SITE SUMMARIES

Site: CAR-1C

Priority: 1
Position: 00°40.319´S, 82°04.853´W
Water Depth: 1423 m
Sediment Thickness: 513 m
Target Drilling Depth: 513 mbsf
Approved Maximum Penetration: 550 mbsf
Seismic Coverage: Sediment cover: Two-way traveltime (TWTT) = 0.604 s (513 m) Primary Line: 2000 NEMO-3 (*Melville*) CAR-1 survey Line 6, JD153 07:18:23z (SP2626; CDP 6427). Crossing Line: 2000 NEMO-3 (*Melville*) CAR-1 survey Line 12.

Objectives: The objectives at Site CAR-1C are to provide a continuous sedimentary sequence to:

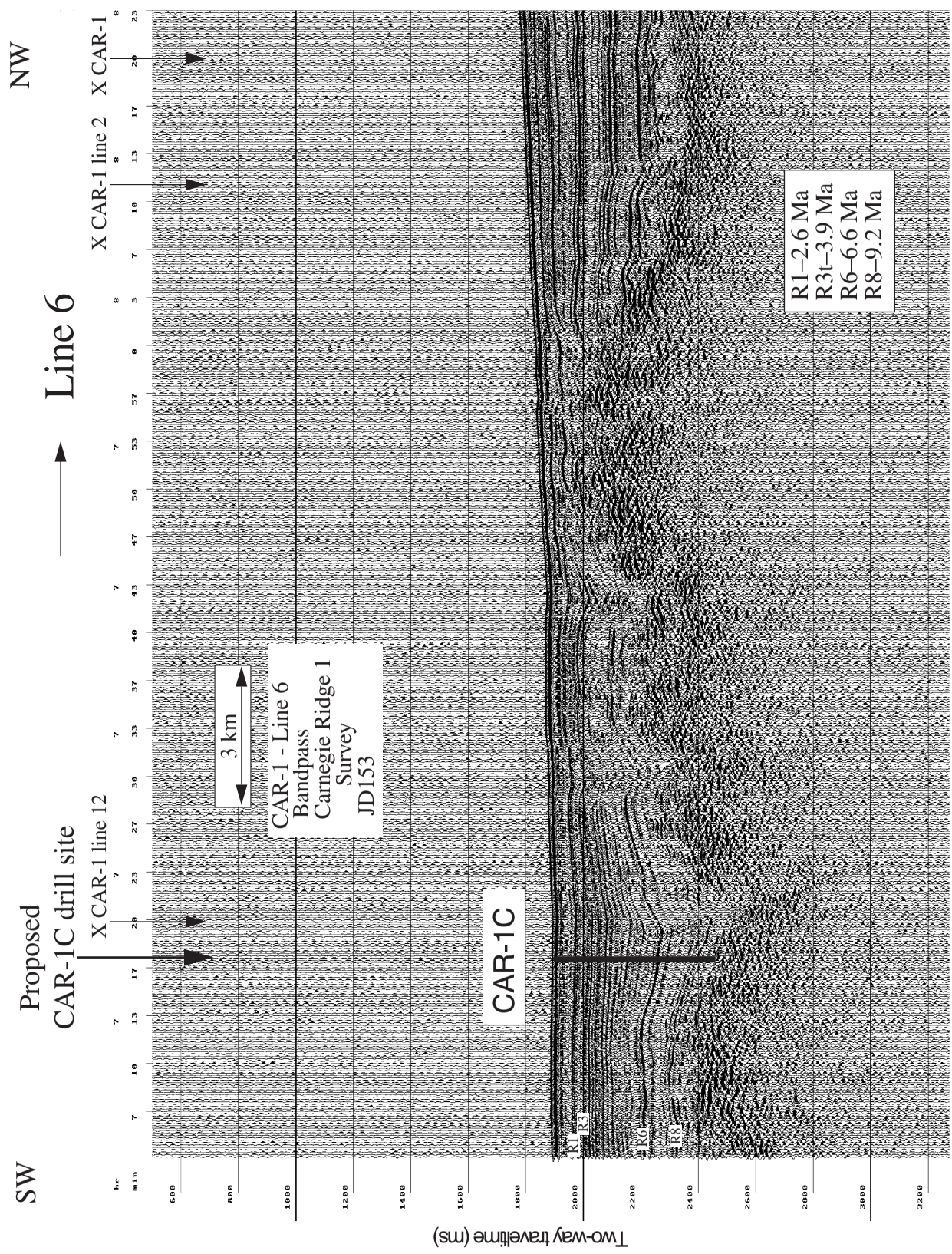
1. Study the Pleistocene history of upwelling and paleoproductivity within the South Equatorial Current off Ecuador.

