC,25       |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| V <sub>p</sub> (a)                 | —                                   | —            | —            | 4.52        |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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 |   |   |   |           |   |   |   |   |                                  |  |  |  |  |  |      |      |       |       |                    |   |   |   |      |                    |   |   |   |      |                    |      |   |      |      |                |      |   |      |      |                |   |      |   |   |
| V <sub>p</sub> (b)                 | —                                   | —            | —            | 4.21        |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| V <sub>p</sub> (c)                 | 1.68                                | —            | 1.54         | 4.21        |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| ρ <sub>b</sub>                     | 2.02                                | —            | 1.97         | 3.04        |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| T <sub>c</sub>                     | —                                   | 3.79         | —            | —           |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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|                                    |                                     |              |              |             |                |                  |           | 2       |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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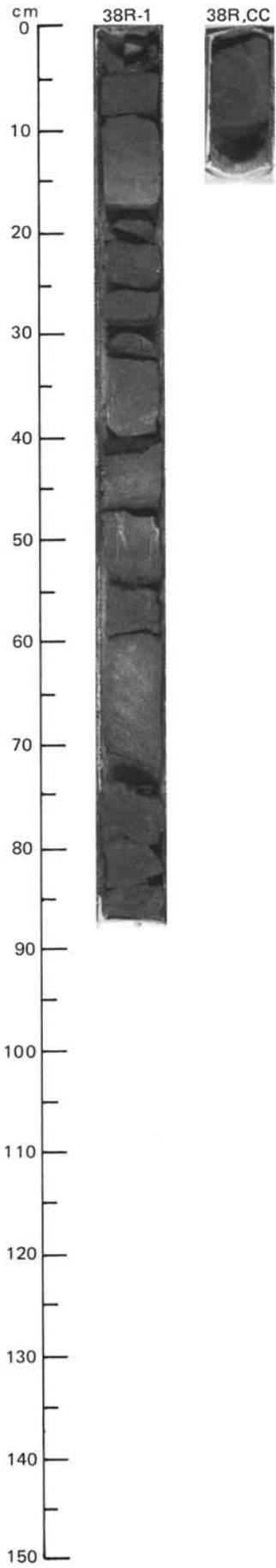


| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | LITHOLOGIC DESCRIPTION |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
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|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   | CC-3 / CC4 a | F/M          | B R/P   | ■ ■ ■          | 24 % ●           | 1         | 0.5     |        | ✓                 | ✓                 | #               | <p><b>SANDSTONE, CLAYSTONE and NANNOFOSSIL MARLSTONE</b></p> <p>The above-mentioned lithologies are randomly distributed in the single section recovered. Sandstone beds are dark gray (N/4), dark greenish and bluish gray (5Y4/1, 5B4/1), contain large amounts (up to 7%) of terrestrial plant debris and are carbonate cemented. They are normally graded, either massive or parallel laminated at the base and grade upward to structureless or finely laminated dark greenish gray claystone (Bouma sequences Tæ and Tb-e). Gaps occur between sandstone blocks and there are indications that uncemented sandy portions have been largely washed by drilling (recovery less than 15%). The dark gray (N/4) claystone alternates with light greenish gray (5Y6/1) nannofossil marlstone. Both are intensely disturbed by drilling.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,3-5<br/>D</th> <th>1,49<br/>D</th> <th>1,56<br/>D</th> </tr> </thead> <tbody> <tr> <td><b>TEXTURE:</b></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sand</td> <td>80</td> <td>—</td> <td>—</td> </tr> <tr> <td>Silt</td> <td>20</td> <td>—</td> <td>8</td> </tr> <tr> <td>Clay</td> <td>—</td> <td>100</td> <td>92</td> </tr> </tbody> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,3-5<br/>D</th> <th>1,49<br/>D</th> <th>1,56<br/>D</th> </tr> </thead> <tbody> <tr> <td>Quartz</td> <td>44</td> <td>Tr</td> <td>5</td> </tr> <tr> <td>Feldspar</td> <td>22</td> <td>—</td> <td>—</td> </tr> <tr> <td>Mica</td> <td>4</td> <td>Tr</td> <td>1</td> </tr> <tr> <td>Clay</td> <td>—</td> <td>60</td> <td>82</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Calcite Cement</td> <td>25</td> <td>—</td> <td>—</td> </tr> <tr> <td><b>Accessory Minerals:</b></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Iron Oxides</td> <td>—</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Pyrite Framboids</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td>Zeolites</td> <td>—</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Nannofossils</td> <td>—</td> <td>40</td> <td>10</td> </tr> <tr> <td>Plant Debris</td> <td>—</td> <td>—</td> <td>1</td> </tr> <tr> <td><b>Rock Fragments:</b></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Acid Plutonic</td> <td>1</td> <td>—</td> <td>—</td> </tr> <tr> <td>Schist and Hornfels</td> <td>2</td> <td>—</td> <td>—</td> </tr> <tr> <td>Micrite/Peloid Intraclasts</td> <td>2</td> <td>—</td> <td>—</td> </tr> </tbody> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,4</th> <th>1,23</th> <th>1,49</th> </tr> </thead> <tbody> <tr> <td>V<sub>p</sub> (a)</td> <td>4.01</td> <td>—</td> <td>—</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>3.93</td> <td>—</td> <td>—</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>3.75</td> <td>1.65</td> <td>—</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.76</td> <td>2.08</td> <td>—</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>—</td> <td>3.87</td> </tr> </tbody> </table> |                        | 1,3-5<br>D | 1,49<br>D | 1,56<br>D | <b>TEXTURE:</b> |  |  |  | Sand | 80 | — | — | Silt | 20 | — | 8 | Clay | — | 100 | 92 |  | 1,3-5<br>D | 1,49<br>D | 1,56<br>D | Quartz | 44 | Tr | 5 | Feldspar | 22 | — | — | Mica | 4 | Tr | 1 | Clay | — | 60 | 82 | Calcite/Dolomite | — | Tr | — | Calcite Cement | 25 | — | — | <b>Accessory Minerals:</b> |  |  |  | Iron Oxides | — | — | Tr | Pyrite Framboids | — | — | 1 | Zeolites | — | — | Tr | Nannofossils | — | 40 | 10 | Plant Debris | — | — | 1 | <b>Rock Fragments:</b> |  |  |  | Acid Plutonic | 1 | — | — | Schist and Hornfels | 2 | — | — | Micrite/Peloid Intraclasts | 2 | — | — |  | 1,4 | 1,23 | 1,49 | V <sub>p</sub> (a) | 4.01 | — | — | V <sub>p</sub> (b) | 3.93 | — | — | V <sub>p</sub> (c) | 3.75 | 1.65 | — | ρ <sub>b</sub> | 2.76 | 2.08 | — | T <sub>c</sub> | — | — | 3.87 |
|                                    | 1,3-5<br>D                          | 1,49<br>D    | 1,56<br>D    |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| <b>TEXTURE:</b>                    |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Sand                               | 80                                  | —            | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Silt                               | 20                                  | —            | 8            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Clay                               | —                                   | 100          | 92           |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
|                                    | 1,3-5<br>D                          | 1,49<br>D    | 1,56<br>D    |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Quartz                             | 44                                  | Tr           | 5            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Feldspar                           | 22                                  | —            | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Mica                               | 4                                   | Tr           | 1            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Clay                               | —                                   | 60           | 82           |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Calcite/Dolomite                   | —                                   | Tr           | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Calcite Cement                     | 25                                  | —            | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| <b>Accessory Minerals:</b>         |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Iron Oxides                        | —                                   | —            | Tr           |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Pyrite Framboids                   | —                                   | —            | 1            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Zeolites                           | —                                   | —            | Tr           |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Nannofossils                       | —                                   | 40           | 10           |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Plant Debris                       | —                                   | —            | 1            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| <b>Rock Fragments:</b>             |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Acid Plutonic                      | 1                                   | —            | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Schist and Hornfels                | 2                                   | —            | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| Micrite/Peloid Intraclasts         | 2                                   | —            | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
|                                    | 1,4                                 | 1,23         | 1,49         |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| V <sub>p</sub> (a)                 | 4.01                                | —            | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| V <sub>p</sub> (b)                 | 3.93                                | —            | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| V <sub>p</sub> (c)                 | 3.75                                | 1.65         | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| ρ <sub>b</sub>                     | 2.76                                | 2.08         | —            |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |
| T <sub>c</sub>                     | —                                   | —            | 3.87         |         |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |            |           |           |                 |  |  |  |      |    |   |   |      |    |   |   |      |   |     |    |  |            |           |           |        |    |    |   |          |    |   |   |      |   |    |   |      |   |    |    |                  |   |    |   |                |    |   |   |                            |  |  |  |             |   |   |    |                  |   |   |   |          |   |   |    |              |   |    |    |              |   |   |   |                        |  |  |  |               |   |   |   |                     |   |   |   |                            |   |   |   |  |     |      |      |                    |      |   |   |                    |      |   |   |                    |      |      |   |                |      |      |   |                |   |   |      |



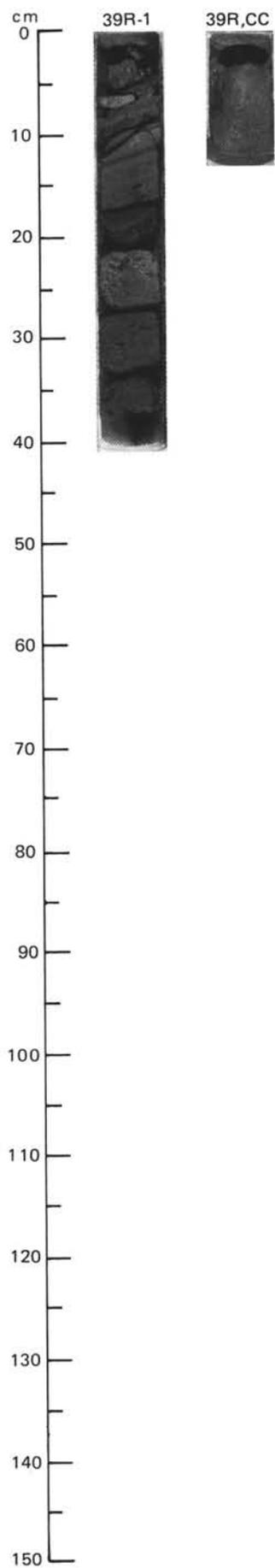
SITE 638 HOLE B CORE 38 R CORED INTERVAL 5016.5-5026.2 mbsl; 353.8-363.5 mbsf

| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY     | SECTION | METERS | GRAPHIC LITHOLOGY                                                                 | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|---------------|---------|--------|-----------------------------------------------------------------------------------|-------------------|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |               |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | R/P                                 | F/P          |              |         |                |                  | 45 % ●●● 19 % | 1       | 0.5    |  |                   |                 | #       | <p><b>SANDSTONE, CLAYSTONE and NANNOFOSSIL MARLSTONE</b></p> <p>The above-mentioned lithologies are randomly distributed in the single section recovered in this core. Pieces are not in order. The core consists of dark gray (N/4), dark greenish and bluish gray (5Y4/1, 5B4/1) sandstone, containing large amounts (up to 7-8%) of terrestrial plant debris. Pieces are normally graded, either massive or parallel laminated and are carbonate cemented.</p> <p><b>THIN SECTION SUMMARY (%):</b></p> <p style="text-align: right;">1,58-62<br/>D</p> <p><b>TEXTURE:</b></p> <p>Sand 80<br/>Silt 20</p> <p><b>COMPOSITION:</b></p> <p>Quartz 32<br/>Feldspar 20<br/>Rock Fragments 10<br/>Mica 10<br/>Cement-Calcite 15<br/>Foraminifers Tr<br/>Plant Debris 12<br/>Bioclasts Tr<br/>Micritic Intraclasts 1</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <p style="text-align: right;">1,30    1,33</p> <p><math>V\rho</math> (a) 3.31    2.76<br/><math>V\rho</math> (b) 3.91    3.22<br/><math>V\rho</math> (c) 3.81    2.63<br/><math>\rho_b</math> 2.59    2.49</p> |

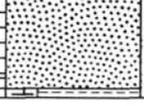


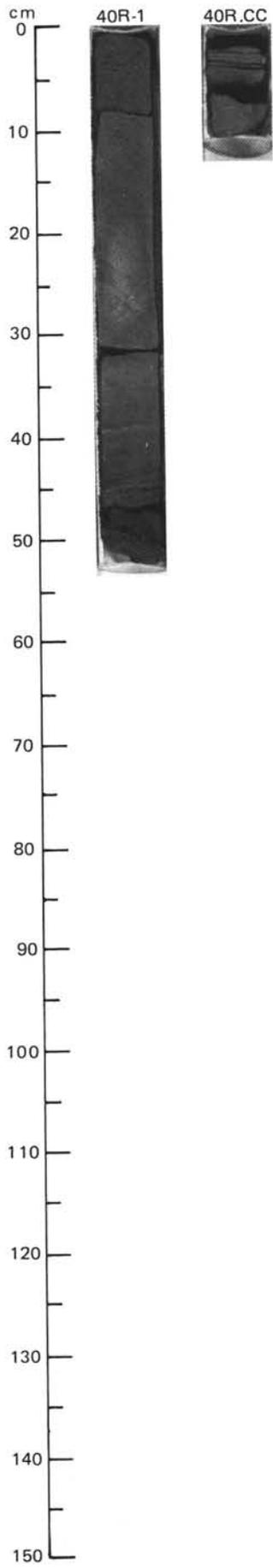
SITE 638 HOLE B CORE 39 R CORED INTERVAL 5026.2-5035.8 mbsf; 363.5-373.1 mbsf

| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
|------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|----------------------|-------------------|-----------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|---------|---------|---|---|---|---|--|------|---------|---------|------|---|---|----|------|----|---|----|------|----|----|---|--|------|---------|---------|--------|----|----|----|----------|----|---|----|----------------|---|---|----|------|----|----|---|------|----|---|---|------------------|----|---|---|---------|--|--|--|-------------------|---|---|----|------------|---|---|----|--------|---|---|---|--------|---|---|---|---------------|----|---|----|--------------|---|---|---|--------------|----|---|---|--------------|---|---|---|-----------|---|----|---|---------|---|----|---|--|------|--------------------|------|--------------------|------|--------------------|------|----------------|------|
|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   | F/P          | B            |         |                | 14 %             | 1         |         |        |                      |                   |                 |         | <p><b>SANDSTONE, CLAYSTONE and NANNOFOSSIL MARLSTONE</b></p> <p>The above-mentioned lithologies are present in the 40-cm section recovered in this core. Sandstone beds are coarse grained and dark gray (N/4, 2.5Y4/1), contain terrestrial plant debris in amounts up to 8% and are carbonate cemented. They are graded and without bedding structures. It is likely that uncemented portions of sandstone beds or softer clay and marl have been largely lost during drilling as the recovery was less than 5%. Dark gray (N/4) claystone alternating with light greenish gray (5Y 6/1) nannofossil marlstone is also present.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,10</th> <th>1,14-15</th> <th>1,19-25</th> </tr> </thead> <tbody> <tr> <td>M</td> <td>M</td> <td>M</td> <td>D</td> </tr> </tbody> </table> <p><b>TEXTURE:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,10</th> <th>1,14-15</th> <th>1,19-25</th> </tr> </thead> <tbody> <tr> <td>Sand</td> <td>-</td> <td>-</td> <td>90</td> </tr> <tr> <td>Silt</td> <td>30</td> <td>2</td> <td>10</td> </tr> <tr> <td>Clay</td> <td>70</td> <td>98</td> <td>-</td> </tr> </tbody> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,10</th> <th>1,14-15</th> <th>1,19-25</th> </tr> </thead> <tbody> <tr> <td>Quartz</td> <td>10</td> <td>Tr</td> <td>45</td> </tr> <tr> <td>Feldspar</td> <td>Tr</td> <td>-</td> <td>15</td> </tr> <tr> <td>Rock Fragments</td> <td>-</td> <td>-</td> <td>15</td> </tr> <tr> <td>Mica</td> <td>15</td> <td>Tr</td> <td>7</td> </tr> <tr> <td>Clay</td> <td>49</td> <td>-</td> <td>-</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>15</td> <td>-</td> <td>-</td> </tr> <tr> <td>Cement:</td> <td></td> <td></td> <td></td> </tr> <tr> <td>  Calcite/Trace QTZ</td> <td>-</td> <td>-</td> <td>15</td> </tr> <tr> <td>Tourmaline</td> <td>-</td> <td>-</td> <td>Tr</td> </tr> <tr> <td>Opakes</td> <td>1</td> <td>1</td> <td>-</td> </tr> <tr> <td>Pyrite</td> <td>1</td> <td>-</td> <td>-</td> </tr> <tr> <td>Zircon,Rutile</td> <td>Tr</td> <td>-</td> <td>Tr</td> </tr> <tr> <td>Nannofossils</td> <td>7</td> <td>-</td> <td>-</td> </tr> <tr> <td>Fish Remains</td> <td>Tr</td> <td>-</td> <td>-</td> </tr> <tr> <td>Plant Debris</td> <td>2</td> <td>1</td> <td>3</td> </tr> <tr> <td>Bioclasts</td> <td>-</td> <td>Tr</td> <td>-</td> </tr> <tr> <td>Micrite</td> <td>-</td> <td>98</td> <td>-</td> </tr> </tbody> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tbody> <tr> <td></td> <td>1,35</td> </tr> <tr> <td>V<sub>p</sub> (a)</td> <td>4.05</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>4.34</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>3.87</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.67</td> </tr> </tbody> </table> |  | 1,10 | 1,14-15 | 1,19-25 | M | M | M | D |  | 1,10 | 1,14-15 | 1,19-25 | Sand | - | - | 90 | Silt | 30 | 2 | 10 | Clay | 70 | 98 | - |  | 1,10 | 1,14-15 | 1,19-25 | Quartz | 10 | Tr | 45 | Feldspar | Tr | - | 15 | Rock Fragments | - | - | 15 | Mica | 15 | Tr | 7 | Clay | 49 | - | - | Calcite/Dolomite | 15 | - | - | Cement: |  |  |  | Calcite/Trace QTZ | - | - | 15 | Tourmaline | - | - | Tr | Opakes | 1 | 1 | - | Pyrite | 1 | - | - | Zircon,Rutile | Tr | - | Tr | Nannofossils | 7 | - | - | Fish Remains | Tr | - | - | Plant Debris | 2 | 1 | 3 | Bioclasts | - | Tr | - | Micrite | - | 98 | - |  | 1,35 | V <sub>p</sub> (a) | 4.05 | V <sub>p</sub> (b) | 4.34 | V <sub>p</sub> (c) | 3.87 | ρ <sub>b</sub> | 2.67 |
|                                    | 1,10                                | 1,14-15      | 1,19-25      |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| M                                  | M                                   | M            | D            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
|                                    | 1,10                                | 1,14-15      | 1,19-25      |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Sand                               | -                                   | -            | 90           |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Silt                               | 30                                  | 2            | 10           |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Clay                               | 70                                  | 98           | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
|                                    | 1,10                                | 1,14-15      | 1,19-25      |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Quartz                             | 10                                  | Tr           | 45           |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Feldspar                           | Tr                                  | -            | 15           |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Rock Fragments                     | -                                   | -            | 15           |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Mica                               | 15                                  | Tr           | 7            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Clay                               | 49                                  | -            | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Calcite/Dolomite                   | 15                                  | -            | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Cement:                            |                                     |              |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Calcite/Trace QTZ                  | -                                   | -            | 15           |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Tourmaline                         | -                                   | -            | Tr           |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Opakes                             | 1                                   | 1            | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Pyrite                             | 1                                   | -            | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Zircon,Rutile                      | Tr                                  | -            | Tr           |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Nannofossils                       | 7                                   | -            | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Fish Remains                       | Tr                                  | -            | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Plant Debris                       | 2                                   | 1            | 3            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Bioclasts                          | -                                   | Tr           | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| Micrite                            | -                                   | 98           | -            |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
|                                    | 1,35                                |              |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| V <sub>p</sub> (a)                 | 4.05                                |              |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| V <sub>p</sub> (b)                 | 4.34                                |              |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| V <sub>p</sub> (c)                 | 3.87                                |              |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |
| ρ <sub>b</sub>                     | 2.67                                |              |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |         |         |   |   |   |   |  |      |         |         |      |   |   |    |      |    |   |    |      |    |    |   |  |      |         |         |        |    |    |    |          |    |   |    |                |   |   |    |      |    |    |   |      |    |   |   |                  |    |   |   |         |  |  |  |                   |   |   |    |            |   |   |    |        |   |   |   |        |   |   |   |               |    |   |    |              |   |   |   |              |    |   |   |              |   |   |   |           |   |    |   |         |   |    |   |  |      |                    |      |                    |      |                    |      |                |      |

