14. CRETACEOUS/TERTIARY BOUNDARY SUMMARY[1]

Shipboard Scientific Party[2]

LITHOSTRATIGRAPHY

Depositional Environments at the Cretaceous/Tertiary Boundary

The Cretaceous/Tertiary boundary occurs within the lower indurated chalk unit of Hole 752B at about 358 m below seafloor (mbsf) (Fig. 1). The boundary lies within a 60-cm-long ash-chert-chalk sequence (Fig. 2) that directly underlies a 5.5- to 6.5-m-thick compound ash layer. Details of the magnetic susceptibility data for this sequence (see "Paleomagnetics" section, this chapter) suggest that the thick ash may be the result of multiple lesser ash falls rather than one large one.

The rock record of this important event must be interpreted with caution. The recovered materials are in the form of "drilling biscuits," 4- to 10-cm-long cylinders of rock that twist off during the coring process and are captured by the core barrel. There is no way of knowing how much material is missing between biscuits. Core 121-752B-11R, the boundary core, recovered 52% of the drilled 9.6 m of sediment. The only recovered chert occurs in the middle of the 23-cm-long transition zone between sub-boundary Cretaceous flora and fauna and supra-boundary Tertiary flora and fauna (Fig. 2). In general, most recovery loss is associated with cherts, so there may be important components of the Cretaceous/Tertiary boundary section missing from Core 121-752B-11R.

Bearing this in mind, the sediments of the Cretaceous/Tertiary boundary section seem little different than those above or below. Light gray, mottled, and faintly laminated chalks of latest Maestrichtian age record open-ocean deposition at high mass-accumulation rates of 4 to 4.7 g/cm^2/1000 yr, implying continuing high productivity. The chalks terminate at a biscuit boundary, above which is a large burrow structure capped by an ash layer, which in turn is overlaid by a chalk exhibiting soft-sediment deformation or slump structures (Fig. 2). Above the next biscuit boundary is 8 cm of gray chert and porcellanite in several pebbles. Above the chert pebbles, a light gray chalk layer grades upward into another ashy unit recovered in two biscuits. Above the ash layer is 23 cm of gray chalk in six biscuits (Fig. 2). There are a total of 10 biscuit boundaries within the one core interval that contains the boundary. The depositional environment of these sediments was one of moderate energy and of oxygenated bottom waters. Ash influx during that time was fairly continuous.

Immediately overlying this boundary section is an ash layer that may exceed 6 m in thickness (Fig. 1), which is the thickest ash unit in the lower Maestrichtian through middle Eocene sedimentary section at Broken Ridge. Magnetic susceptibility information (see "Paleomagnetics" section) suggests that this thick unit may represent a compound ash layer, composed of several individual ash-fall events. This unique deposit may represent either a sudden, somewhat greater, influx of volcanic debris or be a result of the normal, ongoing ash flux in the absence of any carbonate input. The sedimentary flux data permit differentiation between these possibilities (see Table 2 and Fig. 9 in the "Sedimentary Record of Broken Ridge" section of the "Broken Ridge Summary" chapter, this volume). The flux of volcanic ash increases from 0.7 g/cm^2/1000 yr in the uppermost Maestrichtian section to 1.1 g/cm^2/1000 yr in the lowest Paleocene, an increase barely larger than the error of calculation ($\pm 25\%$). For the same interval, the mass-accumulation rate of calcium carbonate falls from 3.9 to 0.4 g/cm^2/1000 yr just above the boundary, almost an order of magnitude reduction of flux. The important change in sedimentation at the Cretaceous/Tertiary boundary, then, is in the rate of deposition of the biogenic component. Ash flux increased only moderately.

The significant implication of this scenario is that the carbonate flux at Kerguelen Plateau–Broken Ridge was greatly reduced through the initial two zones of the Tertiary, a period of about 1.5 m.y. The flora preserved in the thick ash unit comprise an assemblage of opportunistic "survivor species" that bloomed when previously dominant groups were no longer competitive or were absent (see "Biostratigraphy" section, this chapter). The record, then, is of an oceanic ecosystem lasting more than a million years where the combination of nutrient supply and the ambient carbonate-secreting organisms was suddenly insufficient to precipitate previously normal amounts of calcite. The Broken Ridge ecosystem returned to the normal, high-productivity environment between 63.8 and 64.8 Ma, and high productivity continued for another 10 m.y. before tapering off (see "Sedimentary Record of Broken Ridge" section, "Broken Ridge Summary" chapter).

BIOSTRATIGRAPHY

One of the pleasant surprises of Leg 121 was the recovery of a Cretaceous/Tertiary boundary section in Hole 752B (Fig. 2), one of the few in either the Indian Ocean or in austral/temperate areas. The Cretaceous/Tertiary boundary is probably complete in Section 121-752B-11R-3, despite the "drilling biscuits" at 77–83 cm. The detailed calcareous nannofossil stratigraphy across the Cretaceous/Tertiary boundary outlined in Figure 3 shows the replacement of Cretaceous taxa by hardy Cretaceous survivor taxa. A major reduction in abundance of typical Cretaceous foraminiferal taxa occurs at 385.75 mbsf, between 95 and 96 cm in Section 121-752B-11R-3 (Fig. 2). The iridium anomaly is usually found just above this extinction level (Smit and Romein, 1985). As for the chronostratigraphic Mesozoic/Cenozoic boundary, this iridium level is preferred to define the Cretaceous/Tertiary boundary, although some biostratigraphers (see the following discussion) prefer to have the boundary at the first appearance of Paleocene taxa. The latter practice produces diachronous boundary levels (Smit and Romein, 1985).

Visual examination of the surface of the working half of Section 121-752B-11R-3 (see Fig. 2) under a binocular microscope shows an abundant, but not diverse, assemblage of Cretaceous planktonic foraminiferal taxa, consisting mostly of *Rugoglobigerina* spp. and *Globigerinelloides* spp. together with a few globotruncanids. This assemblage is typical for both austral and boreal temperate areas (Bolli et al., 1985). These Cretaceous as-

[1] Peirce, J., Weissel, J., et al., 1989. *Proc. ODP, Init. Repts.*, 121: College Station, TX (Ocean Drilling Program).

[2] Shipboard Scientific Party is as given in the list of Participants preceding the contents.