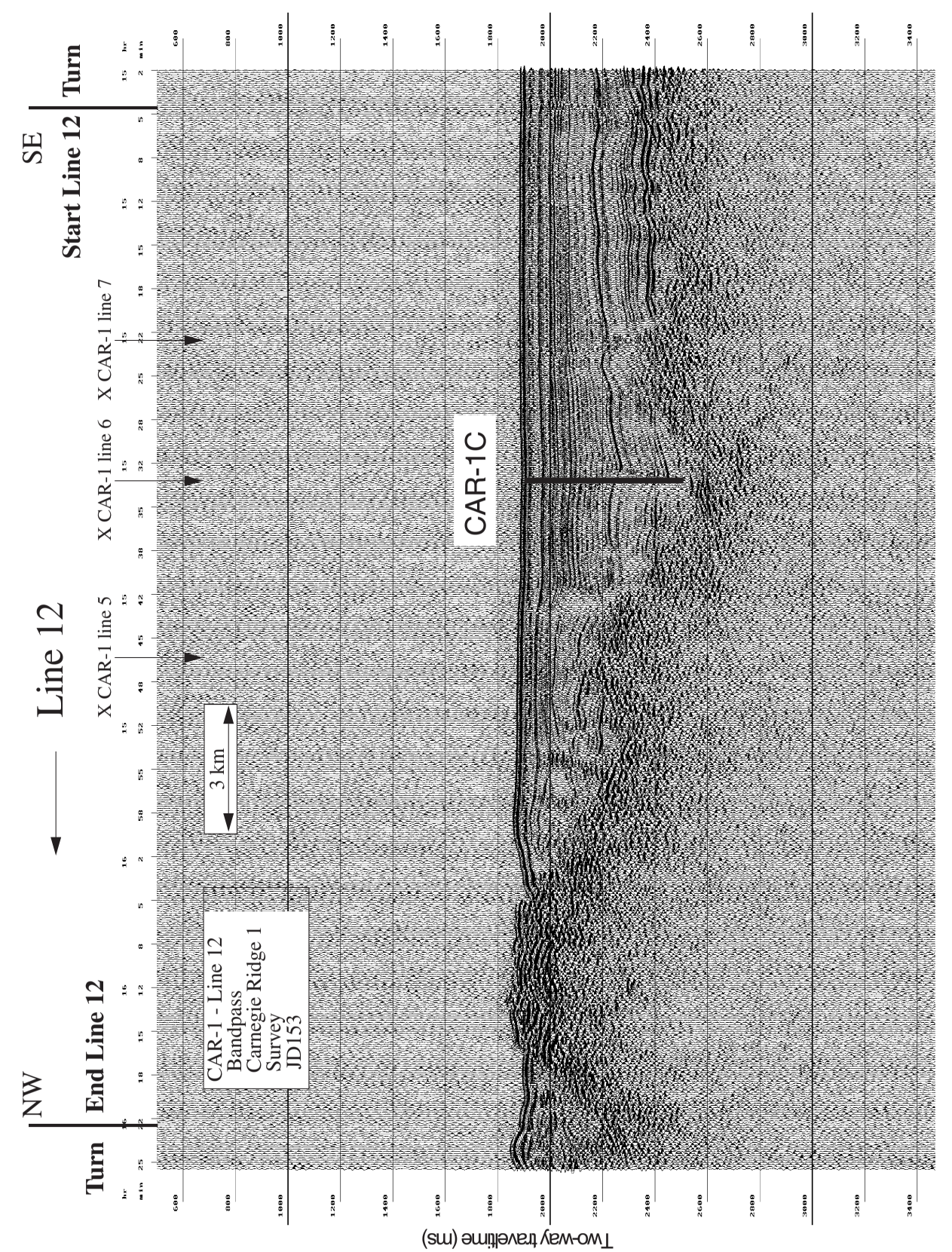
2. Monitor the composition of basal intermediate waters to monitor the South Equatorial Current.