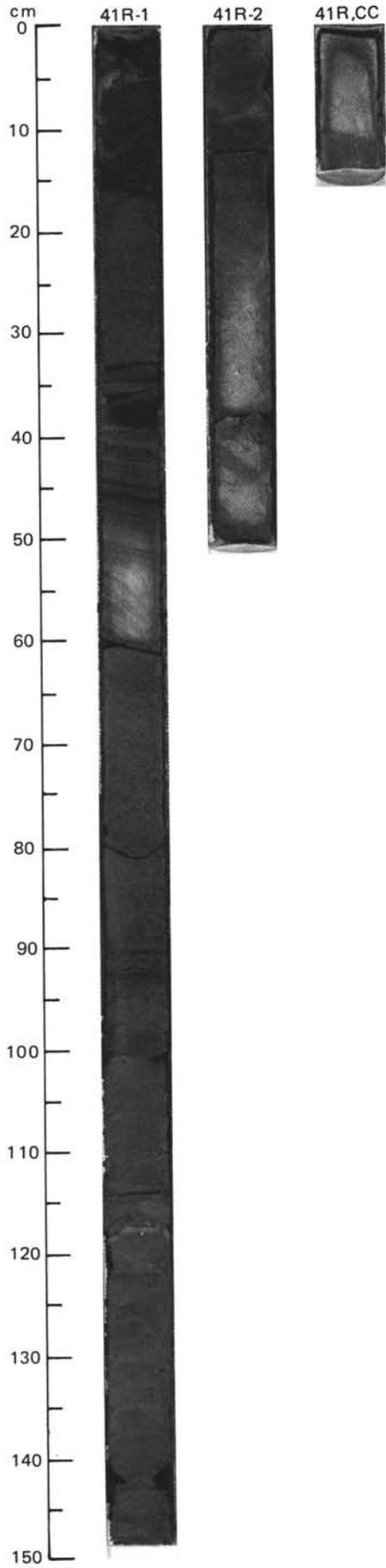


SITE 638 HOLE B CORE 40 R CORED INTERVAL 5035.8-5045.5 mbsl; 373.1-382.8 mbsf

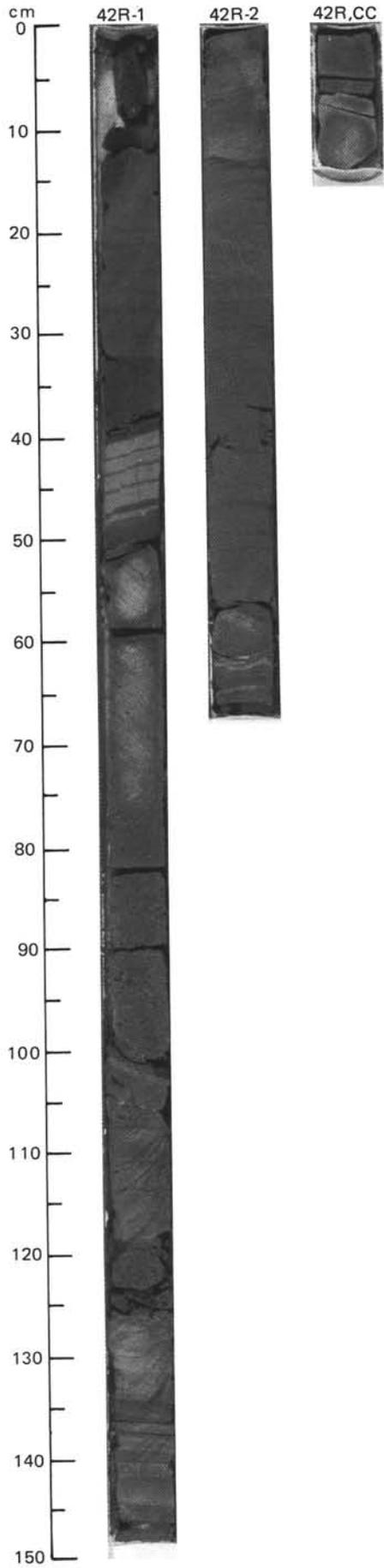
| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |               |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC<br>LITHOLOGY                                                              | DRILLING DISTURB.<br>SED. STRUCTURES                                              | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------|-------------------------------------|---------------|--------------|---------|----------------|------------------|-----------|---------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    | FORAMINIFERS                        | NANNOFOSSILS  | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                                                                                   |                                                                                   |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   | CC-3 / CC 4 a | F/M          | B       |                | ■                | ● 17 %    | 1       |        |  |  |         | <p><b>SANDSTONE and CLAYSTONE</b></p> <p>Core 40 consists of a few pieces of coarse-grained arkosic sandstone rich in plant debris. The sandstone beds display normal grading, parallel and ripple laminae pertaining respectively to the divisions a, b, and c of the Bouma sequence. They are intercalated with gray calcareous claystone also of turbidite origin.</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <p style="text-align: right;">1.53</p> <p><math>V_p</math> (a) 2.63<br/> <math>V_p</math> (b) 1.79<br/> <math>V_p</math> (c) 3.32<br/> <math>\rho_b</math> 2.46</p> |



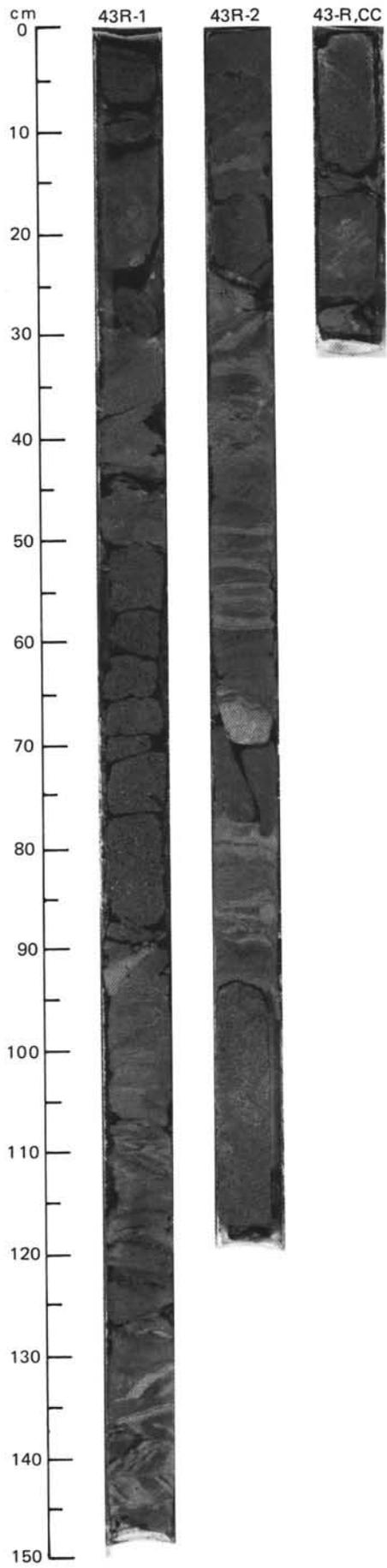
| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |            | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
|------------------------------------|-------------------------------------|--------------|--------------|------------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------|---------|--------|------------|-----------------|--|--|--|--|------|---|---|---|-----|------|---|----|----|---|------|-----|----|----|---|--|---------|---------|--------|------------|--------|---|----|----|----|----------|----|---|---|----|----------------|---|---|---|---|------|----|---|---|----|------|----|----|----|---|------------------|----|----|----|---|----------------|---|---|---|----|----------------------------|--|--|--|--|--------|----|---|----|----|--------|---|---|---|----|---------|---|---|---|----|--------------|----|----|----|---|--------------|---|---|---|---|--|---------|---------|-----|------|-----------|------|---|---|------|-----------|------|---|---|------|-----------|------|------|------|------|----------|------|------|------|------|
|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   |              |              |            |                |                  |           |         |        |                   |                   |                 |         | <p><b>SANDSTONE and CLAYSTONE</b></p> <p>This core consists of a sequence of graded sandstone beds, ranging in thickness from 30 to 50 cm. The sandstone is gray to very dark gray (5Y4/1), coarse to medium grained, and bears terrestrial plant debris in considerable amounts (up to 8%). It grades upwards to siltstone and may be capped by a relatively thin, dark gray (5Y4/1) or grayish brown (2.5Y5/2) claystone layer (Bouma sequences Td and Te). The sandstone beds are either massive (Ta) or parallel laminated (Tb) and may contain claystone clasts, a few centimeters in diameter, in their basal portions (e.g. Sample 2, 40 to 45 centimeters). Pelagic sediment is virtually absent. Recovered portions are fairly undeformed although washing of significant amounts of unconsolidated sediment (chiefly sand) is presumed because of the overall low percentage of core recovery.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,119 M</th> <th>1,133 D</th> <th>2,44 M</th> <th>CC,10-13 D</th> </tr> </thead> <tbody> <tr> <td><b>TEXTURE:</b></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sand</td> <td>-</td> <td>-</td> <td>-</td> <td>100</td> </tr> <tr> <td>Silt</td> <td>-</td> <td>23</td> <td>10</td> <td>-</td> </tr> <tr> <td>Clay</td> <td>100</td> <td>77</td> <td>90</td> <td>-</td> </tr> </tbody> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,119 M</th> <th>1,133 D</th> <th>2,44 M</th> <th>CC,10-13 D</th> </tr> </thead> <tbody> <tr> <td>Quartz</td> <td>-</td> <td>10</td> <td>Tr</td> <td>38</td> </tr> <tr> <td>Feldspar</td> <td>Tr</td> <td>-</td> <td>-</td> <td>20</td> </tr> <tr> <td>Rock Fragments</td> <td>-</td> <td>-</td> <td>-</td> <td>3</td> </tr> <tr> <td>Mica</td> <td>Tr</td> <td>2</td> <td>1</td> <td>12</td> </tr> <tr> <td>Clay</td> <td>68</td> <td>59</td> <td>79</td> <td>-</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>Tr</td> <td>10</td> <td>10</td> <td>-</td> </tr> <tr> <td>Cement-Calcite</td> <td>-</td> <td>-</td> <td>-</td> <td>27</td> </tr> <tr> <td><b>Accessory Minerals:</b></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pyrite</td> <td>Tr</td> <td>1</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Zircon</td> <td>-</td> <td>-</td> <td>-</td> <td>Tr</td> </tr> <tr> <td>Apatite</td> <td>-</td> <td>-</td> <td>-</td> <td>Tr</td> </tr> <tr> <td>Nannofossils</td> <td>30</td> <td>15</td> <td>10</td> <td>-</td> </tr> <tr> <td>Plant Debris</td> <td>2</td> <td>3</td> <td>-</td> <td>-</td> </tr> </tbody> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,119 M</th> <th>1,133 D</th> <th>2,5</th> <th>2,28</th> </tr> </thead> <tbody> <tr> <td><math>V_p</math> (a)</td> <td>4.49</td> <td>-</td> <td>-</td> <td>4.54</td> </tr> <tr> <td><math>V_p</math> (b)</td> <td>4.62</td> <td>-</td> <td>-</td> <td>4.70</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>4.41</td> <td>1.79</td> <td>2.13</td> <td>4.76</td> </tr> <tr> <td><math>\rho_b</math></td> <td>2.69</td> <td>2.11</td> <td>2.35</td> <td>2.66</td> </tr> </tbody> </table> |  | 1,119 M | 1,133 D | 2,44 M | CC,10-13 D | <b>TEXTURE:</b> |  |  |  |  | Sand | - | - | - | 100 | Silt | - | 23 | 10 | - | Clay | 100 | 77 | 90 | - |  | 1,119 M | 1,133 D | 2,44 M | CC,10-13 D | Quartz | - | 10 | Tr | 38 | Feldspar | Tr | - | - | 20 | Rock Fragments | - | - | - | 3 | Mica | Tr | 2 | 1 | 12 | Clay | 68 | 59 | 79 | - | Calcite/Dolomite | Tr | 10 | 10 | - | Cement-Calcite | - | - | - | 27 | <b>Accessory Minerals:</b> |  |  |  |  | Pyrite | Tr | 1 | Tr | Tr | Zircon | - | - | - | Tr | Apatite | - | - | - | Tr | Nannofossils | 30 | 15 | 10 | - | Plant Debris | 2 | 3 | - | - |  | 1,119 M | 1,133 D | 2,5 | 2,28 | $V_p$ (a) | 4.49 | - | - | 4.54 | $V_p$ (b) | 4.62 | - | - | 4.70 | $V_p$ (c) | 4.41 | 1.79 | 2.13 | 4.76 | $\rho_b$ | 2.69 | 2.11 | 2.35 | 2.66 |
|                                    | 1,119 M                             | 1,133 D      | 2,44 M       | CC,10-13 D |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| <b>TEXTURE:</b>                    |                                     |              |              |            |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Sand                               | -                                   | -            | -            | 100        |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Silt                               | -                                   | 23           | 10           | -          |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Clay                               | 100                                 | 77           | 90           | -          |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
|                                    | 1,119 M                             | 1,133 D      | 2,44 M       | CC,10-13 D |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Quartz                             | -                                   | 10           | Tr           | 38         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Feldspar                           | Tr                                  | -            | -            | 20         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Rock Fragments                     | -                                   | -            | -            | 3          |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Mica                               | Tr                                  | 2            | 1            | 12         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Clay                               | 68                                  | 59           | 79           | -          |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Calcite/Dolomite                   | Tr                                  | 10           | 10           | -          |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Cement-Calcite                     | -                                   | -            | -            | 27         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| <b>Accessory Minerals:</b>         |                                     |              |              |            |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Pyrite                             | Tr                                  | 1            | Tr           | Tr         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Zircon                             | -                                   | -            | -            | Tr         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Apatite                            | -                                   | -            | -            | Tr         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Nannofossils                       | 30                                  | 15           | 10           | -          |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| Plant Debris                       | 2                                   | 3            | -            | -          |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
|                                    | 1,119 M                             | 1,133 D      | 2,5          | 2,28       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| $V_p$ (a)                          | 4.49                                | -            | -            | 4.54       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| $V_p$ (b)                          | 4.62                                | -            | -            | 4.70       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| $V_p$ (c)                          | 4.41                                | 1.79         | 2.13         | 4.76       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
| $\rho_b$                           | 2.69                                | 2.11         | 2.35         | 2.66       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |
|                                    |                                     |              |              |            |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |         |         |        |            |                 |  |  |  |  |      |   |   |   |     |      |   |    |    |   |      |     |    |    |   |  |         |         |        |            |        |   |    |    |    |          |    |   |   |    |                |   |   |   |   |      |    |   |   |    |      |    |    |    |   |                  |    |    |    |   |                |   |   |   |    |                            |  |  |  |  |        |    |   |    |    |        |   |   |   |    |         |   |   |   |    |              |    |    |    |   |              |   |   |   |   |  |         |         |     |      |           |      |   |   |      |           |      |   |   |      |           |      |      |      |      |          |      |      |      |      |