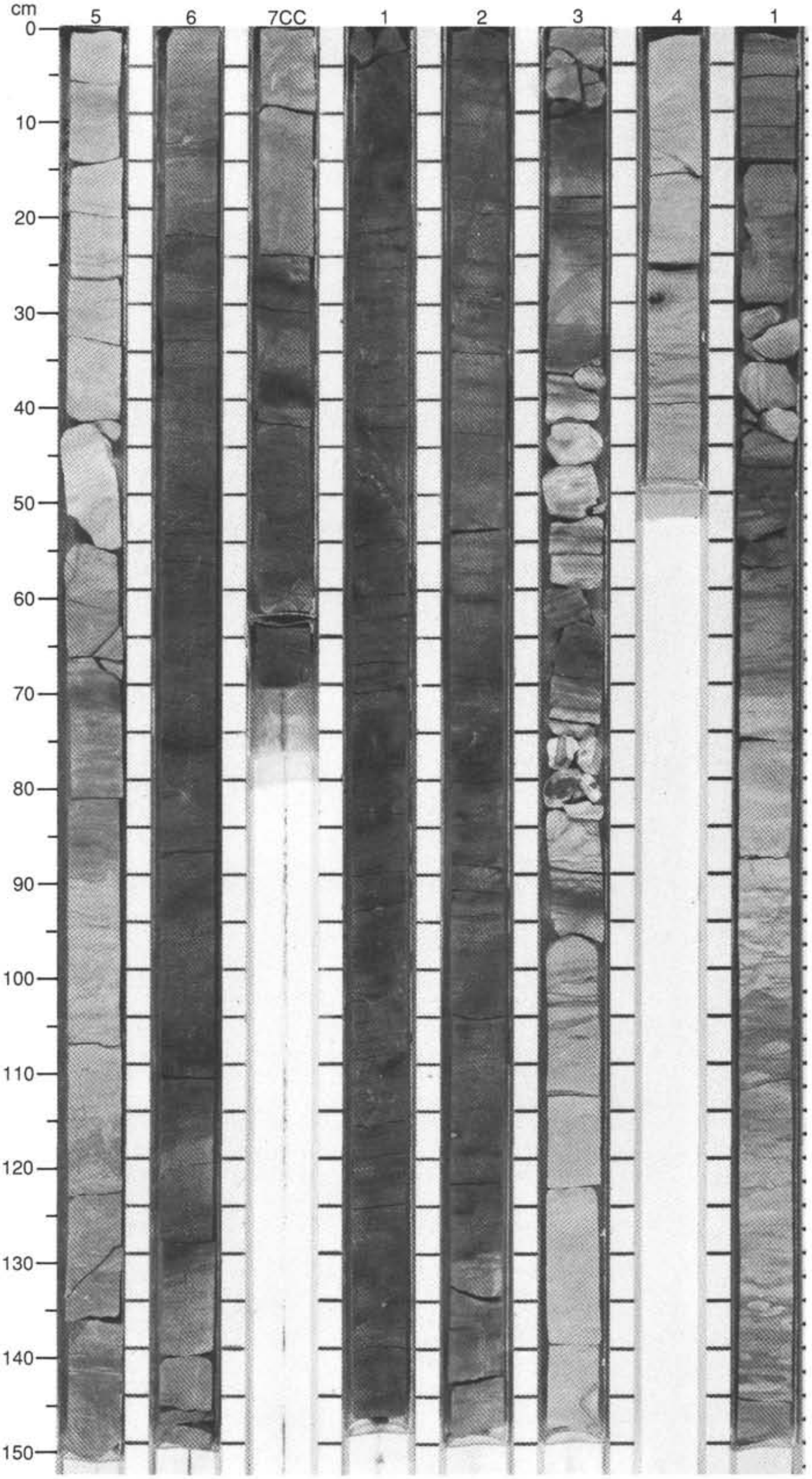

Figure 1. Core photograph of the recovered sediments across the Cretaceous/Tertiary boundary. The boundary is located in the interval from 72 to 95 cm in Section 121-752B-11R-3, beneath the thick overlying ash layer.

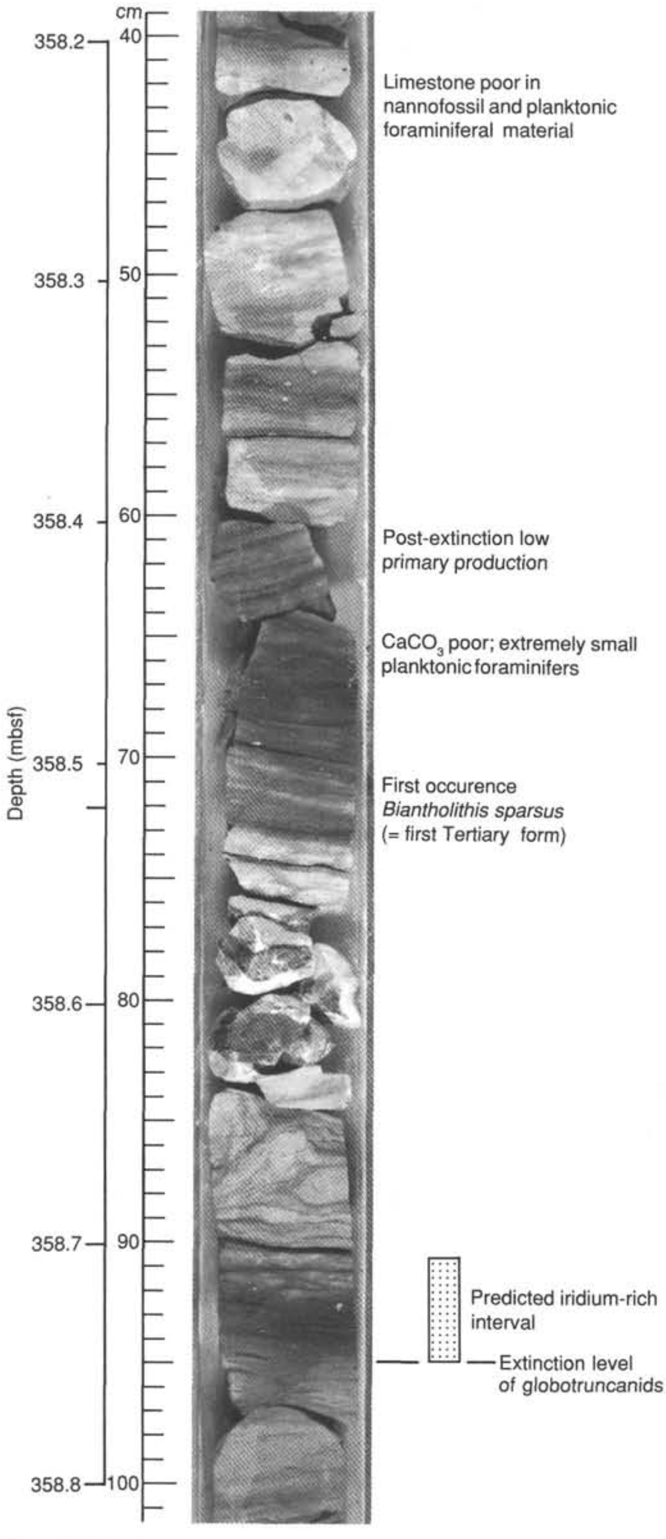

Figure 2. The Cretaceous/Tertiary boundary is within the interval from 72 to 95 cm in Section 121-752B-11R-3, 40–100 cm. The main Cretaceous/Tertiary boundary planktonic foraminiferal extinction event is probably at 358.75 mbsf. The first truly Tertiary nannofossil species, *Biantholithus sparsus,* is at 358.53 mbsf. The most likely position of the iridium anomaly associated with the Cretaceous/Tertiary boundary event, if it is present, would be in the dark interval from 358.75 to 358.72 mbsf.

semblages—similar in diversity, species composition, and abundance—range from Section 121-752B-19R-CC to 96 cm in Section 121-752B-11R-3, immediately below a dark laminated layer. The spatial distribution of the planktonic foraminifers in Cretaceous micritic limestone remains generally the same throughout this interval.