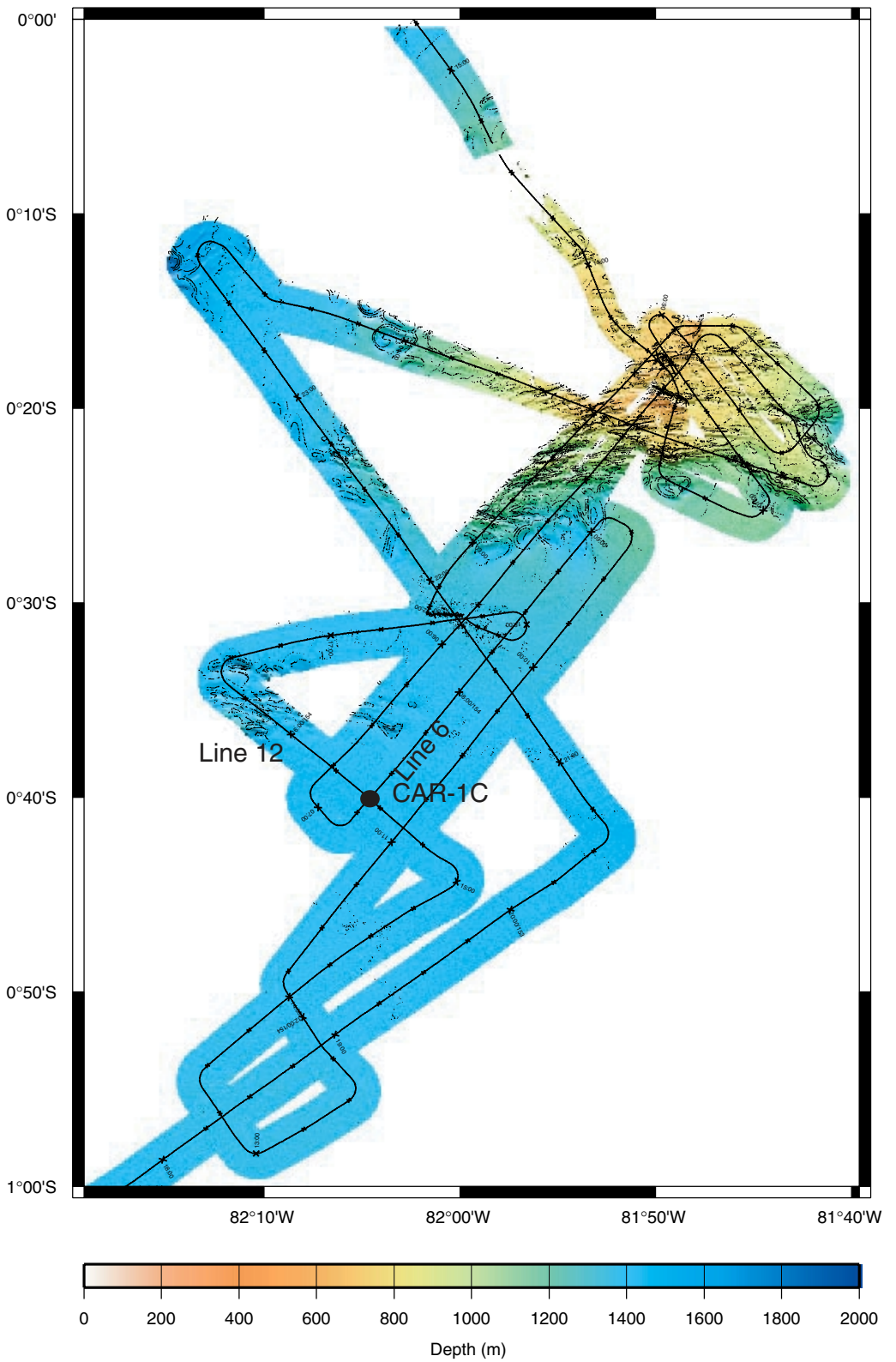
Drilling Program: Triple APC to refusal. Tensor orientation on APC cores. Single XCB to extend one hole to basement or refusal (expected penetration ~520 mbsf).