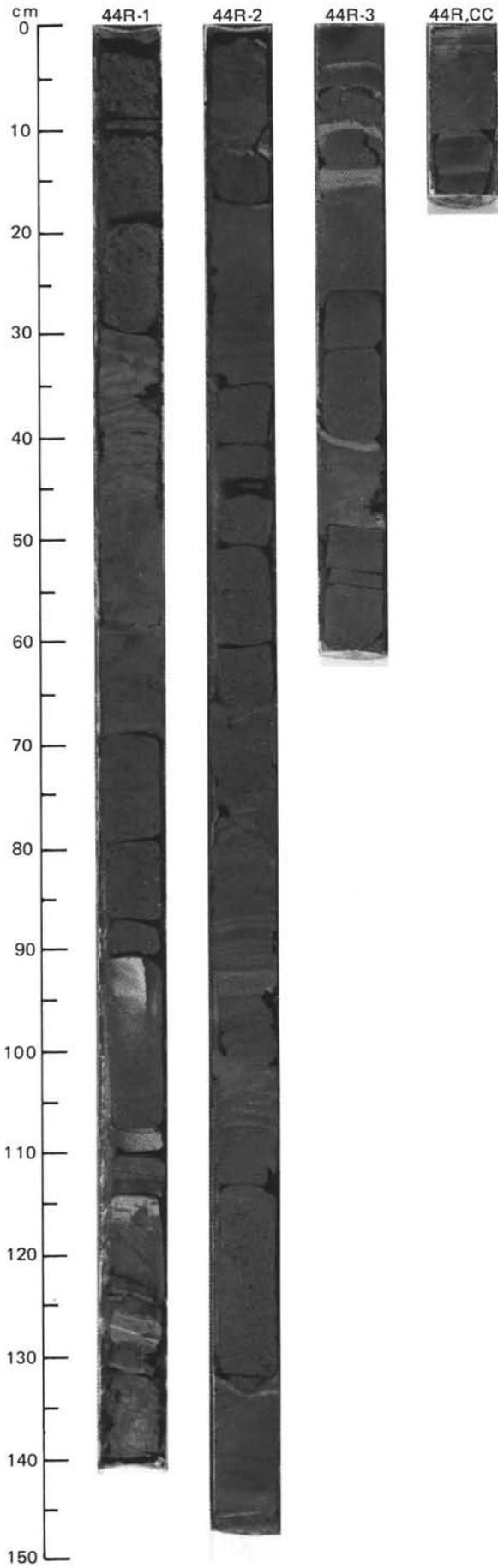


| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |               |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
|------------------------------------|-------------------------------------|---------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------|-------|------|-------|--------------------|---|---|---|------|--------------------|---|---|---|------|--------------------|---|------|---|------|----------------|---|------|---|------|----------------|------|---|------|---|
|                                    | FORAMINIFERS                        | NANNOFOSSILS  | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   | CC-3 / CC 4 a | C/M          | C/P     |                | ■ ■ ● 12 %       |           | 1       | 0.5    |                   |                   |                 | #       | <p><b>SANDSTONE and CLAYSTONE/MARLSTONE COUPLETS</b></p> <p>The core consists of graded sandstone beds, ranging in thickness from 30 to 50 cm, interbedded with thin bedded gray (2.5Y5/1) claystone and light greenish gray (5Y6/1) nannofossil marlstone couplets of turbiditic origin (symbols given in 'Graphic lithology' column are schematic, because thickness of couplets is too small to accurately display at this scale). Sandstone beds are gray to very dark gray (5Y4/1), very coarse to medium grained, and contain considerable amounts (up to 10%) of terrestrial plant debris. Only cemented basal portions of the beds are recovered; these are massive (Ta) and rarely show faint parallel laminae (Tb). Recovered portions are fairly undeformed although loss of significant amounts of unconsolidated sediment (chiefly sand) is presumed.</p> <p><b>THIN SECTION SUMMARY (%):</b></p> <p style="text-align: right;">1,66-70<br/>M</p> <p><b>TEXTURE:</b></p> <p>Clay 100</p> <p><b>COMPOSITION:</b></p> <p>Quartz 1<br/>Mica Tr<br/>Accessory Minerals:<br/>Pyrite 2<br/>Organic Matter 1<br/>Micrite 96<br/>Bioclasts Tr</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>1,100</td> <td>1,131</td> <td>2,50</td> <td>2,116</td> </tr> <tr> <td>V<sub>p</sub> (a)</td> <td>—</td> <td>—</td> <td>—</td> <td>4.39</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>—</td> <td>—</td> <td>—</td> <td>4.22</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>—</td> <td>1.67</td> <td>—</td> <td>3.96</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>—</td> <td>2.06</td> <td>—</td> <td>2.71</td> </tr> <tr> <td>T<sub>c</sub></td> <td>4.07</td> <td>—</td> <td>3.45</td> <td>—</td> </tr> </table> |  | 1,100 | 1,131 | 2,50 | 2,116 | V <sub>p</sub> (a) | — | — | — | 4.39 | V <sub>p</sub> (b) | — | — | — | 4.22 | V <sub>p</sub> (c) | — | 1.67 | — | 3.96 | ρ <sub>b</sub> | — | 2.06 | — | 2.71 | T <sub>c</sub> | 4.07 | — | 3.45 | — |
|                                    | 1,100                               | 1,131         | 2,50         | 2,116   |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
| V <sub>p</sub> (a)                 | —                                   | —             | —            | 4.39    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
| V <sub>p</sub> (b)                 | —                                   | —             | —            | 4.22    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
| V <sub>p</sub> (c)                 | —                                   | 1.67          | —            | 3.96    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
| ρ <sub>b</sub>                     | —                                   | 2.06          | —            | 2.71    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
| T <sub>c</sub>                     | 4.07                                | —             | 3.45         | —       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
|                                    |                                     |               |              |         |                |                  |           | 2       | 1.0    |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |
|                                    |                                     |               |              |         |                |                  |           | CC      |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |      |       |                    |   |   |   |      |                    |   |   |   |      |                    |   |      |   |      |                |   |      |   |      |                |      |   |      |   |



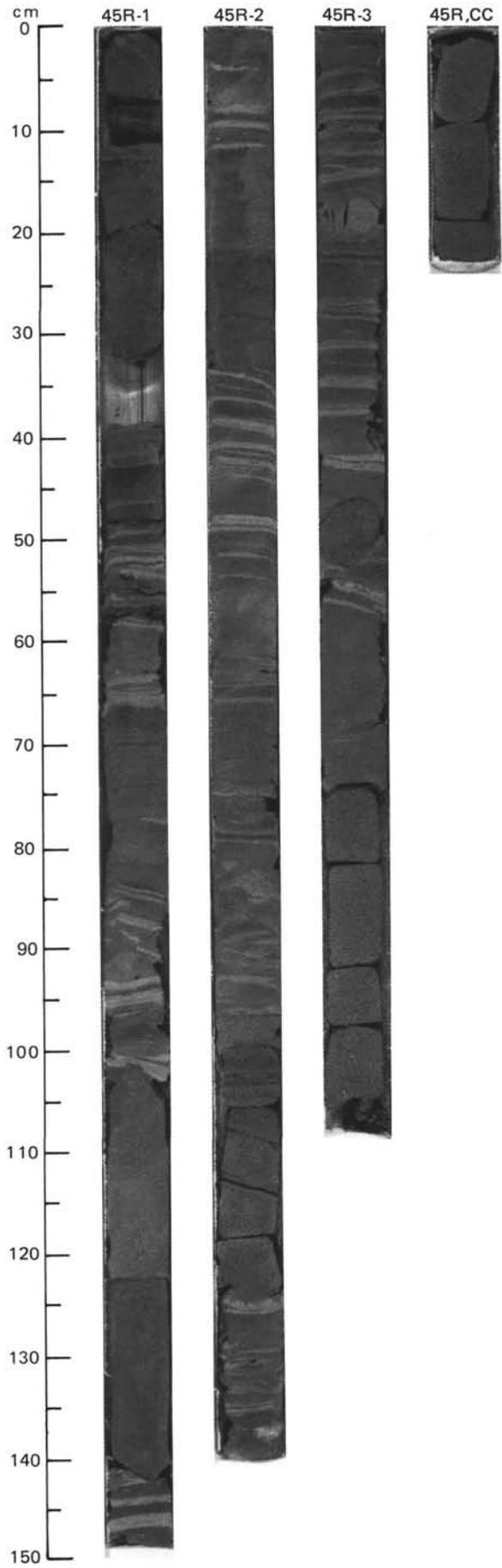
SITE 638 HOLE B CORE 44 R CORED INTERVAL 5074.6-5084.2 mbsl; 411.9-421.5 mbsf

| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |               |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
|------------------------------------|-------------------------------------|---------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------|---------|---------|---------|--|-----|-----|--|--|---|---|---|---|---|--|----------|---------|---------|---------|------|---|---|----|----|------|----|----|---|----|------|----|----|---|---|--|----------|---------|---------|---------|--------|----|----|----|----|----------|---|---|----|----|----------------|---|----|---|---|------|----|----|----|---|------|----|----|---|----|----------------|----|----|----|----|--------------------|----|----|----|---|--------------|---|----|---|---|----------------------|---|----|----|---|--|-------|------|------|--------------------|---|---|------|--------------------|---|---|------|--------------------|------|---|------|----------------|------|---|------|----------------|---|------|---|
|                                    | FORAMINIFERS                        | NANNOFOSSILS  | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   | CC-3 / CC 4 a | F/P          |         |                | 7 %              |           | 1       | 0.5    |                   |                   |                 |         | <p><b>SANDSTONE and CLAYSTONE/MARLSTONE COUPLETS</b></p> <p>The core consists of graded sandstone beds, ranging in thickness from 30 to 50 cm, interbedded with thin-bedded gray (2.5Y4/1) claystone and light greenish gray (5Y5/1) nannofossil marlstone couplets. (symbols given in 'Graphic lithology' column are schematic, because thickness of couplets is too small to accurately display at this scale). Sandstone beds are gray to very dark gray (N/4), very coarse to medium grained, and considerable amounts (up to 10%) of terrestrial plant debris. They are massive (Ta) of the Bouma sequence, rarely showing faint parallel laminae (Tb) and ripple laminae (Tc). Claystone rip-up clasts may be present at the base of the beds (Section 2, 0-60 cm). Most of the fine-grained divisions of major turbidite beds appear to have been washed out of the core during drilling and were not recovered.</p> <p><b>THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>2,98-102</th> <th>3,51-53</th> <th>3,55-57</th> <th>3,59-61</th> </tr> <tr> <th></th> <th>(a)</th> <th>(b)</th> <th></th> <th></th> </tr> </thead> <tbody> <tr> <td>D</td> <td>D</td> <td>D</td> <td>D</td> <td>D</td> </tr> </tbody> </table> <p><b>TEXTURE:</b></p> <table border="1"> <thead> <tr> <th></th> <th>2,98-102</th> <th>3,51-53</th> <th>3,55-57</th> <th>3,59-61</th> </tr> </thead> <tbody> <tr> <td>Sand</td> <td>—</td> <td>—</td> <td>90</td> <td>90</td> </tr> <tr> <td>Silt</td> <td>90</td> <td>90</td> <td>5</td> <td>10</td> </tr> <tr> <td>Clay</td> <td>10</td> <td>10</td> <td>5</td> <td>—</td> </tr> </tbody> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <thead> <tr> <th></th> <th>2,98-102</th> <th>3,51-53</th> <th>3,55-57</th> <th>3,59-61</th> </tr> </thead> <tbody> <tr> <td>Quartz</td> <td>40</td> <td>15</td> <td>30</td> <td>47</td> </tr> <tr> <td>Feldspar</td> <td>3</td> <td>1</td> <td>20</td> <td>15</td> </tr> <tr> <td>Rock Fragments</td> <td>1</td> <td>Tr</td> <td>4</td> <td>5</td> </tr> <tr> <td>Mica</td> <td>20</td> <td>15</td> <td>12</td> <td>5</td> </tr> <tr> <td>Clay</td> <td>Tr</td> <td>10</td> <td>8</td> <td>Tr</td> </tr> <tr> <td>Cement Calcite</td> <td>26</td> <td>29</td> <td>25</td> <td>25</td> </tr> <tr> <td>Accessory Minerals</td> <td>Tr</td> <td>Tr</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Plant Debris</td> <td>5</td> <td>20</td> <td>1</td> <td>3</td> </tr> <tr> <td>Micritic Intraclasts</td> <td>5</td> <td>10</td> <td>Tr</td> <td>—</td> </tr> </tbody> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,111</th> <th>2,49</th> <th>2,56</th> </tr> </thead> <tbody> <tr> <td>V<sub>ρ</sub> (a)</td> <td>—</td> <td>—</td> <td>3.55</td> </tr> <tr> <td>V<sub>ρ</sub> (b)</td> <td>—</td> <td>—</td> <td>3.81</td> </tr> <tr> <td>V<sub>ρ</sub> (c)</td> <td>1.75</td> <td>—</td> <td>3.91</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.15</td> <td>—</td> <td>2.63</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>3.65</td> <td>—</td> </tr> </tbody> </table> |  | 2,98-102 | 3,51-53 | 3,55-57 | 3,59-61 |  | (a) | (b) |  |  | D | D | D | D | D |  | 2,98-102 | 3,51-53 | 3,55-57 | 3,59-61 | Sand | — | — | 90 | 90 | Silt | 90 | 90 | 5 | 10 | Clay | 10 | 10 | 5 | — |  | 2,98-102 | 3,51-53 | 3,55-57 | 3,59-61 | Quartz | 40 | 15 | 30 | 47 | Feldspar | 3 | 1 | 20 | 15 | Rock Fragments | 1 | Tr | 4 | 5 | Mica | 20 | 15 | 12 | 5 | Clay | Tr | 10 | 8 | Tr | Cement Calcite | 26 | 29 | 25 | 25 | Accessory Minerals | Tr | Tr | Tr | — | Plant Debris | 5 | 20 | 1 | 3 | Micritic Intraclasts | 5 | 10 | Tr | — |  | 1,111 | 2,49 | 2,56 | V <sub>ρ</sub> (a) | — | — | 3.55 | V <sub>ρ</sub> (b) | — | — | 3.81 | V <sub>ρ</sub> (c) | 1.75 | — | 3.91 | ρ <sub>b</sub> | 2.15 | — | 2.63 | T <sub>c</sub> | — | 3.65 | — |
|                                    | 2,98-102                            | 3,51-53       | 3,55-57      | 3,59-61 |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
|                                    | (a)                                 | (b)           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| D                                  | D                                   | D             | D            | D       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
|                                    | 2,98-102                            | 3,51-53       | 3,55-57      | 3,59-61 |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Sand                               | —                                   | —             | 90           | 90      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Silt                               | 90                                  | 90            | 5            | 10      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Clay                               | 10                                  | 10            | 5            | —       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
|                                    | 2,98-102                            | 3,51-53       | 3,55-57      | 3,59-61 |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Quartz                             | 40                                  | 15            | 30           | 47      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Feldspar                           | 3                                   | 1             | 20           | 15      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Rock Fragments                     | 1                                   | Tr            | 4            | 5       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Mica                               | 20                                  | 15            | 12           | 5       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Clay                               | Tr                                  | 10            | 8            | Tr      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Cement Calcite                     | 26                                  | 29            | 25           | 25      |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Accessory Minerals                 | Tr                                  | Tr            | Tr           | —       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Plant Debris                       | 5                                   | 20            | 1            | 3       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| Micritic Intraclasts               | 5                                   | 10            | Tr           | —       |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
|                                    | 1,111                               | 2,49          | 2,56         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| V <sub>ρ</sub> (a)                 | —                                   | —             | 3.55         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| V <sub>ρ</sub> (b)                 | —                                   | —             | 3.81         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| V <sub>ρ</sub> (c)                 | 1.75                                | —             | 3.91         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| ρ <sub>b</sub>                     | 2.15                                | —             | 2.63         |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
| T <sub>c</sub>                     | —                                   | 3.65          | —            |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
|                                    |                                     |               |              |         |                |                  |           | 2       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
|                                    |                                     |               |              |         |                |                  |           | 3       |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |
|                                    |                                     |               |              |         |                |                  |           | CC      |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |          |         |         |         |  |     |     |  |  |   |   |   |   |   |  |          |         |         |         |      |   |   |    |    |      |    |    |   |    |      |    |    |   |   |  |          |         |         |         |        |    |    |    |    |          |   |   |    |    |                |   |    |   |   |      |    |    |    |   |      |    |    |   |    |                |    |    |    |    |                    |    |    |    |   |              |   |    |   |   |                      |   |    |    |   |  |       |      |      |                    |   |   |      |                    |   |   |      |                    |      |   |      |                |      |   |      |                |   |      |   |

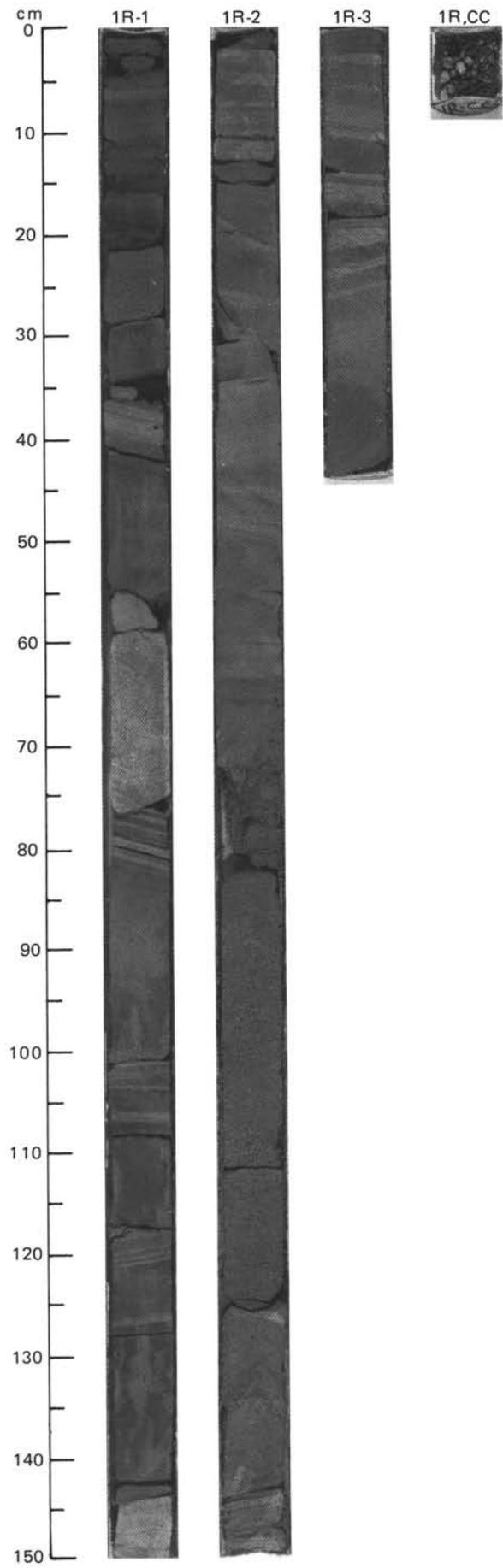


SITE 638 HOLE B CORE 45 R CORED INTERVAL 5084.2-5093.8 mbsl; 421.5-431.1 mbsf

| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | LITHOLOGIC DESCRIPTION |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
|------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-------|------|------|------|-------|--------------------|---|---|---|---|------|--------------------|---|---|---|---|------|--------------------|------|---|------|---|------|----------------|------|---|------|---|------|----------------|---|------|---|------|---|
|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | B                                   | CC-3 / CC4 a | A/P          |         |                | ● 26 %           | 1         | 0.5     |        |                   |                   |                 | <p><b>SANDSTONE and CLAYSTONE/MARLSTONE COUPLETS</b></p> <p>The core consists of graded sandstone beds, ranging in thickness from 30 to 50 cm, interbedded with thin-bedded gray (2.5Y4/1, 5GY4/1) siltstone/claystone and light greenish gray (5Y5/1) nannofossil marlstone couplets (turbidites) (symbols given in 'Graphic lithology' column are schematic, because thickness of couplets is too small to accurately display at this scale). Sandstone beds are gray to very dark gray (N/4), very coarse to medium grained, and contain considerable amounts (up to 10%) of terrestrial plant debris. The sands are massive (Ta) of the Bouma sequence, rarely show faint parallel laminae (Tb) and ripple laminae (Tc). Recovered portions are fairly undeformed although loss of significant amounts of unconsolidated sediment (chiefly sand) is presumed.</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,116</th> <th>2,19</th> <th>2,75</th> <th>3,41</th> <th>3,101</th> </tr> </thead> <tbody> <tr> <td>V<sub>p</sub> (a)</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>3.30</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>3.38</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.80</td> <td>—</td> <td>1.80</td> <td>—</td> <td>3.03</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.30</td> <td>—</td> <td>2.19</td> <td>—</td> <td>2.58</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>3.42</td> <td>—</td> <td>3.46</td> <td>—</td> </tr> </tbody> </table> |                        | 1,116 | 2,19 | 2,75 | 3,41 | 3,101 | V <sub>p</sub> (a) | — | — | — | — | 3.30 | V <sub>p</sub> (b) | — | — | — | — | 3.38 | V <sub>p</sub> (c) | 1.80 | — | 1.80 | — | 3.03 | ρ <sub>b</sub> | 2.30 | — | 2.19 | — | 2.58 | T <sub>c</sub> | — | 3.42 | — | 3.46 | — |
|                                    | 1,116                               | 2,19         | 2,75         | 3,41    | 3,101          |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
| V <sub>p</sub> (a)                 | —                                   | —            | —            | —       | 3.30           |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
| V <sub>p</sub> (b)                 | —                                   | —            | —            | —       | 3.38           |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
| V <sub>p</sub> (c)                 | 1.80                                | —            | 1.80         | —       | 3.03           |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
| ρ <sub>b</sub>                     | 2.30                                | —            | 2.19         | —       | 2.58           |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
| T <sub>c</sub>                     | —                                   | 3.42         | —            | 3.46    | —              |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
|                                    |                                     |              |              |         |                | ● 4 %            | 2         | 1.0     |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
|                                    |                                     |              |              |         |                |                  | 3         |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |
|                                    |                                     |              |              |         |                |                  | CC        |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                        |       |      |      |      |       |                    |   |   |   |   |      |                    |   |   |   |   |      |                    |      |   |      |   |      |                |      |   |      |   |      |                |   |      |   |      |   |