The limestone intervals from 74 to 90 cm and 60 to 73 cm in Section 121-752B-11R-3 contain a strongly reduced number of the larger Cretaceous planktonic foraminifers. The same limestone intervals show an incursion of Cretaceous nannofossil taxa (Fig. 3), but still contain a high percentage of "survivor taxa." Redeposition is the most probable explanation for these limestone intervals, as supported by the soft-sediment deformation structures.

The low-productivity interval above the Cretaceous/Tertiary boundary extinction event and below the level where planktonic biota return to normal abundance probably extends throughout the entire 6.1-m dark green ash-rich interval, from 352.65 to 358.75 mbsf. The magnetic susceptibility and downhole logging data (Figs. 4 and 8, "Geophysical Well Logging" section, this chapter) confirm this thickness. Biostratigraphically, the entire subunit is probably basal Danian, ranging from P0 to within the P1B foraminiferal subzones (Fig. 5). In Sample 121-752B-10R-CC exceedingly rare, badly preserved, minute planktonic foraminiferal specimens were found, although representatives of the *Globigerina eugubina* lineage have not yet been observed.

The Chron 29N/29R boundary is tentatively located somewhere between 353.3 and 357.2 mbsf (Fig. 6), some 1.5–5.5 m above the Cretaceous/Tertiary boundary at 358.75 mbsf. This would imply sedimentation rates of 0.5–1.8 cm/1000 yr. This estimate is about three times lower than the average sedimentation rates of the lower Tertiary and Upper Cretaceous at Broken Ridge, but it is not unreasonable with respect to the global low productivity described for the earliest Danian (Smit, 1982).

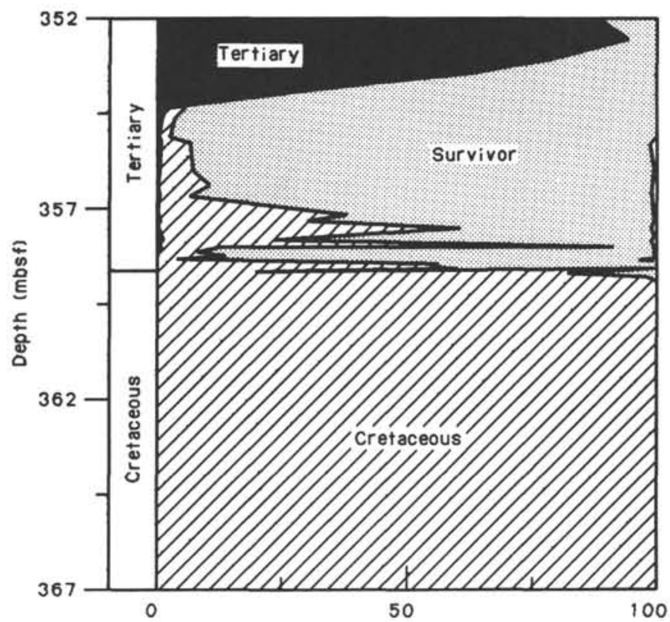

Figure 3. Detailed calcareous nannofossil abundances across the Cretaceous/Tertiary boundary at Site 752. The first occurrence of a Tertiary species (*Biantholithus sparsus*) is at 358.53 mbsf (Sample 121-752B-11R-3, 72–73 cm).