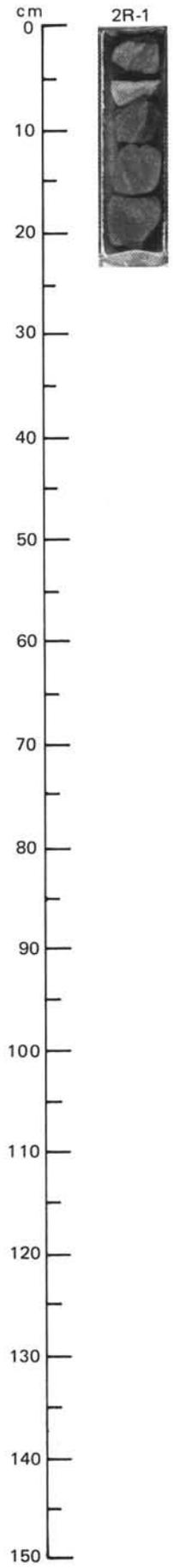


| TIME-ROCK UNIT                     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
|------------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|------|------|-------|--|---|---|---|---|---|-----------------|--|--|--|--|--|------|---|----|----|----|----|------|---|----|----|----|----|---------------------|--|--|--|--|--|--------|----|----|----|---|---|------|---|---|---|----|---|------|---|----|----|----|----|------------------|----|----|---|----|----|----------------------------|--|--|--|--|--|-----------------|---|----|---|---|---|-----------|---|----|---|---|---|-----------------|---|---|---|---|---|--------------|---|---|----|----|---|--------------|----|----|---|---|---|--------------|---|---|----|---|---|----------------------------------|--|--|--|--|--|--|------|------|------|------|--|--------------------|------|---|---|------|--|--------------------|------|---|---|------|--|--------------------|------|------|------|------|--|----------------|------|------|------|------|--|
|                                    | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| LATE VALANGINIAN/EARLY HAUTERIVIAN | R/P                                 | F/P          | CC-3 /CC 4 a | C/P     |                |                  |           | 1       | 0.5    |                   |                   |                 |         | <p><b>SANDSTONE, CLAYSTONE and MARLSTONE</b></p> <p>This core consists of alternations of the following lithologies:</p> <ol style="list-style-type: none"> <li>(1) Dark gray (N/4, N/5), coarse- to fine-grained arkosic sandstone, which is calcite cemented and, in places, rich in coalified wood fragments. Sandstone beds generally show normal size grading and parallel laminations (Tb of the Bouma sequence). The coarser grained sandstone beds are generally massive. Thickness varies from 20 to 40 cm.</li> <li>(2) Dark gray to dark greenish gray (N/4, 5Y4/1, 5Y4/2) faintly laminated (Td) or massive (Te) claystone layers, typically from a few cm up to 20 cm thick. A silty clay horizon is commonly present at the base. Rare, light brownish gray (2.5Y5/1) siderite-rich layers, grading upwards to claystone occur in this lithology (Section 1, 56-60 cm).</li> <li>(3) Light greenish and olive gray (5Y6/1, 5Y7/1 and 5Y6/2), parallel-laminated, nannofossil marlstone layers, averaging 1 cm in thickness.</li> </ol> <p>Lithologies (1) and (2) are turbidites; lithology (3) is pelagic. Sandstone beds occur with a frequency of 2-3 per section and are interbedded in microturbidite sequences consisting of small-scale alternation of lithologies (2) and (3). Lithology (3) constitutes about 5-10% of the core.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,40</th> <th>1,56</th> <th>1,26</th> <th>1,39</th> <th>1,142</th> </tr> <tr> <th></th> <th>M</th> <th>D</th> <th>M</th> <th>M</th> <th>D</th> </tr> </thead> <tbody> <tr> <td><b>TEXTURE:</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Silt</td> <td>—</td> <td>20</td> <td>40</td> <td>29</td> <td>35</td> </tr> <tr> <td>Clay</td> <td>—</td> <td>80</td> <td>60</td> <td>71</td> <td>65</td> </tr> <tr> <td><b>COMPOSITION:</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Quartz</td> <td>Tr</td> <td>10</td> <td>10</td> <td>—</td> <td>—</td> </tr> <tr> <td>Mica</td> <td>—</td> <td>1</td> <td>1</td> <td>Tr</td> <td>3</td> </tr> <tr> <td>Clay</td> <td>—</td> <td>38</td> <td>52</td> <td>50</td> <td>53</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>96</td> <td>45</td> <td>2</td> <td>29</td> <td>15</td> </tr> <tr> <td><b>Accessory Minerals:</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Pyrite, Opaques</td> <td>1</td> <td>Tr</td> <td>—</td> <td>1</td> <td>—</td> </tr> <tr> <td>Amphibole</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Zeol, Pyr, FeOx</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>3</td> </tr> <tr> <td>Nannofossils</td> <td>—</td> <td>—</td> <td>10</td> <td>20</td> <td>5</td> </tr> <tr> <td>Radiolarians</td> <td>Tr</td> <td>Tr</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Plant Debris</td> <td>—</td> <td>—</td> <td>25</td> <td>—</td> <td>1</td> </tr> <tr> <td><b>PHYSICAL PROPERTIES DATA:</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>1,69</td> <td>1,93</td> <td>2,54</td> <td>2,95</td> <td></td> </tr> <tr> <td>V<sub>p</sub> (a)</td> <td>4.20</td> <td>—</td> <td>—</td> <td>4.24</td> <td></td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>4.42</td> <td>—</td> <td>—</td> <td>4.29</td> <td></td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>4.39</td> <td>1.83</td> <td>1.79</td> <td>4.36</td> <td></td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.78</td> <td>2.67</td> <td>2.17</td> <td>2.64</td> <td></td> </tr> </tbody> </table> |  | 1,40 | 1,56 | 1,26 | 1,39 | 1,142 |  | M | D | M | M | D | <b>TEXTURE:</b> |  |  |  |  |  | Silt | — | 20 | 40 | 29 | 35 | Clay | — | 80 | 60 | 71 | 65 | <b>COMPOSITION:</b> |  |  |  |  |  | Quartz | Tr | 10 | 10 | — | — | Mica | — | 1 | 1 | Tr | 3 | Clay | — | 38 | 52 | 50 | 53 | Calcite/Dolomite | 96 | 45 | 2 | 29 | 15 | <b>Accessory Minerals:</b> |  |  |  |  |  | Pyrite, Opaques | 1 | Tr | — | 1 | — | Amphibole | — | Tr | — | — | — | Zeol, Pyr, FeOx | — | — | — | — | 3 | Nannofossils | — | — | 10 | 20 | 5 | Radiolarians | Tr | Tr | — | — | — | Plant Debris | — | — | 25 | — | 1 | <b>PHYSICAL PROPERTIES DATA:</b> |  |  |  |  |  |  | 1,69 | 1,93 | 2,54 | 2,95 |  | V <sub>p</sub> (a) | 4.20 | — | — | 4.24 |  | V <sub>p</sub> (b) | 4.42 | — | — | 4.29 |  | V <sub>p</sub> (c) | 4.39 | 1.83 | 1.79 | 4.36 |  | ρ <sub>b</sub> | 2.78 | 2.67 | 2.17 | 2.64 |  |
|                                    | 1,40                                | 1,56         | 1,26         | 1,39    | 1,142          |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
|                                    | M                                   | D            | M            | M       | D              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| <b>TEXTURE:</b>                    |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Silt                               | —                                   | 20           | 40           | 29      | 35             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Clay                               | —                                   | 80           | 60           | 71      | 65             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| <b>COMPOSITION:</b>                |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Quartz                             | Tr                                  | 10           | 10           | —       | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Mica                               | —                                   | 1            | 1            | Tr      | 3              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Clay                               | —                                   | 38           | 52           | 50      | 53             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Calcite/Dolomite                   | 96                                  | 45           | 2            | 29      | 15             |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| <b>Accessory Minerals:</b>         |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Pyrite, Opaques                    | 1                                   | Tr           | —            | 1       | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Amphibole                          | —                                   | Tr           | —            | —       | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Zeol, Pyr, FeOx                    | —                                   | —            | —            | —       | 3              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Nannofossils                       | —                                   | —            | 10           | 20      | 5              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Radiolarians                       | Tr                                  | Tr           | —            | —       | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| Plant Debris                       | —                                   | —            | 25           | —       | 1              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| <b>PHYSICAL PROPERTIES DATA:</b>   |                                     |              |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
|                                    | 1,69                                | 1,93         | 2,54         | 2,95    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| V <sub>p</sub> (a)                 | 4.20                                | —            | —            | 4.24    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| V <sub>p</sub> (b)                 | 4.42                                | —            | —            | 4.29    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| V <sub>p</sub> (c)                 | 4.39                                | 1.83         | 1.79         | 4.36    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |
| ρ <sub>b</sub>                     | 2.78                                | 2.67         | 2.17         | 2.64    |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |      |      |      |      |       |  |   |   |   |   |   |                 |  |  |  |  |  |      |   |    |    |    |    |      |   |    |    |    |    |                     |  |  |  |  |  |        |    |    |    |   |   |      |   |   |   |    |   |      |   |    |    |    |    |                  |    |    |   |    |    |                            |  |  |  |  |  |                 |   |    |   |   |   |           |   |    |   |   |   |                 |   |   |   |   |   |              |   |   |    |    |   |              |    |    |   |   |   |              |   |   |    |   |   |                                  |  |  |  |  |  |  |      |      |      |      |  |                    |      |   |   |      |  |                    |      |   |   |      |  |                    |      |      |      |      |  |                |      |      |      |      |  |

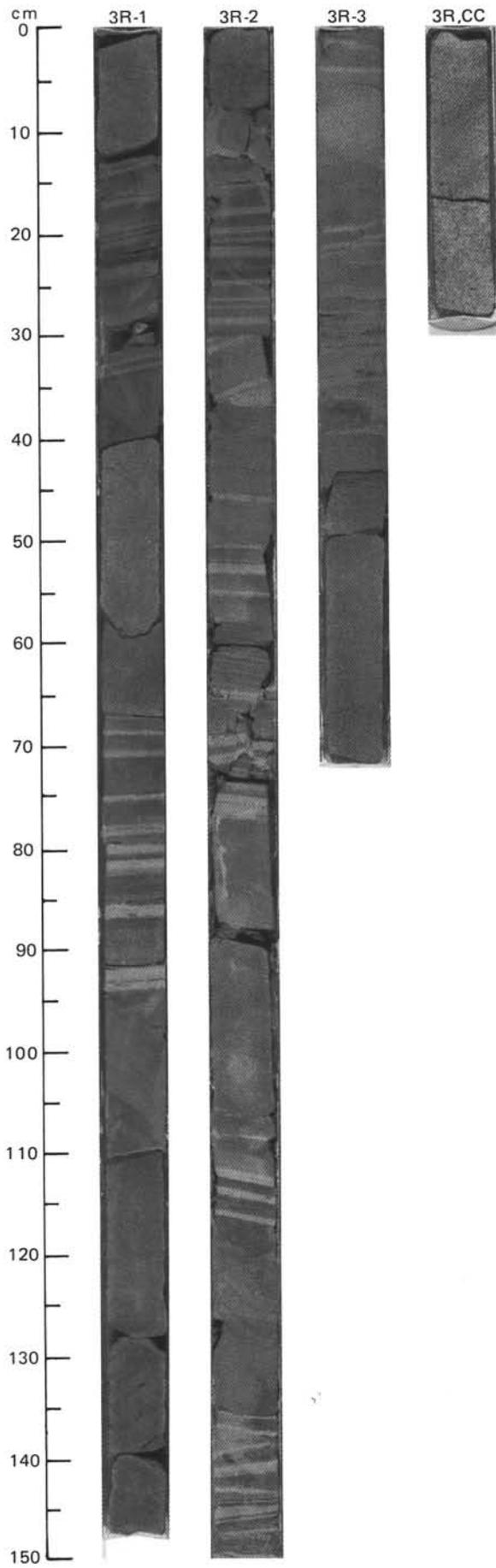


SITE 638 HOLE C CORE 2 R CORED INTERVAL 5084.0-5093.7 mbsl; 421.5-431.2 mbsf

| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY                                                                 | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-----------------------------------------------------------------------------------|-------------------|-----------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                                                                                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                |                                     |              |              |         |                |                  |           | 1       |        |  | /                 |                 | #       | <p><b>SANDSTONE WITH MARLSTONE</b></p> <p>This core consists of a few unoriented pieces of dark gray (N/4), medium-grained sandstone, normally graded and faintly parallel laminated. A fragment of greenish gray (5Y5/1) nannofossil marlstone occurs in Sample 1, 6-8 cm.</p> <p><b>THIN SECTION SUMMARY (%):</b></p> <p style="text-align: right;">1,4<br/>D</p> <p><b>TEXTURE:</b></p> <p>Silt 45<br/>Clay 50</p> <p><b>COMPOSITION:</b></p> <p>Quartz and feldspars 20<br/>Mica 1<br/>Clay 24<br/>Micrite 50<br/>Opagues, organic matter 5<br/>Radiolarians Tr</p> |

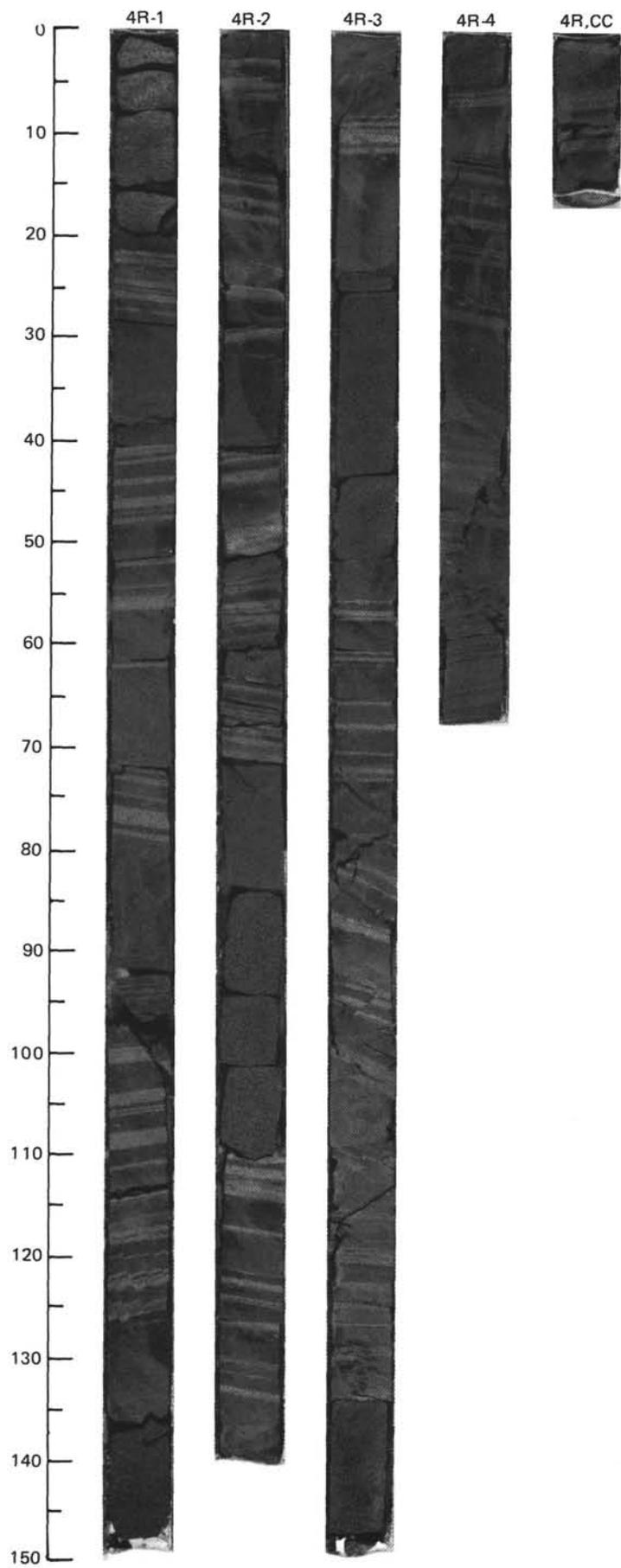






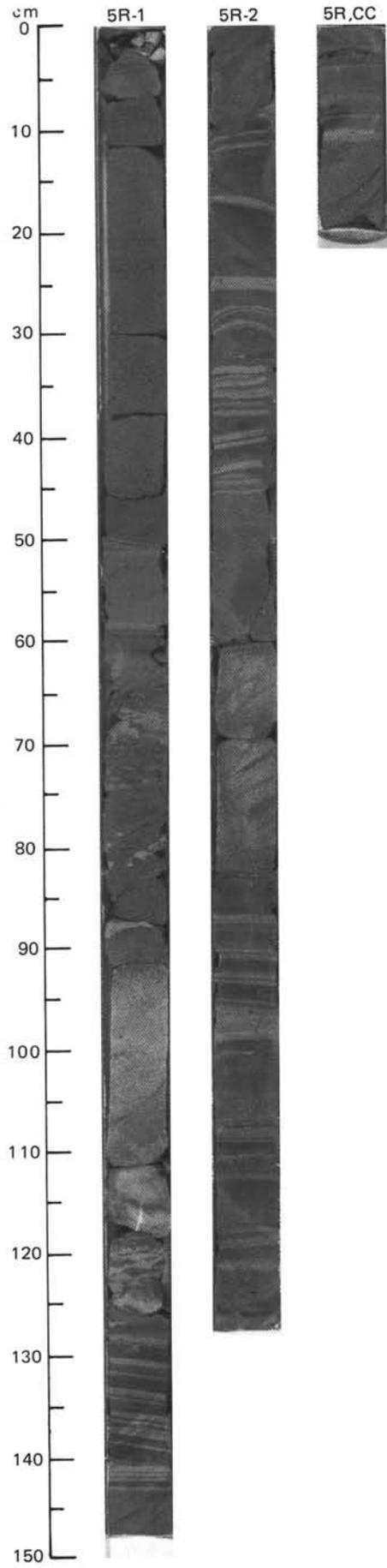
SITE 638 HOLE C CORE 4 R CORED INTERVAL 5103.4-5113.1 mbsl; 440.9-450.5 mbsf