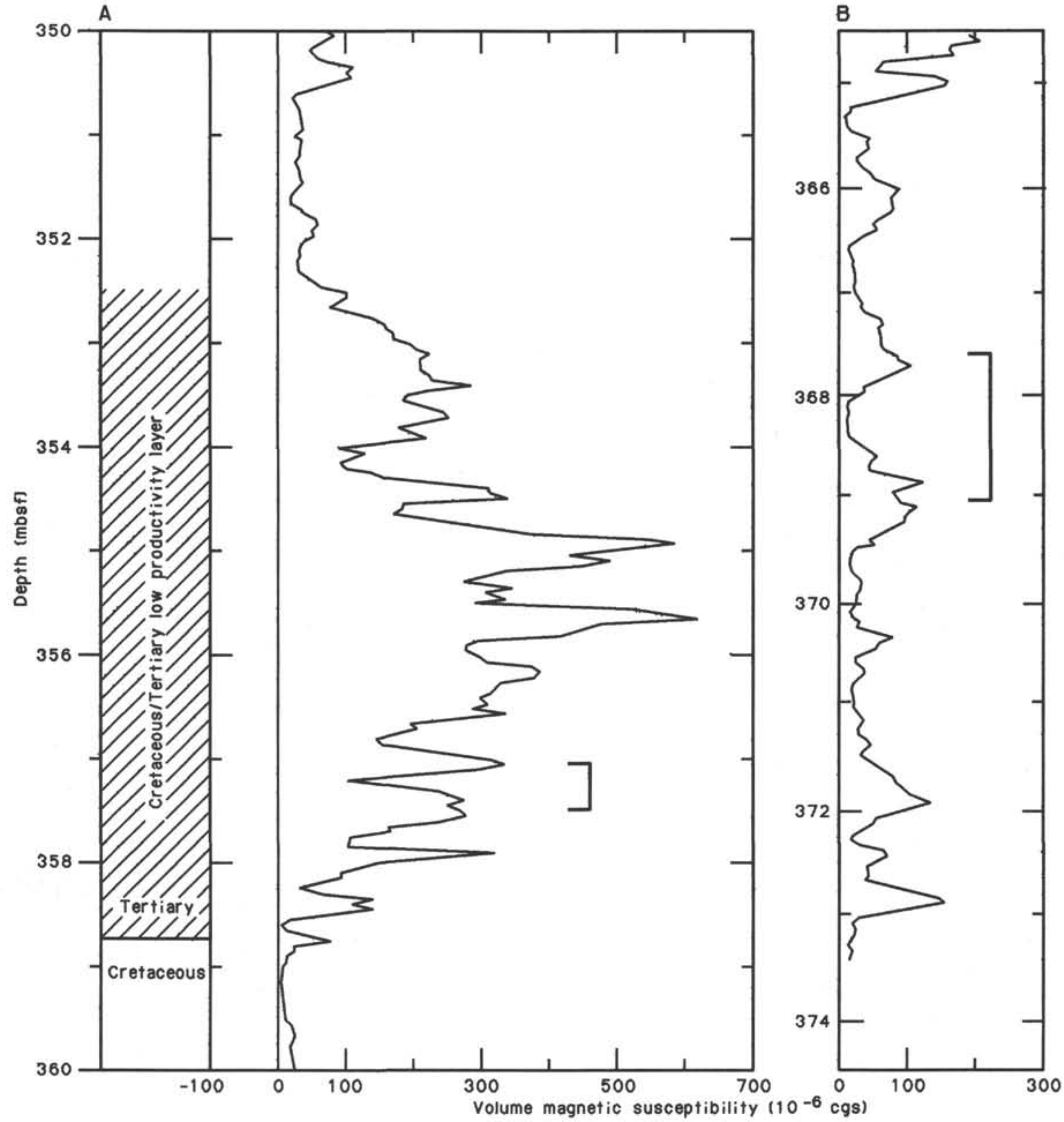

Figure 4. Volume magnetic susceptibility across the Cretaceous/Tertiary boundary. The dark green ash-rich unit above the Cretaceous/Tertiary boundary is shaded. The average distance (bracketed) between the susceptibility peaks, which presumably correlate with ash content, in the Cretaceous/Tertiary boundary interval (352.65–358.75 mbsf in **A**) is about one-third of the spacing in Core 121-752B-12R (**B**).

One major difference between the Broken Ridge area and low-latitude, mainly Tethys sections across the Cretaceous/Tertiary boundary, which are the best studied, is the extended duration of lower carbonate production. The restoration of normal carbonate (= primary) production in low-latitude areas takes place at the first appearance of new Paleocene species such as *Globigerina eugubina*, *Globigerina fringa*, and *Globigerina minutula*, well below the Chron 29N/29R boundary. On Broken Ridge, however, this restoration apparently took place well into the Danian (Fig. 5).

The lower sedimentation rates in this interval could also have important implications for the interpretation of the ash layer accumulation. If the Kerguelen/Ninetyeast hot spot continued delivering the Cretaceous/Tertiary ash layers at about the same rate as observed for Site 752 Upper Cretaceous and lower Paleocene sediments (Fig. 4), then presumably the higher ash concentrations in this interval are just what should be expected, given the low carbonate supply. The measured peaks in volume magnetic susceptibility (Fig. 4) in general correlate well with individual ash beds. The average spacing between the peaks in susceptibility is about 45 cm in the Cretaceous/Tertiary ash bed (354–359 mbsf) and 135 cm in Core 121-752B-12R (365–373 mbsf), suggesting either an increase in eruptive activity or a decrease in sedimentation rate by a factor of about three. The latter interpretation is compatible with the position of the Chron 29N/29R reversal.

In the present controversy between advocates of increased volcanic activity and proponents of the impact theory (Hallam, 1987; Officer et al., 1987; Smit et al., 1987), the distribution of

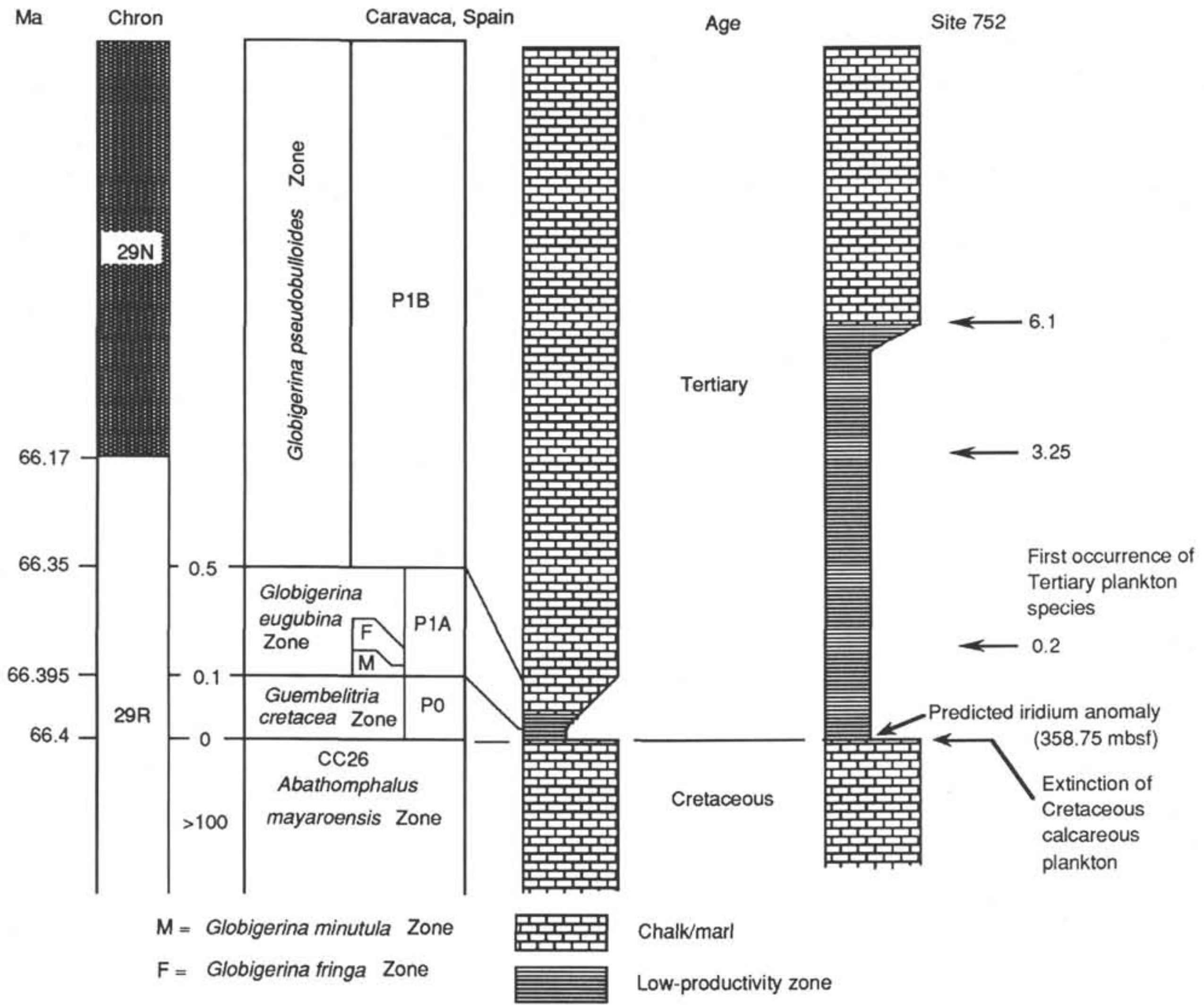

Figure 5. Detailed biostratigraphy (Smit, 1982) of a typical Tethyan section across the Cretaceous/Tertiary boundary interval. Distances are in meters from the Cretaceous/Tertiary boundary as defined by extinction level. Thus far, these subzonations are not recognized in the interval at Site 752. The Chron 29N/29R transition occurs within the low-productivity layer, shown compared with the Tethyan section (Smit and Romein, 1985).