| TIME-ROCK UNIT      | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |                                   |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
|---------------------|-------------------------------------|-----------------------------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|---|--|------|-----|-------------------|----|------|----|--------------------|----|---------------------|--|-----------------|---|--------|----|--------------|----|--------------|----|--------------|----|---------------|----|--|------|------|------|------|------|------|--------------------|------|---|---|---|------|---|--------------------|------|---|---|---|------|---|--------------------|------|------|---|------|------|---|----------------|------|------|---|------|------|---|----------------|---|---|------|---|---|------|
|                     | FORAMINIFERS                        | NANNOFOSSILS                      | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| VALANGINIAN         | C2-3                                | <i>L. nodosa-busnardoii</i> Zones | CC-3 / CC4 a |         |                |                  |           |         |        |                   |                   |                 |         | <p><b>SANDSTONE, CLAYSTONE and MARLSTONE</b></p> <p>This core consists of alternations of the following lithologies:</p> <p>(1) Dark gray (N4/), coarse- to fine-grained arkosic sandstone, which is calcite cemented and in places rich in coalified wood fragments. Sandstone beds generally show normal size grading and parallel laminations (Tb of the Bouma sequence) and range from 20 to 30 cm thick. The coarser grained sandstone beds are generally massive. A few layers, several centimeters thick, of fine-grained, ripple- to convolute-laminated sand occur in Sections 2 and 3 (Tc).</p> <p>(2) Dark gray to dark greenish gray (N/4, 5Y4/1, 5Y4/2) faintly laminated (Td) or massive (Te) claystone layers, typically from a few to 10 cm thick. A silty clay horizon is commonly present at the base of these clay layers. Planolites and Chondrites burrows occur at several levels.</p> <p>(3) Light greenish and olive gray (5Y6/1, 5Y7/1 and 5Y6/2), parallel-laminated, nannofossil marlstone layers, averaging 1 cm thick.</p> <p>Lithologies (1) and (2) are turbidites, lithology (3) is pelagic. Sandstone beds occur with a frequency of 2 per section and are interbedded in microturbidite sequences consisting of small-scale alternations of lithologies (2) and (3). Normal microfaults occur at Sample 1, 121-127 cm. Lithology (3) constitutes about 10-15% of the core.</p> <p><b>THIN SECTION SUMMARY (%):</b></p> <table style="margin-left: 40px;"> <tr><td></td><td>2,47</td></tr> <tr><td>D</td><td></td></tr> </table> <p><b>TEXTURE:</b></p> <table style="margin-left: 40px;"> <tr><td>Silt</td><td>100</td></tr> </table> <p><b>COMPOSITION:</b></p> <table style="margin-left: 40px;"> <tr><td>Quartz, feldspars</td><td>45</td></tr> <tr><td>Mica</td><td>10</td></tr> <tr><td>Clay and microspar</td><td>40</td></tr> <tr><td>Accessory minerals:</td><td></td></tr> <tr><td>    Pyrite, opaques</td><td>4</td></tr> <tr><td>    Zircon</td><td>Tr</td></tr> <tr><td>Radiolarians</td><td>Tr</td></tr> <tr><td>Fish remains</td><td>Tr</td></tr> <tr><td>Plant debris</td><td>Tr</td></tr> <tr><td>Peloid grains</td><td>Tr</td></tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table style="margin-left: 40px;"> <tr><td></td><td>1,11</td><td>1,69</td><td>2,76</td><td>2,78</td><td>3,47</td><td>4,36</td></tr> <tr><td>V<sub>p</sub> (a)</td><td>3.27</td><td>—</td><td>—</td><td>—</td><td>3.62</td><td>—</td></tr> <tr><td>V<sub>p</sub> (b)</td><td>3.10</td><td>—</td><td>—</td><td>—</td><td>3.47</td><td>—</td></tr> <tr><td>V<sub>p</sub> (c)</td><td>3.29</td><td>1.84</td><td>—</td><td>1.86</td><td>3.50</td><td>—</td></tr> <tr><td>ρ<sub>b</sub></td><td>2.57</td><td>2.23</td><td>—</td><td>2.24</td><td>1.23</td><td>—</td></tr> <tr><td>T<sub>c</sub></td><td>—</td><td>—</td><td>3.41</td><td>—</td><td>—</td><td>3.42</td></tr> </table> |  | 2,47 | D |  | Silt | 100 | Quartz, feldspars | 45 | Mica | 10 | Clay and microspar | 40 | Accessory minerals: |  | Pyrite, opaques | 4 | Zircon | Tr | Radiolarians | Tr | Fish remains | Tr | Plant debris | Tr | Peloid grains | Tr |  | 1,11 | 1,69 | 2,76 | 2,78 | 3,47 | 4,36 | V <sub>p</sub> (a) | 3.27 | — | — | — | 3.62 | — | V <sub>p</sub> (b) | 3.10 | — | — | — | 3.47 | — | V <sub>p</sub> (c) | 3.29 | 1.84 | — | 1.86 | 3.50 | — | ρ <sub>b</sub> | 2.57 | 2.23 | — | 2.24 | 1.23 | — | T <sub>c</sub> | — | — | 3.41 | — | — | 3.42 |
|                     | 2,47                                |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| D                   |                                     |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Silt                | 100                                 |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Quartz, feldspars   | 45                                  |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Mica                | 10                                  |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Clay and microspar  | 40                                  |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Accessory minerals: |                                     |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Pyrite, opaques     | 4                                   |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Zircon              | Tr                                  |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Radiolarians        | Tr                                  |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Fish remains        | Tr                                  |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Plant debris        | Tr                                  |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| Peloid grains       | Tr                                  |                                   |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
|                     | 1,11                                | 1,69                              | 2,76         | 2,78    | 3,47           | 4,36             |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| V <sub>p</sub> (a)  | 3.27                                | —                                 | —            | —       | 3.62           | —                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| V <sub>p</sub> (b)  | 3.10                                | —                                 | —            | —       | 3.47           | —                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| V <sub>p</sub> (c)  | 3.29                                | 1.84                              | —            | 1.86    | 3.50           | —                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| ρ <sub>b</sub>      | 2.57                                | 2.23                              | —            | 2.24    | 1.23           | —                |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
| T <sub>c</sub>      | —                                   | —                                 | 3.41         | —       | —              | 3.42             |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
|                     | R/M                                 |                                   |              |         | ■              | ● 25 %           | 1         | 0.5     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
|                     | F/M                                 |                                   |              |         | ■              | ● 7 %            | 2         | 1.0     |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
|                     | C/P                                 |                                   |              |         | ■              | ● 5 %            | 3         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
|                     |                                     |                                   |              |         | ■              | ● 25 %           | 4         |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |
|                     |                                     |                                   |              |         |                |                  | CC        |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |   |  |      |     |                   |    |      |    |                    |    |                     |  |                 |   |        |    |              |    |              |    |              |    |               |    |  |      |      |      |      |      |      |                    |      |   |   |   |      |   |                    |      |   |   |   |      |   |                    |      |      |   |      |      |   |                |      |      |   |      |      |   |                |   |   |      |   |   |      |



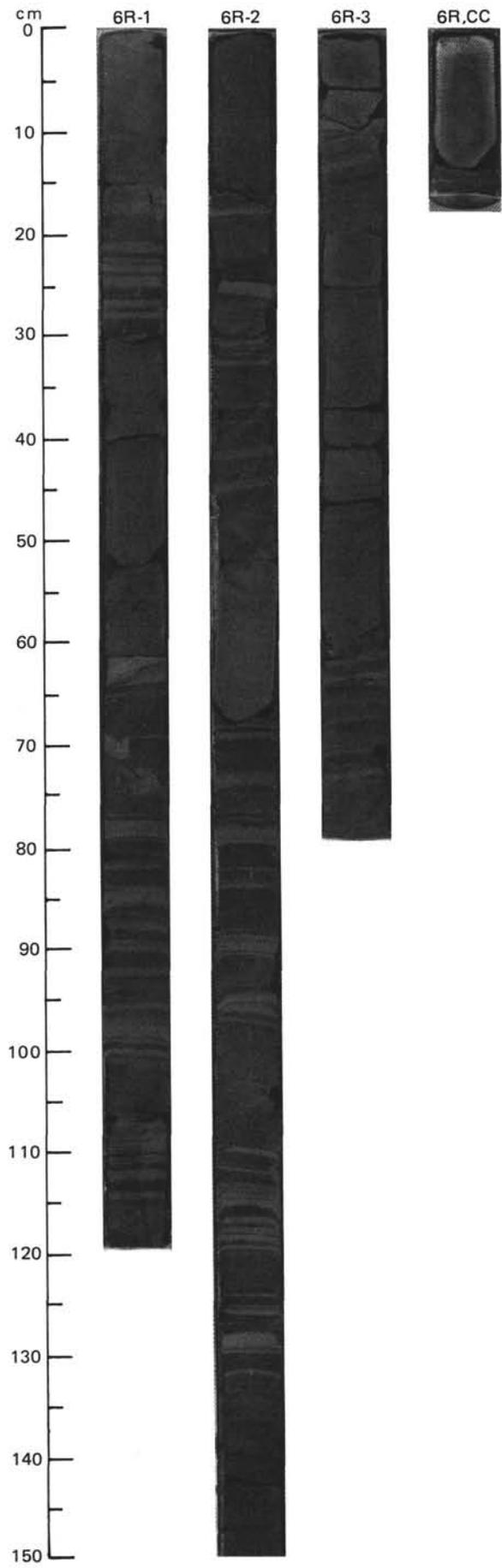
SITE 638 HOLE C CORE 5 R CORED INTERVAL 5113.1-5122.7 mbsl; 450.5-460.2 mbsf

| TIME-ROCK UNIT      | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |               | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY                   | SECTION | METERS     | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
|---------------------|-------------------------------------|--------------|--------------|---------------|----------------|------------------|-----------------------------|---------|------------|-------------------|-------------------|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----|----------|----|------|---|------------------|----|---------------------|--|-----------------|---|--|------|------|------|------|------|------|--------------------|---|------|---|---|---|------|--------------------|---|------|---|---|---|------|--------------------|------|------|---|------|---|------|----------------|------|------|---|------|---|------|----------------|---|---|------|---|------|---|
|                     | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS       |                |                  |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| VALANGINIAN         | B                                   | F/M          | C/P          | CC-3 / CC 4 a |                |                  | 21 %<br>5 %<br>28 %<br>31 % | 1<br>2  | 0.5<br>1.0 |                   |                   | #               |         | <p><b>SANDSTONE, CLAYSTONE and MARLSTONE</b></p> <p>This core consists of alternations of the following lithologies:</p> <ol style="list-style-type: none"> <li>(1) Dark gray (N4/, N5/), coarse- to fine-grained arkosic sandstone, which is calcite cemented and in places rich in coalified wood fragments. Sandstone beds generally show normal size grading and parallel laminations (Tb of the Bouma sequence) at the top. The coarser grained sandstone beds are generally massive. Sandstone beds are 20 to 50 cm thick.</li> <li>(2) Dark greenish gray (N4/, 5Y4/1) faintly laminated (Td) or massive (Te) claystone layers, typically from a few to 10 cm thick. A silty horizon is commonly present at the base.</li> <li>(3) Light greenish gray (5Y6/1, 5Y6/2 and 5Y7/1), parallel-laminated, nannofossil marlstone layers, averaging 1 cm thick.</li> </ol> <p>Lithologies (1) and (2) are turbidites; lithology (3) is pelagic. Sandstone beds occur with a frequency of 2 per section and are interbedded in microturbidite sequences consisting of small-scale alternations of lithologies (2) and (3). Lithology (3) constitutes about 10% of the core.</p> <p><b>THIN SECTION SUMMARY (%):</b></p> <p style="text-align: center;">1,120<br/>D</p> <p><b>COMPOSITION:</b></p> <table border="0"> <tr><td>Quartz,</td><td>50</td></tr> <tr><td>Feldspar</td><td>10</td></tr> <tr><td>Mica</td><td>5</td></tr> <tr><td>Calcite/Dolomite</td><td>33</td></tr> <tr><td>Accessory Minerals:</td><td></td></tr> <tr><td>    Opagues, pyrite</td><td>2</td></tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="0"> <tr> <td></td> <td>1,55</td> <td>1,99</td> <td>2,48</td> <td>2,51</td> <td>2,53</td> <td>2,76</td> </tr> <tr> <td>V<sub>p</sub> (a)</td> <td>—</td> <td>4.76</td> <td>—</td> <td>—</td> <td>—</td> <td>4.47</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>—</td> <td>5.12</td> <td>—</td> <td>—</td> <td>—</td> <td>4.71</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>1.78</td> <td>4.93</td> <td>—</td> <td>1.98</td> <td>—</td> <td>4.81</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.18</td> <td>2.63</td> <td>—</td> <td>2.29</td> <td>—</td> <td>2.69</td> </tr> <tr> <td>T<sub>c</sub></td> <td>—</td> <td>—</td> <td>6.70</td> <td>—</td> <td>4.19</td> <td>—</td> </tr> </table> | Quartz, | 50 | Feldspar | 10 | Mica | 5 | Calcite/Dolomite | 33 | Accessory Minerals: |  | Opagues, pyrite | 2 |  | 1,55 | 1,99 | 2,48 | 2,51 | 2,53 | 2,76 | V <sub>p</sub> (a) | — | 4.76 | — | — | — | 4.47 | V <sub>p</sub> (b) | — | 5.12 | — | — | — | 4.71 | V <sub>p</sub> (c) | 1.78 | 4.93 | — | 1.98 | — | 4.81 | ρ <sub>b</sub> | 2.18 | 2.63 | — | 2.29 | — | 2.69 | T <sub>c</sub> | — | — | 6.70 | — | 4.19 | — |
| Quartz,             | 50                                  |              |              |               |                |                  |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| Feldspar            | 10                                  |              |              |               |                |                  |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| Mica                | 5                                   |              |              |               |                |                  |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| Calcite/Dolomite    | 33                                  |              |              |               |                |                  |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| Accessory Minerals: |                                     |              |              |               |                |                  |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| Opagues, pyrite     | 2                                   |              |              |               |                |                  |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
|                     | 1,55                                | 1,99         | 2,48         | 2,51          | 2,53           | 2,76             |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| V <sub>p</sub> (a)  | —                                   | 4.76         | —            | —             | —              | 4.47             |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| V <sub>p</sub> (b)  | —                                   | 5.12         | —            | —             | —              | 4.71             |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| V <sub>p</sub> (c)  | 1.78                                | 4.93         | —            | 1.98          | —              | 4.81             |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| ρ <sub>b</sub>      | 2.18                                | 2.63         | —            | 2.29          | —              | 2.69             |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |
| T <sub>c</sub>      | —                                   | —            | 6.70         | —             | 4.19           | —                |                             |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |         |    |          |    |      |   |                  |    |                     |  |                 |   |  |      |      |      |      |      |      |                    |   |      |   |   |   |      |                    |   |      |   |   |   |      |                    |      |      |   |      |   |      |                |      |      |   |      |   |      |                |   |   |      |   |      |   |

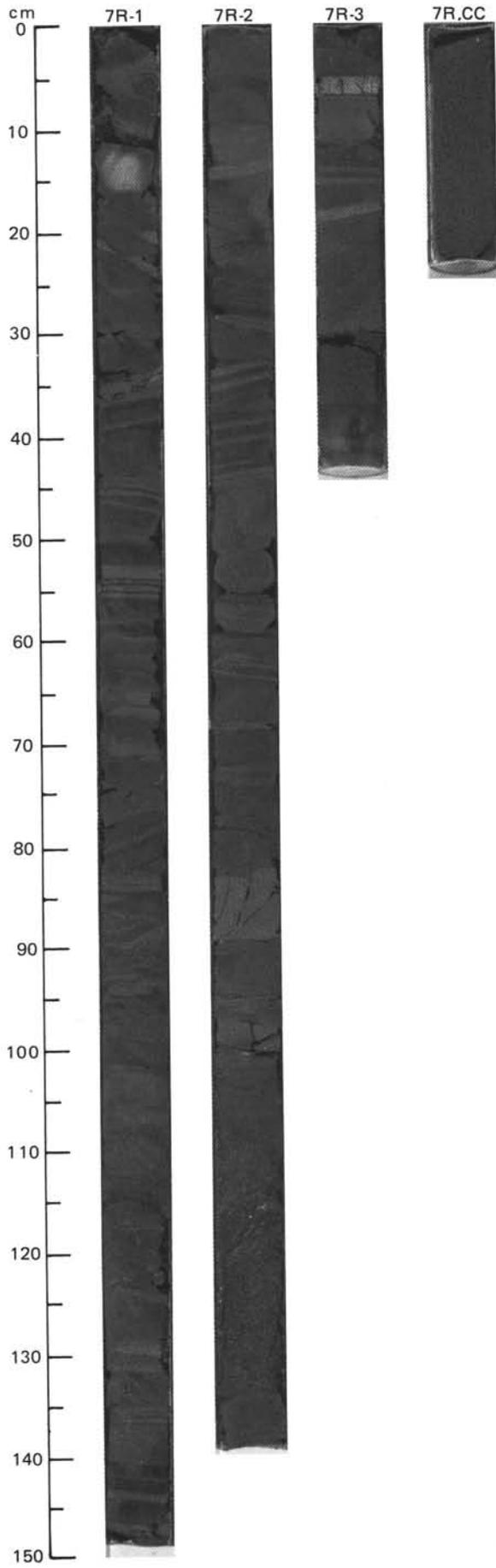


SITE 638 HOLE C CORE 6 R CORED INTERVAL 5122.7-5132.4 mbsl; 460.2-469.9 mbsf

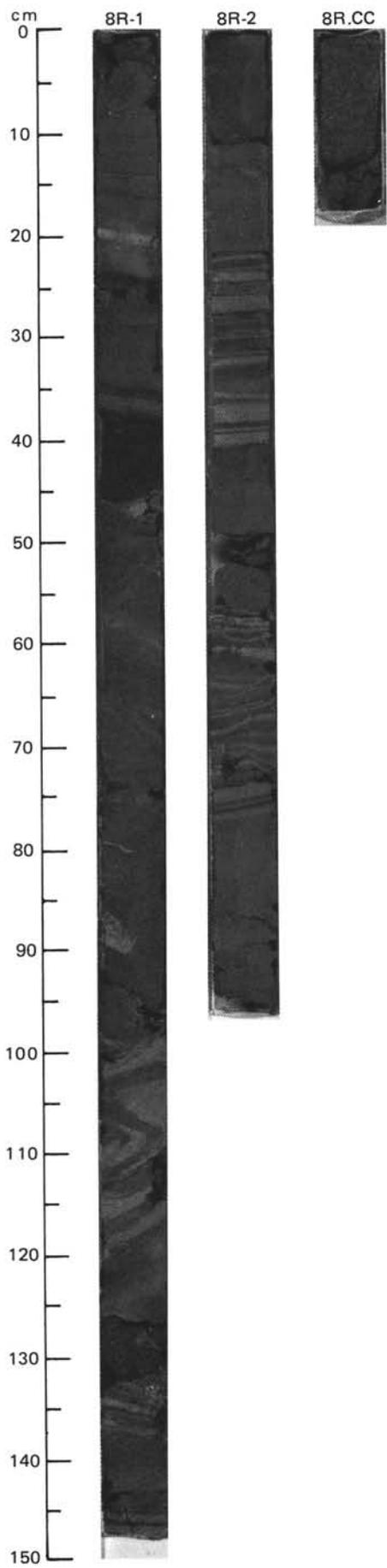
| TIME-ROCK UNIT   | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |               | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
|------------------|-------------------------------------|--------------|--------------|---------------|----------------|------------------|-----------|---------|--------|----------------------|-------------------|-----------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|---|---|---|------|----|----|------|----|----|--------|---|----|----------|---|---|------|---|---|------|----|----|------------------|---|---|--------|---|---|----------------|---|---|--------------|----|---|--------------|----|---|--|------|------|-----|------|-------|------|--------|------|------|------|---|------|------|----------------|------|------|------|---|------|------|----------------|---|---|---|------|---|---|
|                  | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS       |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| VALANGINIAN      | B                                   | C/M          | R/P          | CC-3 / CC 4 a |                |                  |           |         |        |                      |                   |                 |         | <p><b>SANDSTONE, CLAYSTONE and MARLSTONE</b></p> <p>This core consists of alternations of the following lithologies:</p> <p>(1) Dark gray (N4/), coarse- to fine-grained arkosic sandstone, which is calcite cemented and in places rich in coalified wood fragments. Sandstone beds generally show normal size grading, parallel laminations (Tb of the Bouma sequence) and ripple laminae (Tc) at the top. The coarser grained sandstone beds are generally massive. Sandstone beds are 10 to 20 cm thick.</p> <p>(2) Dark greenish gray (5Y4/1) faintly laminated (Td) or massive (Te of the Bouma sequence) claystone layers, typically from a few to 10 cm thick. A silty horizon is commonly present at the base of these layers.</p> <p>(3) Light greenish gray (5Y6/1), parallel-laminated, nannofossil marlstone layers, averaging 1 cm thick.</p> <p>Lithologies (1) and (2) are turbidites. Lithology (3) is pelagic. Sandstone beds occur with a frequency of 2-3 per section and are interbedded in microturbidite sequences consisting of small-scale alternations of lithologies (2) and (3). A siderite-rich layer occurs at Sample 2, 128 cm. Lithology (3) constitutes about 10-15% of the core.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="0"> <tr> <td></td> <td>1,85</td> <td>2,50</td> </tr> <tr> <td>D</td> <td>D</td> <td>D</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="0"> <tr> <td>Silt</td> <td>10</td> <td>15</td> </tr> <tr> <td>Clay</td> <td>90</td> <td>85</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="0"> <tr> <td>Quartz</td> <td>2</td> <td>10</td> </tr> <tr> <td>Feldspar</td> <td>-</td> <td>2</td> </tr> <tr> <td>Mica</td> <td>-</td> <td>5</td> </tr> <tr> <td>Clay</td> <td>40</td> <td>72</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>5</td> <td>2</td> </tr> </table> <p><b>Accessory Minerals:</b></p> <table border="0"> <tr> <td>Pyrite</td> <td>2</td> <td>-</td> </tr> <tr> <td>Opagues+Zircon</td> <td>-</td> <td>1</td> </tr> <tr> <td>Nannofossils</td> <td>50</td> <td>5</td> </tr> <tr> <td>Plant Debris</td> <td>Tr</td> <td>3</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="0"> <tr> <td></td> <td>1,45</td> <td>1,83</td> <td>2,3</td> <td>2,44</td> <td>2,134</td> <td>3,66</td> </tr> <tr> <td>Vp (c)</td> <td>4.56</td> <td>1.78</td> <td>3.70</td> <td>-</td> <td>1.78</td> <td>1.75</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>2.83</td> <td>2.13</td> <td>2.54</td> <td>-</td> <td>2.14</td> <td>2.19</td> </tr> <tr> <td>T<sub>c</sub></td> <td>-</td> <td>-</td> <td>-</td> <td>3.21</td> <td>-</td> <td>-</td> </tr> </table> |  | 1,85 | 2,50 | D | D | D | Silt | 10 | 15 | Clay | 90 | 85 | Quartz | 2 | 10 | Feldspar | - | 2 | Mica | - | 5 | Clay | 40 | 72 | Calcite/Dolomite | 5 | 2 | Pyrite | 2 | - | Opagues+Zircon | - | 1 | Nannofossils | 50 | 5 | Plant Debris | Tr | 3 |  | 1,45 | 1,83 | 2,3 | 2,44 | 2,134 | 3,66 | Vp (c) | 4.56 | 1.78 | 3.70 | - | 1.78 | 1.75 | ρ <sub>b</sub> | 2.83 | 2.13 | 2.54 | - | 2.14 | 2.19 | T <sub>c</sub> | - | - | - | 3.21 | - | - |
|                  | 1,85                                | 2,50         |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| D                | D                                   | D            |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Silt             | 10                                  | 15           |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Clay             | 90                                  | 85           |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Quartz           | 2                                   | 10           |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Feldspar         | -                                   | 2            |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Mica             | -                                   | 5            |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Clay             | 40                                  | 72           |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Calcite/Dolomite | 5                                   | 2            |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Pyrite           | 2                                   | -            |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Opagues+Zircon   | -                                   | 1            |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Nannofossils     | 50                                  | 5            |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Plant Debris     | Tr                                  | 3            |              |               |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
|                  | 1,45                                | 1,83         | 2,3          | 2,44          | 2,134          | 3,66             |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| Vp (c)           | 4.56                                | 1.78         | 3.70         | -             | 1.78           | 1.75             |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| ρ <sub>b</sub>   | 2.83                                | 2.13         | 2.54         | -             | 2.14           | 2.19             |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |
| T <sub>c</sub>   | -                                   | -            | -            | 3.21          | -              | -                |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |      |      |   |   |   |      |    |    |      |    |    |        |   |    |          |   |   |      |   |   |      |    |    |                  |   |   |        |   |   |                |   |   |              |    |   |              |    |   |  |      |      |     |      |       |      |        |      |      |      |   |      |      |                |      |      |      |   |      |      |                |   |   |   |      |   |   |



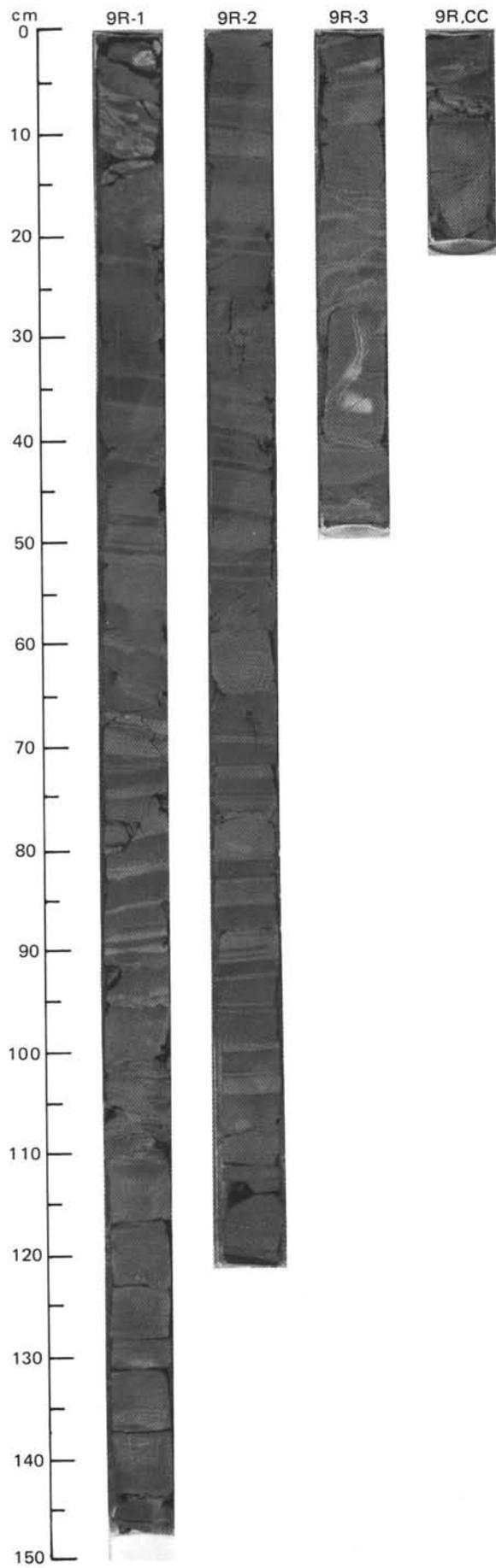
| TIME-ROCK UNIT                | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
|-------------------------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------|-------|--|---|---|------|----|---|------|----|----|------|---|----|--------|----|---|------|---|---|----------|---|----|--------------|---|----|----------|----|---|----------------|---|---|------|---|---|------------------|----|---|-------------------------------|---|---|----------|----|---|------------|----|---|--|-------|------|-------|------|------|-------|------|---|---|------|------|----------|------|---|------|------|------|-------|---|------|---|---|---|
|                               | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| VALANGINIAN                   | B                                   | CC-3 / CC4 a |              |         |                |                  |           | 1       | 0.5    |                   | ///               |                 |         | <p><b>CLAYSTONE and MARLSTONE WITH SAND LAYERS</b></p> <p>This core mainly consists of centimeter-scale alternations of lithologies (2) and (3):</p> <p>(2) Dark gray to greenish gray (N/4, 5Y4/1) faintly laminated (Td) or base. Siderite-rich horizons at the base of claystone layers are rare; their color is olive gray (5Y5/2).</p> <p>(3) Light greenish gray (5Y6/1), parallel-laminated, nannofossil marlstone layers, averaging 1 cm in thick.</p> <p>Several medium- to fine-grained sand layers, poorly cemented to uncemented, a few to 20 cm thick are present. The sand is clay rich and contains wood fragments. Coarser sands are massive or parallel laminated (Ta and Tb of the Bouma sequence); finer and thinner layers show ripple and convolute laminae (Tc). Sands and sandstones correspond to Lithology (1) of the previous cores. A siderite concretionary layer, a few mm thick occur in Section 2 at 95 cm. Lithologies (1) and (2) are turbidites. Lithology (3) is pelagic. Sandstone beds occur with a frequency of 2-3 per section. Lithology (3) constitutes about 20% of the core.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY:</b></p> <table border="1"> <tr> <td></td> <td>2, 57</td> <td>2, 86</td> </tr> <tr> <td></td> <td>D</td> <td>M</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>90</td> <td>—</td> </tr> <tr> <td>Silt</td> <td>10</td> <td>30</td> </tr> <tr> <td>Clay</td> <td>—</td> <td>70</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Quartz</td> <td>38</td> <td>2</td> </tr> <tr> <td>Clay</td> <td>—</td> <td>2</td> </tr> <tr> <td>Siderite</td> <td>—</td> <td>95</td> </tr> <tr> <td>Nannofossils</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Feldspar</td> <td>20</td> <td>—</td> </tr> <tr> <td>Rock fragments</td> <td>5</td> <td>—</td> </tr> <tr> <td>Mica</td> <td>5</td> <td>—</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>30</td> <td>—</td> </tr> </table> <p>Accessory minerals:</p> <table border="1"> <tr> <td>Organic matter, coal fragment</td> <td>2</td> <td>—</td> </tr> <tr> <td>Bioclast</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Intraclast</td> <td>Tr</td> <td>—</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,127</td> <td>2,37</td> <td>2,126</td> <td>3,10</td> <td>CC,7</td> </tr> <tr> <td><math>V_p</math></td> <td>1.82</td> <td>—</td> <td>—</td> <td>1.83</td> <td>3.72</td> </tr> <tr> <td><math>\rho_b</math></td> <td>2.16</td> <td>—</td> <td>2.20</td> <td>2.16</td> <td>2.50</td> </tr> <tr> <td><math>T_c</math></td> <td>—</td> <td>3.59</td> <td>—</td> <td>—</td> <td>—</td> </tr> </table> |  | 2, 57 | 2, 86 |  | D | M | Sand | 90 | — | Silt | 10 | 30 | Clay | — | 70 | Quartz | 38 | 2 | Clay | — | 2 | Siderite | — | 95 | Nannofossils | — | Tr | Feldspar | 20 | — | Rock fragments | 5 | — | Mica | 5 | — | Calcite/Dolomite | 30 | — | Organic matter, coal fragment | 2 | — | Bioclast | Tr | — | Intraclast | Tr | — |  | 1,127 | 2,37 | 2,126 | 3,10 | CC,7 | $V_p$ | 1.82 | — | — | 1.83 | 3.72 | $\rho_b$ | 2.16 | — | 2.20 | 2.16 | 2.50 | $T_c$ | — | 3.59 | — | — | — |
|                               | 2, 57                               | 2, 86        |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
|                               | D                                   | M            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Sand                          | 90                                  | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Silt                          | 10                                  | 30           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Clay                          | —                                   | 70           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Quartz                        | 38                                  | 2            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Clay                          | —                                   | 2            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Siderite                      | —                                   | 95           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Nannofossils                  | —                                   | Tr           |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Feldspar                      | 20                                  | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Rock fragments                | 5                                   | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Mica                          | 5                                   | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Calcite/Dolomite              | 30                                  | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Organic matter, coal fragment | 2                                   | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Bioclast                      | Tr                                  | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| Intraclast                    | Tr                                  | —            |              |         |                |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
|                               | 1,127                               | 2,37         | 2,126        | 3,10    | CC,7           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| $V_p$                         | 1.82                                | —            | —            | 1.83    | 3.72           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| $\rho_b$                      | 2.16                                | —            | 2.20         | 2.16    | 2.50           |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
| $T_c$                         | —                                   | 3.59         | —            | —       | —              |                  |           |         |        |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
|                               |                                     |              |              |         |                |                  |           | 2       | 1.0    |                   | ///               | #               |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
|                               |                                     |              |              |         |                |                  |           | 3       |        |                   | ///               | *               |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |
|                               |                                     |              |              |         |                |                  |           | CC      |        |                   | ///               | W               |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |       |       |  |   |   |      |    |   |      |    |    |      |   |    |        |    |   |      |   |   |          |   |    |              |   |    |          |    |   |                |   |   |      |   |   |                  |    |   |                               |   |   |          |    |   |            |    |   |  |       |      |       |      |      |       |      |   |   |      |      |          |      |   |      |      |      |       |   |      |   |   |   |