ash layers at Site 752 does not appear to support a volcanic cause for the terminal Cretaceous extinctions. Even if an increase in volcanic material is associated with the increased volume magnetic susceptibility in the Cretaceous/Tertiary ash bed interval (see "Paleomagnetics" section), it appears to have occurred after the extinction event and also continued for a finite period of time.

Calcareous Nannofossils at the Cretaceous/Tertiary Boundary

Preliminary results from a quantitative study across the Cretaceous/Tertiary boundary reveal a rather rapid turnover of calcareous assemblages. The study was undertaken on closely spaced samples through the interval encompassing the Cretaceous/Tertiary boundary, from 352.0 to 362.0 mbsf. About 500 specimens per slide were counted from samples taken above and below the Cretaceous/Tertiary boundary. The results of this study are summarized in Figure 3.

The Cretaceous/Tertiary boundary at Site 752 is biostratigraphically approximated by the first occurrence of *Biantholithus sparsus* in Sample 121-752B-11R-3, 72–73 cm (358.5 mbsf). The boundary itself is located at the base of a thick ash sequence in the interval from 72 to 95 cm in Section 121-752B-11R-3. This interval contains numerous drilling biscuits and a predominant chert layer (see "Lithostratigraphy" section, this chapter). Thus, due to the disturbance by drilling, interpretation of data through this interval is made with caution. For example, portions of the section may be missing between the biscuits. However, the boundary section is biostratigraphically complete (i.e., all nannofossil zones are present) and the expanded Danian section is ideal for studying nannofossil assemblages.

For the quantitative study, nannofossil species were grouped into three assemblages, Tertiary, Cretaceous, and "survivor." Tertiary forms include those having first occurrences beginning at the Cretaceous/Tertiary boundary. Cretaceous forms are considered those that became extinct at or below the boundary. Survivor forms are those that are present in the Cretaceous and survive into the Tertiary. Blooms of several of these forms, also noted as "opportunistic" species, have been reported from various Cretaceous/Tertiary sections. Figure 3 shows the progression of each assemblage through a 10-m interval encompassing the Cretaceous/Tertiary boundary.

The drop in the percentage of Cretaceous forms is rapid in the short interval between 70 and 100 cm in Section 121-752B-11R-3 (Fig. 2). About 20 species become extinct. The most dominant of these are *Nephrolithus frequens, Arkhangelskiella cymbiformis, Kamptnerius magnificus, Prediscosphaera stoveri*, and *Micula decussata*. The overall Cretaceous assemblage is typical of the high-latitude upper Maestrichtian *Nephrolithus frequens* Zone. Nannofossils from several intervals sampled below the boundary are poorly preserved. Diversity in these samples is reduced to four or five solution-resistant forms. In samples where preservation is improved, the diversity among Cretaceous forms is about 20 or so species.

At the Cretaceous/Tertiary boundary level, survivor forms rapidly replace the existing Cretaceous assemblage (Fig. 3). The boundary-crossing species include *Zygodiscus sigmoides, Thoracosphaera, Markalius inversus, Neocrepidolithus, Cyclagelosphaera reinhardtii*, and *Biscutum castrorum*. Of these, *Z. sigmoides* is the most dominant. *Thoracosphaera* is abundant in several samples from above the boundary although not as abundant as in other Cretaceous/Tertiary boundary sections, most notably in the Tethyan localities.

In the interval of about 4 m (nannofossil Zone CP1a) above the boundary, survivor forms dominate the assemblage along with varying amounts of reworked Cretaceous forms and very rare newly evolving Tertiary species. An exception to this is observed in a 1-m-thick interval beginning about 70 cm above the boundary, where Cretaceous forms make a comeback. In Sample 121-752B-11R-3, 12–13 cm, the survivor percentage drops to 7% from 82% in Sample 121-752B-11R-3, 19–20 cm. The survivor species eventually reach their previous percent abundance about 1 m above this level. This drop in survivor abundance and peak in Cretaceous forms may easily be explained as an increase in reworking through this interval. However, because total nannofossil abundance in the sediment decreases in this portion of the section, the percentage of Cretaceous specimens may be enhanced by the absence of survivor forms. The drop in the number of survivor forms could perhaps be the result of another lapse in surface productivity other than the original collapse that occurred at the Cretaceous/Tertiary boundary.

Incoming Tertiary species rapidly replace the survivor assemblage beginning in Sample 121-752B-10R-6, 86–87 cm, which corresponds to the first abundant occurrence of *Cruciplacolithus tenuis* (nannofossil Zone CP1a/1b boundary). Tertiary species such as *Biantholithus sparsus* and *Cruciplacolithus primus* are rare below this level. The low- to middle-latitude forms, *Biscutum romeinii* and *Toweius petalosus*, are also present but extremely rare. Another form, *Prinsius teniculum*, first occurs along with *C. tenuis* and is very abundant in the few samples examined from Zone CP1b.

The Cretaceous/Tertiary section of Site 752 is similar to the high-latitude section recovered from the Maud Rise (65°S) during Leg 113 (Pospichal and Wise, in press), but is much more expanded. The pattern of assemblage turnover from Cretaceous to Tertiary is similar, as are the constituents of the survivor species assemblage and the Cretaceous assemblage. An extremely high abundance of *Prediscosphaera stoveri* was noted in the uppermost Maestrichtian of the Maud Rise. The percentage abundance of this form is not nearly as high in this section. An acme of *Prediscosphaera quadripunctata*, a similar (synonymous?) species, was also noted by Jiang and Gartner (1986) in uppermost Maestrichtian sediments from the Brazos River, Texas, and El Kef, Tunisia. Widespread blooms of these forms may have correlated with late Maestrichtian cooling. Data from this section along with that of Maud Rise should provide additional information on this interesting topic.