| TIME-ROCK UNIT      | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES  | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | LITHOLOGIC DESCRIPTION |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
|---------------------|-------------------------------------|--------------|--------------|---------|----------------|-------------------|-----------|---------|--------|-------------------|-------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|------|--|---|---|------|---|----|------|---|----|------|----|----|--------|---|----|----------|---|----|----------------|---|---|------|----|---|------|---|---|---------|---|----|--------------|---|---|--------------|----|---|---------------------|--|--|--------|---|---|---------|----|---|--|------|-------|------|------|------|--------------------|---|---|------|---|------|--------------------|---|---|------|---|------|--------------------|---|------|------|---|------|----------------|---|------|------|---|------|----------------|------|---|---|------|---|
|                     | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| VALANGINIAN         | B                                   | F/M          | C/P          | B       |                | ■ 64% ● 19% ● 16% | 1         | 0.5     |        |                   |                   | #               | <p><b>SANDSTONE, CLAYSTONE and MARLSTONE</b><br/>This core consists of alternations of the following lithologies:</p> <p>(1) Dark gray (N4/), coarse- to fine-grained, calcite cemented, arkosic sandstone. A few laminae and a thick layer (Sample 1, 37-42 cm) contain very abundant, coarse, coalified plant debris. Sandstone beds generally show normal size grading, parallel laminations (Tb of the Bouma sequence) and, less commonly, ripple laminations (Tc) at the top. Coarse-grained to granule-sized sandstone beds (recovered in the CC) are generally massive. In Sample 2, 11-22 cm, claystone 'rip-up' clasts are present at the boundary between the massive division (Ta) and ripple-laminated division (Tc of the Bouma sequence). Sandstone beds are a few to 10 thick.</p> <p>(2) Dark gray to dark greenish gray (N4/, 5Y4/1) faintly laminated (Td) or massive (Te of the Bouma sequence) claystone layers, typically from a few to 10 cm thick. A silty horizon is commonly present at the base.</p> <p>(3) Light greenish gray (5Y6/1, 5Y5/1), parallel-laminated nannofossil marlstone layers, averaging 2-3 cm in thickness.</p> <p>Lithologies (1) and (2) are turbidites. Lithology (3) is pelagic. Sandstone beds occur with a frequency of 2 per section and are interbedded in microturbidite sequences consisting of small-scale alternation of Lithologies (2) and (3). Slump structures are present at Sample 1, 50 to 130 cm. Light olive gray (2.5Y6/2) siderite-rich layers and nodules occur in Section 1 at 20, 50 and 90-95 cm. Lithology (3) constitutes about 5% of the core.</p> <p><b>THIN SECTION SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>1,46</td> <td>CC,8</td> </tr> <tr> <td></td> <td>D</td> <td>D</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Sand</td> <td>—</td> <td>50</td> </tr> <tr> <td>Silt</td> <td>5</td> <td>25</td> </tr> <tr> <td>Clay</td> <td>95</td> <td>25</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Quartz</td> <td>5</td> <td>40</td> </tr> <tr> <td>Feldspar</td> <td>—</td> <td>28</td> </tr> <tr> <td>Rock Fragments</td> <td>—</td> <td>4</td> </tr> <tr> <td>Clay</td> <td>95</td> <td>—</td> </tr> <tr> <td>Mica</td> <td>—</td> <td>2</td> </tr> <tr> <td>Calcite</td> <td>—</td> <td>25</td> </tr> <tr> <td>Plant debris</td> <td>1</td> <td>—</td> </tr> <tr> <td>Radiolarians</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Accessory Minerals:</td> <td></td> <td></td> </tr> <tr> <td>  Pyrite</td> <td>1</td> <td>—</td> </tr> <tr> <td>  Zeolite</td> <td>Tr</td> <td>—</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,53</td> <td>1,142</td> <td>2,27</td> <td>2,48</td> <td>CC,9</td> </tr> <tr> <td>V<sub>p</sub> (a)</td> <td>—</td> <td>—</td> <td>2.49</td> <td>—</td> <td>3.82</td> </tr> <tr> <td>V<sub>p</sub> (b)</td> <td>—</td> <td>—</td> <td>2.56</td> <td>—</td> <td>3.96</td> </tr> <tr> <td>V<sub>p</sub> (c)</td> <td>—</td> <td>1.88</td> <td>2.64</td> <td>—</td> <td>3.62</td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>—</td> <td>2.20</td> <td>2.41</td> <td>—</td> <td>2.68</td> </tr> <tr> <td>T<sub>c</sub></td> <td>3.63</td> <td>—</td> <td>—</td> <td>3.81</td> <td>—</td> </tr> </table> |                        | 1,46 | CC,8 |  | D | D | Sand | — | 50 | Silt | 5 | 25 | Clay | 95 | 25 | Quartz | 5 | 40 | Feldspar | — | 28 | Rock Fragments | — | 4 | Clay | 95 | — | Mica | — | 2 | Calcite | — | 25 | Plant debris | 1 | — | Radiolarians | Tr | — | Accessory Minerals: |  |  | Pyrite | 1 | — | Zeolite | Tr | — |  | 1,53 | 1,142 | 2,27 | 2,48 | CC,9 | V <sub>p</sub> (a) | — | — | 2.49 | — | 3.82 | V <sub>p</sub> (b) | — | — | 2.56 | — | 3.96 | V <sub>p</sub> (c) | — | 1.88 | 2.64 | — | 3.62 | ρ <sub>b</sub> | — | 2.20 | 2.41 | — | 2.68 | T <sub>c</sub> | 3.63 | — | — | 3.81 | — |
|                     | 1,46                                | CC,8         |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
|                     | D                                   | D            |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Sand                | —                                   | 50           |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Silt                | 5                                   | 25           |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Clay                | 95                                  | 25           |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Quartz              | 5                                   | 40           |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Feldspar            | —                                   | 28           |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Rock Fragments      | —                                   | 4            |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Clay                | 95                                  | —            |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Mica                | —                                   | 2            |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Calcite             | —                                   | 25           |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Plant debris        | 1                                   | —            |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Radiolarians        | Tr                                  | —            |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Accessory Minerals: |                                     |              |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Pyrite              | 1                                   | —            |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| Zeolite             | Tr                                  | —            |              |         |                |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
|                     | 1,53                                | 1,142        | 2,27         | 2,48    | CC,9           |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| V <sub>p</sub> (a)  | —                                   | —            | 2.49         | —       | 3.82           |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| V <sub>p</sub> (b)  | —                                   | —            | 2.56         | —       | 3.96           |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| V <sub>p</sub> (c)  | —                                   | 1.88         | 2.64         | —       | 3.62           |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| ρ <sub>b</sub>      | —                                   | 2.20         | 2.41         | —       | 2.68           |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |
| T <sub>c</sub>      | 3.63                                | —            | —            | 3.81    | —              |                   |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                        |      |      |  |   |   |      |   |    |      |   |    |      |    |    |        |   |    |          |   |    |                |   |   |      |    |   |      |   |   |         |   |    |              |   |   |              |    |   |                     |  |  |        |   |   |         |    |   |  |      |       |      |      |      |                    |   |   |      |   |      |                    |   |   |      |   |      |                    |   |      |      |   |      |                |   |      |      |   |      |                |      |   |   |      |   |

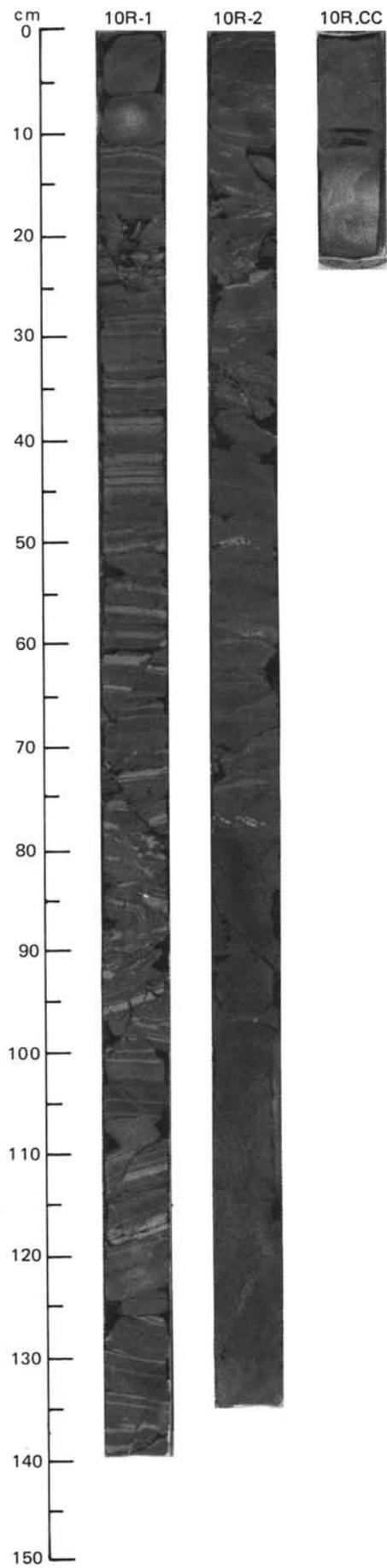


| TIME-ROCK UNIT                        | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |               | PALEOMAGNETICS | PHYS. PROPERTIES      | CHEMISTRY | SECTION<br>METERS | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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   |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
|---------------------------------------|-------------------------------------|--------------|--------------|---------------|----------------|-----------------------|-----------|-------------------|----------------------|-------------------|-----------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|------|------|------|------|-------|--|---|---|---|---|---|---|---|-----------------|--|--|--|--|--|--|--|------|---|----|---|---|---|---|----|------|----|----|----|----|---|----|----|------|----|----|----|----|----|----|----|---------------------|--|--|--|--|--|--|--|--------|----|----|----|---|---|---|----|----------|---|---|---|---|---|---|---|------|---|---|----|---|---|---|----|------|----|----|----|----|----|----|----|------------------|---|---|---|---|---|----|----|----------------------------|--|--|--|--|--|--|--|-----------------------------|----|---|---|---|---|---|---|---------------------|---|----|---|---|---|---|---|---------------------------------------|----|----|----|---|----|----|----|--------------|---|----|----|----|----|----|----|--------------|---|---|---|---|---|----|---|--------------|---|---|---|---|---|---|---|--------|----|---|---|---|---|---|---|----------|---|---|---|---|----|---|---|----------------------------------|--|--|--|--|--|--|--|--|------|-------|-------|------|------|--|--|--------------------|---|------|------|---|------|--|--|--------------------|---|------|---|---|---|--|--|--------------------|---|------|---|---|---|--|--|----------------|---|------|------|---|------|--|--|----------------|------|---|---|------|---|--|--|
|                                       | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS       |                |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| VALANGINIAN                           | R/M                                 | A/G          | F/P          | CC-3 / CC-4 a |                | 18% ● 22% ● 31% ● 35% | 10% ●     | 0.5<br>1.0        |                      |                   |                 |         | <p><b>SANDSTONE, CLAYSTONE and MARLSTONE</b></p> <p>This core consists of alternations of the following lithologies:</p> <ol style="list-style-type: none"> <li>(1) Dark gray to dark greenish gray (N4/, N5/, 5Y4/1), medium- to fine-grained, calcite cemented, arkosic sandstone beds showing normal size grading, parallel laminations (Tb of the Bouma sequence) and ripple laminations (Tc) at the top. Sandstone beds, a few to 10 cm thick, show microfaults which are sealed and cut by calcite-filled veins (Section 3, 30-40 cm), and water-escape structures (Sections 2, 116-118 cm).</li> <li>(2) Dark greenish gray (5Y4/1) faintly laminated (Td) or massive (Te) claystone layers, typically a few cm thick. A silty clay- or siderite-rich horizon generally occurs at the base of claystone layers.</li> <li>(3) Light greenish gray (5Y6/1), parallel-laminated, nannofossil marlstone layers, averaging 1 cm in thickness, either with sharp or gradational boundaries with the underlying claystone.</li> </ol> <p>Lithologies (1) and (2) are turbidites. Lithology (3) is pelagic. Sandstone beds occur with a frequency of 2-3 per section and are interbedded in microturbidite sequences consisting of small-scale alternations of Lithologies (2) and (3). Lithology (3) constitutes about 10% of the core.</p> <p><b>SMEAR SLIDE AND THIN SECTION SUMMARY (%):</b></p> <table border="1"> <thead> <tr> <th></th> <th>1,31</th> <th>1,33</th> <th>1,48</th> <th>1,55</th> <th>2,73</th> <th>2,79</th> <th>CC,17</th> </tr> <tr> <th></th> <th>D</th> <th>M</th> <th>M</th> <th>D</th> <th>D</th> <th>M</th> <th>D</th> </tr> </thead> <tbody> <tr> <td><b>TEXTURE:</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sand</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> <td>—</td> <td>5</td> <td>35</td> </tr> <tr> <td>Silt</td> <td>25</td> <td>20</td> <td>18</td> <td>30</td> <td>5</td> <td>20</td> <td>15</td> </tr> <tr> <td>Clay</td> <td>75</td> <td>80</td> <td>82</td> <td>70</td> <td>95</td> <td>75</td> <td>50</td> </tr> <tr> <td><b>COMPOSITION:</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Quartz</td> <td>10</td> <td>12</td> <td>15</td> <td>8</td> <td>1</td> <td>7</td> <td>35</td> </tr> <tr> <td>Feldspar</td> <td>5</td> <td>—</td> <td>—</td> <td>2</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Mica</td> <td>2</td> <td>2</td> <td>10</td> <td>2</td> <td>—</td> <td>—</td> <td>Tr</td> </tr> <tr> <td>Clay</td> <td>76</td> <td>41</td> <td>55</td> <td>67</td> <td>35</td> <td>33</td> <td>25</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>2</td> <td>2</td> <td>—</td> <td>1</td> <td>3</td> <td>15</td> <td>15</td> </tr> <tr> <td><b>Accessory Minerals:</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Opauques (Pyrite +Hematite)</td> <td>Tr</td> <td>2</td> <td>2</td> <td>1</td> <td>—</td> <td>3</td> <td>—</td> </tr> <tr> <td>Phosphatic Material</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Zircon, Amphibole, Rutile, Tourmaline</td> <td>Tr</td> <td>Tr</td> <td>Tr</td> <td>—</td> <td>Tr</td> <td>Tr</td> <td>Tr</td> </tr> <tr> <td>Nannofossils</td> <td>1</td> <td>40</td> <td>15</td> <td>15</td> <td>60</td> <td>40</td> <td>25</td> </tr> <tr> <td>Fish Remains</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>Tr</td> <td>—</td> </tr> <tr> <td>Plant Debris</td> <td>4</td> <td>1</td> <td>3</td> <td>4</td> <td>1</td> <td>2</td> <td>—</td> </tr> <tr> <td>Spores</td> <td>Tr</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Zeolites</td> <td>—</td> <td>—</td> <td>—</td> <td>—</td> <td>Tr</td> <td>—</td> <td>—</td> </tr> <tr> <td><b>PHYSICAL PROPERTIES DATA:</b></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>1,50</td> <td>1,121</td> <td>1,134</td> <td>2,50</td> <td>2,78</td> <td></td> <td></td> </tr> <tr> <td>V<sub>ρ</sub> (a)</td> <td>—</td> <td>4.46</td> <td>2.25</td> <td>—</td> <td>1.83</td> <td></td> <td></td> </tr> <tr> <td>V<sub>ρ</sub> (b)</td> <td>—</td> <td>5.02</td> <td>—</td> <td>—</td> <td>—</td> <td></td> <td></td> </tr> <tr> <td>V<sub>ρ</sub> (c)</td> <td>—</td> <td>4.76</td> <td>—</td> <td>—</td> <td>—</td> <td></td> <td></td> </tr> <tr> <td>ρ<sub>b</sub></td> <td>—</td> <td>2.67</td> <td>2.45</td> <td>—</td> <td>2.23</td> <td></td> <td></td> </tr> <tr> <td>T<sub>c</sub></td> <td>3.46</td> <td>—</td> <td>—</td> <td>3.87</td> <td>—</td> <td></td> <td></td> </tr> </tbody> </table> |  | 1,31 | 1,33 | 1,48 | 1,55 | 2,73 | 2,79 | CC,17 |  | D | M | M | D | D | M | D | <b>TEXTURE:</b> |  |  |  |  |  |  |  | Sand | — | Tr | — | — | — | 5 | 35 | Silt | 25 | 20 | 18 | 30 | 5 | 20 | 15 | Clay | 75 | 80 | 82 | 70 | 95 | 75 | 50 | <b>COMPOSITION:</b> |  |  |  |  |  |  |  | Quartz | 10 | 12 | 15 | 8 | 1 | 7 | 35 | Feldspar | 5 | — | — | 2 | — | — | — | Mica | 2 | 2 | 10 | 2 | — | — | Tr | Clay | 76 | 41 | 55 | 67 | 35 | 33 | 25 | Calcite/Dolomite | 2 | 2 | — | 1 | 3 | 15 | 15 | <b>Accessory Minerals:</b> |  |  |  |  |  |  |  | Opauques (Pyrite +Hematite) | Tr | 2 | 2 | 1 | — | 3 | — | Phosphatic Material | — | Tr | — | — | — | — | — | Zircon, Amphibole, Rutile, Tourmaline | Tr | Tr | Tr | — | Tr | Tr | Tr | Nannofossils | 1 | 40 | 15 | 15 | 60 | 40 | 25 | Fish Remains | — | — | — | — | — | Tr | — | Plant Debris | 4 | 1 | 3 | 4 | 1 | 2 | — | Spores | Tr | — | — | — | — | — | — | Zeolites | — | — | — | — | Tr | — | — | <b>PHYSICAL PROPERTIES DATA:</b> |  |  |  |  |  |  |  |  | 1,50 | 1,121 | 1,134 | 2,50 | 2,78 |  |  | V <sub>ρ</sub> (a) | — | 4.46 | 2.25 | — | 1.83 |  |  | V <sub>ρ</sub> (b) | — | 5.02 | — | — | — |  |  | V <sub>ρ</sub> (c) | — | 4.76 | — | — | — |  |  | ρ <sub>b</sub> | — | 2.67 | 2.45 | — | 2.23 |  |  | T <sub>c</sub> | 3.46 | — | — | 3.87 | — |  |  |
|                                       | 1,31                                | 1,33         | 1,48         | 1,55          | 2,73           | 2,79                  | CC,17     |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |   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|                                       | D                                   | M            | M            | D             | D              | M                     | D         |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| <b>TEXTURE:</b>                       |                                     |              |              |               |                |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Sand                                  | —                                   | Tr           | —            | —             | —              | 5                     | 35        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Silt                                  | 25                                  | 20           | 18           | 30            | 5              | 20                    | 15        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Clay                                  | 75                                  | 80           | 82           | 70            | 95             | 75                    | 50        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| <b>COMPOSITION:</b>                   |                                     |              |              |               |                |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Quartz                                | 10                                  | 12           | 15           | 8             | 1              | 7                     | 35        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Feldspar                              | 5                                   | —            | —            | 2             | —              | —                     | —         |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Mica                                  | 2                                   | 2            | 10           | 2             | —              | —                     | Tr        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Clay                                  | 76                                  | 41           | 55           | 67            | 35             | 33                    | 25        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Calcite/Dolomite                      | 2                                   | 2            | —            | 1             | 3              | 15                    | 15        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| <b>Accessory Minerals:</b>            |                                     |              |              |               |                |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Opauques (Pyrite +Hematite)           | Tr                                  | 2            | 2            | 1             | —              | 3                     | —         |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Phosphatic Material                   | —                                   | Tr           | —            | —             | —              | —                     | —         |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Zircon, Amphibole, Rutile, Tourmaline | Tr                                  | Tr           | Tr           | —             | Tr             | Tr                    | Tr        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Nannofossils                          | 1                                   | 40           | 15           | 15            | 60             | 40                    | 25        |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Fish Remains                          | —                                   | —            | —            | —             | —              | Tr                    | —         |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Plant Debris                          | 4                                   | 1            | 3            | 4             | 1              | 2                     | —         |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Spores                                | Tr                                  | —            | —            | —             | —              | —                     | —         |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| Zeolites                              | —                                   | —            | —            | —             | Tr             | —                     | —         |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| <b>PHYSICAL PROPERTIES DATA:</b>      |                                     |              |              |               |                |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
|                                       | 1,50                                | 1,121        | 1,134        | 2,50          | 2,78           |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| V <sub>ρ</sub> (a)                    | —                                   | 4.46         | 2.25         | —             | 1.83           |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| V <sub>ρ</sub> (b)                    | —                                   | 5.02         | —            | —             | —              |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| V <sub>ρ</sub> (c)                    | —                                   | 4.76         | —            | —             | —              |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| ρ <sub>b</sub>                        | —                                   | 2.67         | 2.45         | —             | 2.23           |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |
| T <sub>c</sub>                        | 3.46                                | —            | —            | 3.87          | —              |                       |           |                   |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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  |    |      |    |    |    |    |   |    |    |      |    |    |    |    |    |    |    |                     |  |  |  |  |  |  |  |        |    |    |    |   |   |   |    |          |   |   |   |   |   |   |   |      |   |   |    |   |   |   |    |      |    |    |    |    |    |    |    |                  |   |   |   |   |   |    |    |                            |  |  |  |  |  |  |  |                             |    |   |   |   |   |   |   |                     |   |    |   |   |   |   |   |                                       |    |    |    |   |    |    |    |              |   |    |    |    |    |    |    |              |   |   |   |   |   |    |   |              |   |   |   |   |   |   |   |        |    |   |   |   |   |   |   |          |   |   |   |   |    |   |   |                                  |  |  |  |  |  |  |  |  |      |       |       |      |      |  |  |                    |   |      |      |   |      |  |  |                    |   |      |   |   |   |  |  |                    |   |      |   |   |   |  |  |                |   |      |      |   |      |  |  |                |      |   |   |      |   |  |  |

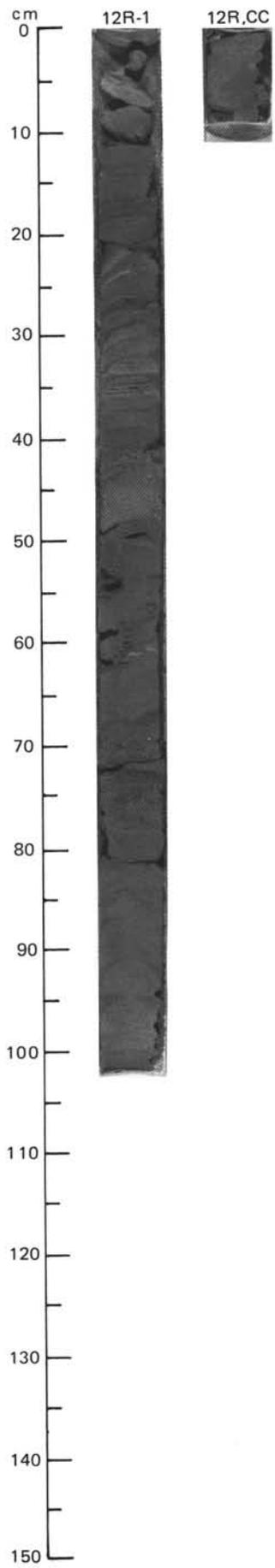


| TIME-ROCK UNIT     | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |               |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS     | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
|--------------------|-------------------------------------|---------------|--------------|---------|----------------|------------------|-----------|---------|------------|-------------------|-------------------|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-------|-------|--|---|---|------|----|----|------|----|----|--------|---|----|----------|----|---|------|----|----|------|----|----|------------------|---|---|--------------------|---|---|---------|---|---|-----------|---|---|--------------|---|---|--------------|---|---|--------------|---|---|--|-------|------|-------|-----------|------|---|------|----------|------|---|------|-------|---|------|---|
|                    | FORAMINIFERS                        | NANNOFOSSILS  | RADIOLARIANS | DIATOMS |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| VALANGINIAN        | B                                   | CC-3 / CC 4 a | C/G          | A/P     |                | ■ 5 %<br>● 11 %  |           | 1<br>2  | 0.5<br>1.0 |                   |                   |                 |         | <p><b>CLAYSTONE and MARLSTONE WITH SANDSTONE BEDS</b></p> <p>This core consists of alternations of the following lithologies:</p> <p>(1) Dark gray (N4/, N5/) medium- to fine-grained, calcite cemented arkosic sandstone beds, averaging 10 cm in thickness and showing normal size grading, a massive texture (Ta) and parallel laminations (Tb). Fine-grained, thin sandstone beds, averaging 1 cm thick, with sharp, planar boundaries and showing ripple laminae, occur in Section 1.</p> <p>(2) Dark greenish gray (5Y4/1) faintly laminated (Td of the Bouma sequence) or massive (Te) claystone layers, typically a few cm thick (Section 1). In Sample 2, 40-150 cm, massive silty claystone beds averaging 20 cm thick, are present. A silty clay horizon generally occurs at the base of most beds.</p> <p>(3) Light greenish gray (5Y6/1), parallel-laminated, nannofossil marlstone layers, typically averaging 1 cm thick, either with sharp or gradational boundaries with the underlying claystone.</p> <p>Lithologies (1) and (2) are turbidites. Lithology (3) is pelagic. Thicker sandstone beds occur with a frequency of 1 per section and are interbedded in microturbidite sequences consisting of small-scale alternations of Lithologies (2) and (3). Lithology (3) constitutes about 10% of the core.</p> <p><b>SMEAR SLIDE SUMMARY (%):</b></p> <table border="1"> <tr> <td></td> <td>2,116</td> <td>2,133</td> </tr> <tr> <td></td> <td>D</td> <td>M</td> </tr> </table> <p><b>TEXTURE:</b></p> <table border="1"> <tr> <td>Silt</td> <td>20</td> <td>35</td> </tr> <tr> <td>Clay</td> <td>80</td> <td>65</td> </tr> </table> <p><b>COMPOSITION:</b></p> <table border="1"> <tr> <td>Quartz</td> <td>3</td> <td>15</td> </tr> <tr> <td>Feldspar</td> <td>Tr</td> <td>1</td> </tr> <tr> <td>Mica</td> <td>10</td> <td>10</td> </tr> <tr> <td>Clay</td> <td>75</td> <td>60</td> </tr> <tr> <td>Calcite/Dolomite</td> <td>2</td> <td>3</td> </tr> <tr> <td>Accessory Minerals</td> <td>1</td> <td>3</td> </tr> <tr> <td>Opaques</td> <td>2</td> <td>2</td> </tr> <tr> <td>Siderite?</td> <td>2</td> <td>2</td> </tr> <tr> <td>Nannofossils</td> <td>3</td> <td>3</td> </tr> <tr> <td>Fish Remains</td> <td>1</td> <td>-</td> </tr> <tr> <td>Plant Debris</td> <td>1</td> <td>1</td> </tr> </table> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table border="1"> <tr> <td></td> <td>1,130</td> <td>2,71</td> <td>2,118</td> </tr> <tr> <td><math>V_p</math> (a)</td> <td>1.78</td> <td>-</td> <td>1.91</td> </tr> <tr> <td><math>\rho_b</math></td> <td>2.18</td> <td>-</td> <td>2.24</td> </tr> <tr> <td><math>T_c</math></td> <td>-</td> <td>4.26</td> <td>-</td> </tr> </table> |  | 2,116 | 2,133 |  | D | M | Silt | 20 | 35 | Clay | 80 | 65 | Quartz | 3 | 15 | Feldspar | Tr | 1 | Mica | 10 | 10 | Clay | 75 | 60 | Calcite/Dolomite | 2 | 3 | Accessory Minerals | 1 | 3 | Opaques | 2 | 2 | Siderite? | 2 | 2 | Nannofossils | 3 | 3 | Fish Remains | 1 | - | Plant Debris | 1 | 1 |  | 1,130 | 2,71 | 2,118 | $V_p$ (a) | 1.78 | - | 1.91 | $\rho_b$ | 2.18 | - | 2.24 | $T_c$ | - | 4.26 | - |
|                    | 2,116                               | 2,133         |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
|                    | D                                   | M             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Silt               | 20                                  | 35            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Clay               | 80                                  | 65            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Quartz             | 3                                   | 15            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Feldspar           | Tr                                  | 1             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Mica               | 10                                  | 10            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Clay               | 75                                  | 60            |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Calcite/Dolomite   | 2                                   | 3             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Accessory Minerals | 1                                   | 3             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Opaques            | 2                                   | 2             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Siderite?          | 2                                   | 2             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Nannofossils       | 3                                   | 3             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Fish Remains       | 1                                   | -             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| Plant Debris       | 1                                   | 1             |              |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
|                    | 1,130                               | 2,71          | 2,118        |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| $V_p$ (a)          | 1.78                                | -             | 1.91         |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| $\rho_b$           | 2.18                                | -             | 2.24         |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |
| $T_c$              | -                                   | 4.26          | -            |         |                |                  |           |         |            |                   |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |       |       |  |   |   |      |    |    |      |    |    |        |   |    |          |    |   |      |    |    |      |    |    |                  |   |   |                    |   |   |         |   |   |           |   |   |              |   |   |              |   |   |              |   |   |  |       |      |       |           |      |   |      |          |      |   |      |       |   |      |   |

CORE 11 R NO RECOVERY



| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | LITHOLOGIC DESCRIPTION |
|----------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|-------------------|-------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                   |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                        |
| VALANGINIAN    | B                                   | F/M          | B            |         | ■              | ● 11 %           | CC        | 1       | 0.5    |                   | ///               | #               | <p><b>SILTY CLAY and MARLSTONE WITH SANDSTONE BEDS</b></p> <p>The core consists of dominantly dark gray and dark greenish gray (N4/5Y4/1) silty clay, massive or faintly graded and ranging in thickness from a few mm up to a few cm. Silty clay beds alternate with mm-thick laminae of light greenish gray (5Y5/1), nannofossil marlstone. A few layers, up to 5 cm thick, of fine-grained, parallel- and ripple-laminated sandstone occur. A high percentage (up to 20%) of coalified plant remains occur in the sandstone and dark gray claystone.</p> <p><b>THIN SECTION SUMMARY (%):</b></p> <p style="text-align: right;">1,2<br/>D</p> <p><b>TEXTURE:</b></p> <p>Silt 40<br/>Clay 60</p> <p><b>COMPOSITION:</b></p> <p>Quartz 30<br/>Mica 10<br/>Clay 50<br/>Accessory minerals:<br/>Opauques 10</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <p style="text-align: right;">1,71    1,91</p> <p><math>V\rho</math> (a) — 1.84<br/><math>\rho_b</math> — 2.17<br/><math>T_c</math> 4.24 —</p> |                        |



SITE 638 HOLE C CORE 13 R CORED INTERVAL 5190.4-5200 mbsl; 527.9-537.5 mbsf

| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY | SECTION | METERS | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |      |      |           |      |   |          |      |   |       |   |      |
|----------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|-----------|---------|--------|----------------------|-------------------|-----------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------|------|-----------|------|---|----------|------|---|-------|---|------|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |           |      |   |          |      |   |       |   |      |
| VALANGINIAN    | B                                   | A/M          |              |         |                | ■                | ● 5 %     | 1       |        |                      |                   |                 |         | <p><b>SILTY CLAY and CLAY WITH SANDSTONE BEDS</b></p> <p>The core consists of a highly disturbed mixture of clay and silty clay, with sandy stringers and blebs. Sand ranges from medium- to fine-grained. Graded silty clay to clay layers, with thin laminations at base, are present throughout. Siderite-rich clay layers, 1-2 mm thick, light gray to pale yellow (2.5Y7/2 and 2.5Y7/4) occur at Section 1, 43, 46, 47 and 49 cm. Pyrite specks occur in the dark gray claystone.</p> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table style="margin-left: 40px;"> <tr> <td></td> <td>1,36</td> <td>CC,7</td> </tr> <tr> <td><math>V_p</math> (a)</td> <td>1.97</td> <td>—</td> </tr> <tr> <td><math>\rho_b</math></td> <td>2.21</td> <td>—</td> </tr> <tr> <td><math>T_c</math></td> <td>—</td> <td>4.30</td> </tr> </table> |  | 1,36 | CC,7 | $V_p$ (a) | 1.97 | — | $\rho_b$ | 2.21 | — | $T_c$ | — | 4.30 |
|                | 1,36                                | CC,7         |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |           |      |   |          |      |   |       |   |      |
| $V_p$ (a)      | 1.97                                | —            |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |           |      |   |          |      |   |       |   |      |
| $\rho_b$       | 2.21                                | —            |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |           |      |   |          |      |   |       |   |      |
| $T_c$          | —                                   | 4.30         |              |         |                |                  |           |         |        |                      |                   |                 |         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |      |      |           |      |   |          |      |   |       |   |      |

SITE 638 HOLE C CORE 14 R CORED INTERVAL 5200-5209.7 mbsl; 537.5-547.2 mbsf

| TIME-ROCK UNIT | BIOSTRAT. ZONE/<br>FOSSIL CHARACTER |              |              |         | PALEOMAGNETICS | PHYS. PROPERTIES | CHEMISTRY                 | SECTION | METERS     | GRAPHIC<br>LITHOLOGY | DRILLING DISTURB. | SED. STRUCTURES | SAMPLES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | LITHOLOGIC DESCRIPTION |      |       |     |      |           |   |   |      |   |           |   |   |      |   |           |   |      |      |      |          |   |      |      |      |       |      |   |   |   |
|----------------|-------------------------------------|--------------|--------------|---------|----------------|------------------|---------------------------|---------|------------|----------------------|-------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------|-------|-----|------|-----------|---|---|------|---|-----------|---|---|------|---|-----------|---|------|------|------|----------|---|------|------|------|-------|------|---|---|---|
|                | FORAMINIFERS                        | NANNOFOSSILS | RADIOLARIANS | DIATOMS |                |                  |                           |         |            |                      |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |      |       |     |      |           |   |   |      |   |           |   |   |      |   |           |   |      |      |      |          |   |      |      |      |       |      |   |   |   |
| ?              | R/P                                 | B            |              |         |                | ■                | ● 5 %<br>● 28 %<br>● 10 % | 1       | 0.5<br>1.0 |                      |                   |                 | <p><b>SANDSTONE, CLAYSTONE and MARLSTONE</b></p> <p>The core consists of alternations of the following lithologies:</p> <ol style="list-style-type: none"> <li>(1) Dark gray (N4/), either uncemented or calcite cemented, coarse- to medium-grained sandstone, massive (Ta), parallel laminated (Tb) and ripple laminated (Tc).</li> <li>(2) Dark greenish gray (5Y4/1, 5Y5/1), massive and faintly laminated claystone, slightly bioturbated. Claystone layers range from a few to 6-7 cm in thickness.</li> <li>(3) Thin layers (1 to 5 mm thick) of light greenish gray (5Y6/1) and olive gray (5Y6/3), laminated nannofossil marlstone. Lithologies (2) and (3) alternate at a centimeter scale in Sample 1, 40 to 120 cm and are interpreted as microturbidites. Sandstone constitutes about 25% of the core; pelagic marlstone (Lithology 3), less than 10%.</li> </ol> <p><b>PHYSICAL PROPERTIES DATA:</b></p> <table style="margin-left: 40px;"> <tr> <td></td> <td>1,50</td> <td>1,119</td> <td>2,5</td> <td>2,48</td> </tr> <tr> <td><math>V_p</math> (a)</td> <td>—</td> <td>—</td> <td>4.35</td> <td>—</td> </tr> <tr> <td><math>V_p</math> (b)</td> <td>—</td> <td>—</td> <td>3.67</td> <td>—</td> </tr> <tr> <td><math>V_p</math> (c)</td> <td>—</td> <td>1.68</td> <td>4.00</td> <td>1.94</td> </tr> <tr> <td><math>\rho_b</math></td> <td>—</td> <td>2.05</td> <td>2.85</td> <td>2.16</td> </tr> <tr> <td><math>T_c</math></td> <td>3.54</td> <td>—</td> <td>—</td> <td>—</td> </tr> </table> |                        | 1,50 | 1,119 | 2,5 | 2,48 | $V_p$ (a) | — | — | 4.35 | — | $V_p$ (b) | — | — | 3.67 | — | $V_p$ (c) | — | 1.68 | 4.00 | 1.94 | $\rho_b$ | — | 2.05 | 2.85 | 2.16 | $T_c$ | 3.54 | — | — | — |
|                | 1,50                                | 1,119        | 2,5          | 2,48    |                |                  |                           |         |            |                      |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |      |       |     |      |           |   |   |      |   |           |   |   |      |   |           |   |      |      |      |          |   |      |      |      |       |      |   |   |   |
| $V_p$ (a)      | —                                   | —            | 4.35         | —       |                |                  |                           |         |            |                      |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |      |       |     |      |           |   |   |      |   |           |   |   |      |   |           |   |      |      |      |          |   |      |      |      |       |      |   |   |   |
| $V_p$ (b)      | —                                   | —            | 3.67         | —       |                |                  |                           |         |            |                      |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |      |       |     |      |           |   |   |      |   |           |   |   |      |   |           |   |      |      |      |          |   |      |      |      |       |      |   |   |   |
| $V_p$ (c)      | —                                   | 1.68         | 4.00         | 1.94    |                |                  |                           |         |            |                      |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |      |       |     |      |           |   |   |      |   |           |   |   |      |   |           |   |      |      |      |          |   |      |      |      |       |      |   |   |   |
| $\rho_b$       | —                                   | 2.05         | 2.85         | 2.16    |                |                  |                           |         |            |                      |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |      |       |     |      |           |   |   |      |   |           |   |   |      |   |           |   |      |      |      |          |   |      |      |      |       |      |   |   |   |
| $T_c$          | 3.54                                | —            | —            | —       |                |                  |                           |         |            |                      |                   |                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                        |      |       |     |      |           |   |   |      |   |           |   |   |      |   |           |   |      |      |      |          |   |      |      |      |       |      |   |   |   |