Additional differences between the Maud Rise section and Broken Ridge occur in the Tertiary assemblage. In the section from the Maud Rise, *Hornibrookina edwardsii* dominates the assemblage within a short interval in sediments of Zone CP1a. This species was not noted this low in the section on Broken Ridge. Other early Danian forms such as *Toweius petalosus* and *Biscutum romeinii* that were observed here were not noted in the Maud Rise section. These forms are generally characteristic of middle- to low-latitude Cretaceous/Tertiary sections. Broken Ridge has an approximate paleolatitude of 55°S for the late Maestrichtian–early Paleocene, and, to our knowledge, this is highest southern latitude at which these forms have been recorded. Thus, the geographic range of these species can be extended to include at least the higher southern latitudes of the Indian Ocean.

PALEOMAGNETICS

A peak in bulk susceptibility just above the Cretaceous/Tertiary boundary was reported from studies of Deep Sea Drilling Project and Ocean Drilling Program cores (Worm and Banerjee, 1987; Shipboard Scientific Party, in press). This peak has been interpreted as a concentration of small black spherules of magnetite and/or as an increase of iron-rich clay minerals. The susceptibility of Core 121-752B-11R shows a similar sharp increase directly above the Cretaceous/Tertiary boundary (Fig. 6), which correlates with a very marked increase in ash content.

Reliable identification of the occurrence of ash layers from peaks in the susceptibility record and corresponding peaks in the natural remanent magnetization (NRM) intensity record is well established from the Leg 121 Broken Ridge sites. The susceptibility record from the Campanian/Maestrichtian to the middle Eocene (Fig. 7) clearly demonstrates that this Cretaceous/Tertiary boundary susceptibility peak is not unique. The combined susceptibility log from Holes 754B, 752B, and 752A and the lithologic record indicates that ash influx continued at variable rates throughout the formation of lithologic Unit II (see "Sedimentary Record of Broken Ridge" section, "Broken Ridge Summary" chapter). High rates of ash influx continued throughout the Campanian/Maestrichtian to the early Paleocene and waned during the late Paleocene to middle Eocene. Periods of particularly large and sudden influx occurred around the Campanian/Maestrichtian boundary (260–230 mbsf in Hole 754B; Fig. 7), which may be related to pronounced tectonic activity on the Kerguelen Plateau and the start of very fast spreading between the Indian and Antarctic plates, and at the Cretaceous/Tertiary boundary (360–350 mbsf, Hole 752B; Fig. 7).

Despite the ongoing nature of eruptive activity, the very occurrence of an apparent sudden large ash influx at the Cretaceous/Tertiary boundary and the particularities of its susceptibility and NRM expression warrant some discussion. The very sharp Cretaceous/Tertiary boundary susceptibility peak is directly preceded by an interval of very low susceptibility (Fig. 4). Although data for the interval from 360 to 365 mbsf are missing, this zone of low susceptibility probably represents the final phase of an episode of gradually declining influx during the latest Maestrichtian (Fig. 7). The sharp peak shows an increase in susceptibility greater than two orders of magnitude between 359.3 and 355.5 mbsf (Fig. 6), which is matched by an increase in NRM (9 mT) greater than one order of magnitude. The NRM record is somewhat disturbed by a section cut at 359.3 mbsf, but this cut is not likely to have affected the susceptibility record.

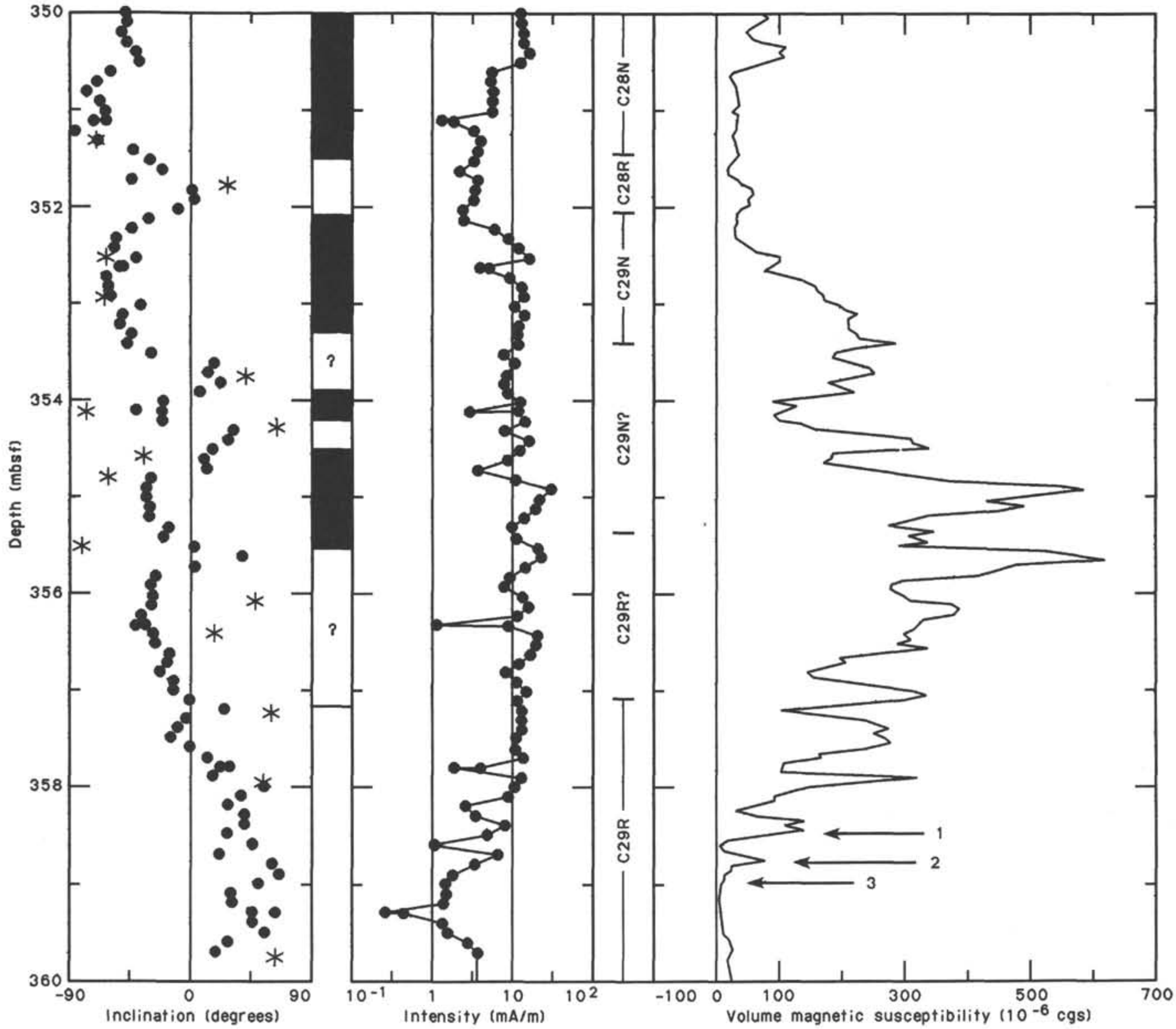

Figure 6. A comparison of NRM (9 mT) and susceptibility logs for the Cretaceous/Tertiary boundary section in Hole 752B (350–360 mbsf). 1 = Cretaceous/Tertiary boundary defined on the basis of the first-appearance datum of Tertiary nannofossils; 2 = Cretaceous/Tertiary boundary defined on the basis of the disappearance of Cretaceous foraminifers and by global lithologic correlation with Cretaceous/Tertiary boundary sections, 3 = expected occurrence of a cataclysmic event based on start of a sharp susceptibility and NRM increase. The boundary between Chrons 29N and 29R is uncertain, but it is interpreted to be between 353.3 and 357.2 m.

It is possible that this high concentration of ash is due partly or wholly to a sharp reduction in biogenic sedimentation following the extinction event, with the ash coming from an unrelated source ("Lithostratigraphy" section).

However, if the sharply increased ash influx reflects a cataclysmic event at the Cretaceous/Tertiary boundary of external (Alvarez et al., 1980; Smit, 1982; Davis and Muller, 1984) or possibly internal (Officer and Drake, 1983; Courtillot et al., 1986) origin, then this event has to be located at the very base of the sharp increase in susceptibility and NRM intensity (line 3 at 359.0–359.3 mbsf; Fig. 6). This is very close to the tentative identification at 358.75 mbsf (line 2; Fig. 6) of the Cretaceous/Tertiary boundary event. This position is based both on an observed sharp drop-off in abundance of Cretaceous globotruncanids and rugoglobigerinids and on lithologic correlation with Cretaceous/Tertiary boundary sections around the globe wherein an iridium-rich level has been observed at that sharp drop-off or immediately above it. Both levels are below the first-occurrence datum of Tertiary nannofossils at 358.5 mbsf (line 1; Fig. 6). This is to be expected, because the passive biostratigraphic expression of a cataclysm has to follow its active lithostratigraphic expression.

GEOPHYSICAL WELL LOGGING

The data acquired through logging at Site 752 include natural gamma radiation (including individual measures of K, U, and Th abundance), sonic velocity, electrical resistivity, and a full set of geochemical logs (see "Explanatory Notes" chapter, this volume). The quality of these data is good. Logs of bulk density, neutron porosity, and photoelectric factor are not available over the entire interval covered by the other tools because of difficulties during logging (see "Geophysical Well Logging" section, "Site 752" chapter, this volume).

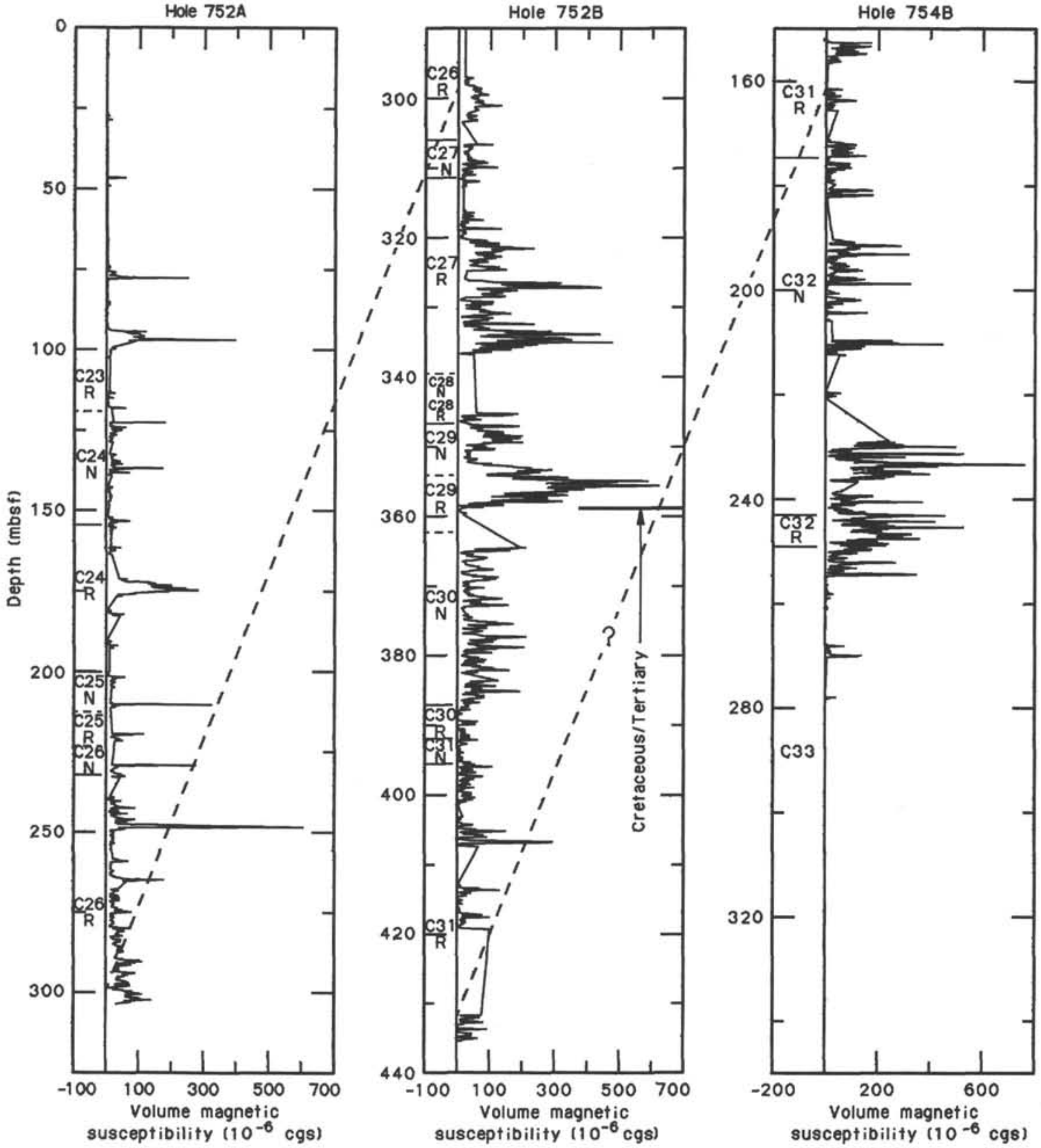

Figure 7. Combined susceptibility log for Holes 752A, 752B, and 754B, ranging from the uppermost Campanian/lowermost Maestrichtian (C33/C32R) to the middle Eocene (C23R). Correlation between Holes 752A and 752B is good, but tenuous between Holes 752B and 754B (see "Paleomagnetics" section, "Broken Ridge Summary" chapter).

Interpretation

The depth of the Cretaceous/Tertiary boundary zone, located at 358.17–358.77 mbsf by core inspection (see "Lithostratigraphy and Sedimentology" section, "Site 752" chapter), is estimated at 357.0–358.5 mbsf based on the logs. This discrepancy is not surprising in view of the 52% core recovery in this interval. This boundary is indicated on the logs by a low slowness (high sonic velocity) spike centered at 358.3 mbsf that results from the thin chalk, chert, and porcellanite in the uppermost Upper Cretaceous sediment (Fig. 8). This boundary interval is relatively low in K, Th, Al, and Si. Overlying this interval, resistivity and Ca abundance decrease, and slowness increases in the thick (4.0-m) ash layer from 353.0 to 357.0 mbsf. Si, Al, K, and Th rise slightly in this ash layer as well. The rise in total natural gamma radiation in the interval from 351.0 to 357.0 mbsf is due primarily to an increase in K. A thin limestone bed from 352.5 to 353.0 mbsf is indicated by an increase in resistivity and a decrease in slowness. The thinner (1.5-m) ash layer above this bed (351.0–352.5 mbsf) exhibits log values similar to those of the ash layer below. Immediately above 351.0 mbsf, and below 358.5 mbsf, the logs show responses to the higher resistivity and Ca and to the lower slowness, K, Th, Si, and Al of the greenish gray chalks of lithologic Subunit IIC (see "Lithostratigraphy

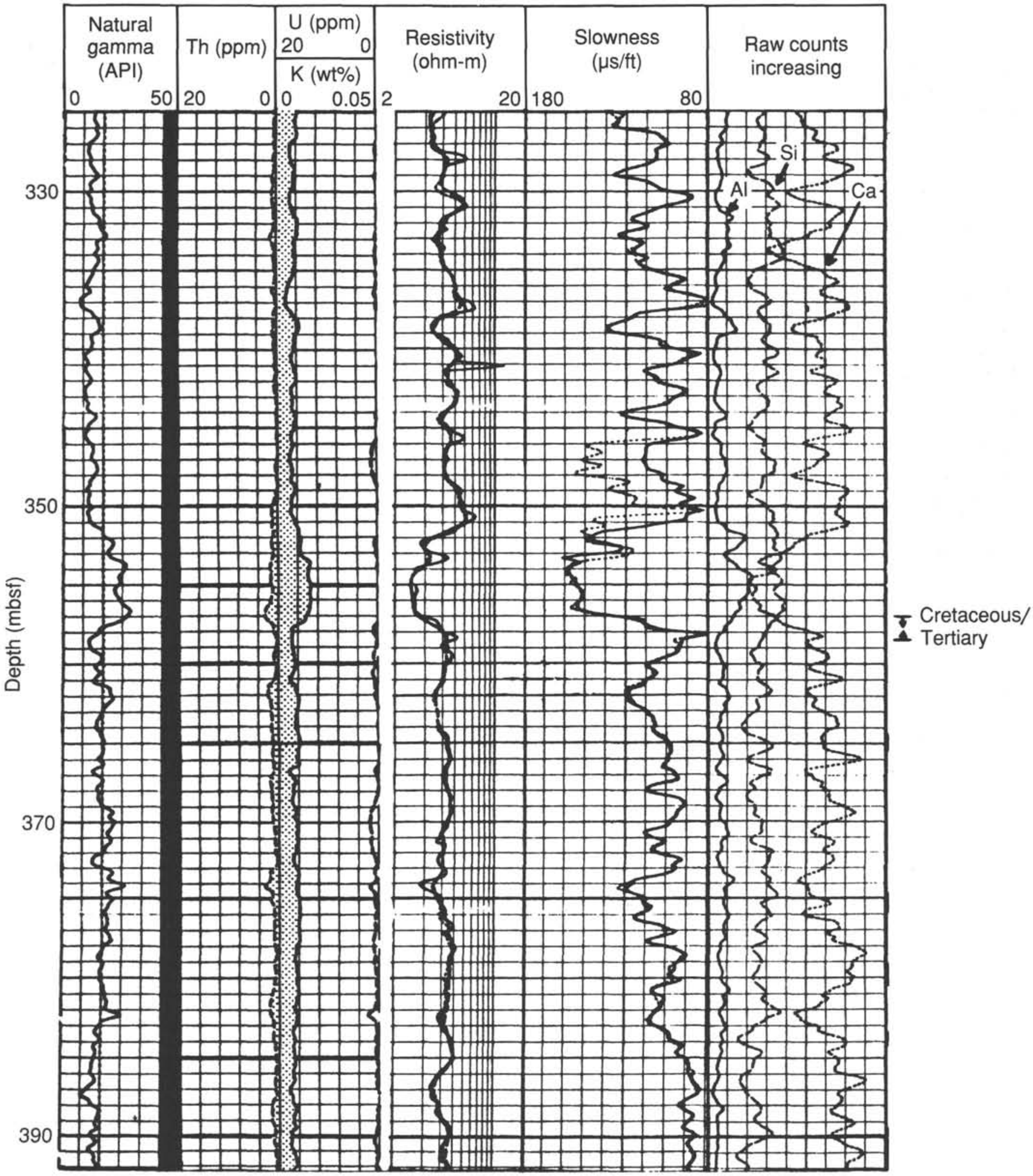

Figure 8. Logs of natural gamma radiation, Th, U, K, electrical resistivity, sonic slowness, and raw counts (relative measure only) of Al, Si, and Ca. Interval shown is Hole 752B, 325–390 mbsf.

and Sedimentology" section, "Site 752" chapter). The variations in log response within these chalks are due to the occurrence of porcellanite, chert, and ash layers.

Summary

A full set of geochemical logs, as well as sonic velocity, electrical resistivity, and natural gamma radiation, was obtained across the interval containing the Cretaceous/Tertiary boundary at Site 752. The estimated width of the Cretaceous/Tertiary boundary zone is 1.5 m (357.0–358.5 mbsf) based on the logs. This boundary is overlain by a distinctive interval from 351.0 to 357.0 mbsf composed primarily of ash. The relative abundance of ash in this interval is apparent both from logging and from core descriptions, and it attests to the time interval during which the calcareous biota recovered from the environmental stress engendered by the Cretaceous/Tertiary "event." Only 52% of Core 121-752B-11R containing the Cretaceous/Tertiary boundary interval was recovered. In a case such as this, the continuous nature of the logs provides a direct means of locating with greater certainty the boundary interval in relation to its surroundings. In addition, continuous mineralogical logs will be obtained from post-cruise analysis of these logging data.

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