Logging and Downhole: Triple combo, third-party Lamont MGT, FMS/sonic, GHMT.

Nature of Rock Anticipated: A site survey piston core consists of foram ooze with nannofossils, highly mottled. There is a subtle alteration of colors downcore, which probably represents orbital cyclicity. Two ash layers were found in the core at 5.4 m (?Ash D, 84 ka) and at 11.11 m (?Ash L, 230 ka), indicating late Pleistocene sedimentation rates of 50-60 m/m.y.. Similar lithologies are expected downcore, with increasing lithification. By comparison of the seismic section to that developed for the cores from Leg 138 and other sites to the west (Mayer et al., 1986; Bloomer et al., 1995), we estimate basal ages at 15 Ma and long-term sedimentation rates at 35 m/m.y.. An exception is the late Miocene-early Pliocene interval between reflectors R3 and R6. This interval has a sedimentation rate roughly twice as high as the others. The late Miocene-early Pliocene is the interval of enhanced equatorial productivity in the eastern Pacific. Basement is likely volcanics from Galapagos hotspot.


SW
NW
Line 6
Proposed
CAR-1C drill site
X CAR-1 line 12
X CAR-1 line 2
X CAR-1
3 km
CAR-1 - Line 6
Bandpass
Carnegie Ridge 1
Survey
JD153
CAR-1C
R1–2.6 Ma
R3t–3.9 Ma
R6–6.6 Ma
R8–9.2 Ma
R1
R3
R6
R8
Two-way traveltime (ms)


NW
Turn
End Line 12
Line 12
SE
Start Line 12
Turn
X CAR-1 line 5
X CAR-1 line 6
X CAR-1 line 7
3 km
CAR-1 - Line 12
Bandpass
Carnegie Ridge 1
Survey
JD153
CAR-1C
Two-way traveltime (ms)


0°00'
0°10'S
0°20'S
0°30'S
0°40'S
0°50'S
1°00'S
82°10'W
82°00'W
81°50'W
81°40'W
Line 12
Line 6
CAR-1C
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Depth (m)

Site: CAR-2C

Priority: 1
Position: 1°52.31´S, 82°46.94´W
Water Depth: 2223 m
Sediment Thickness: 480 m
Target Drilling Depth: 480 mbsf
Approved Maximum Penetration: 500 mbsf
Seismic Coverage: Sediment thickness: 0.582 s (480 m)
Primary Line: 2000 NEMO-3 (*Melville*), CAR-2 survey Line 3, JD150 23:19:01z (SP4137)
Crossing Line: 2000 NEMO-3 (*Melville*), CAR-2 survey Line 6, JD151 10:56:08z (SP3940)

Objectives: The objectives at Site CAR-2C are to provide a continuous sedimentary sequence to:

1. Assess Neogene (0-17 Ma) history of surface water masses, including the eastern reaches of the equatorial cold tongue, upwelling, and paleoproductivity off Ecuador. Because of the relatively shallow depth of CAR-2, the sediments should be above the lysocline and carbonate dissolution should be controlled by the relative rates of carbonate rain from the surface waters and organic carbon degradation within the surface sediments.

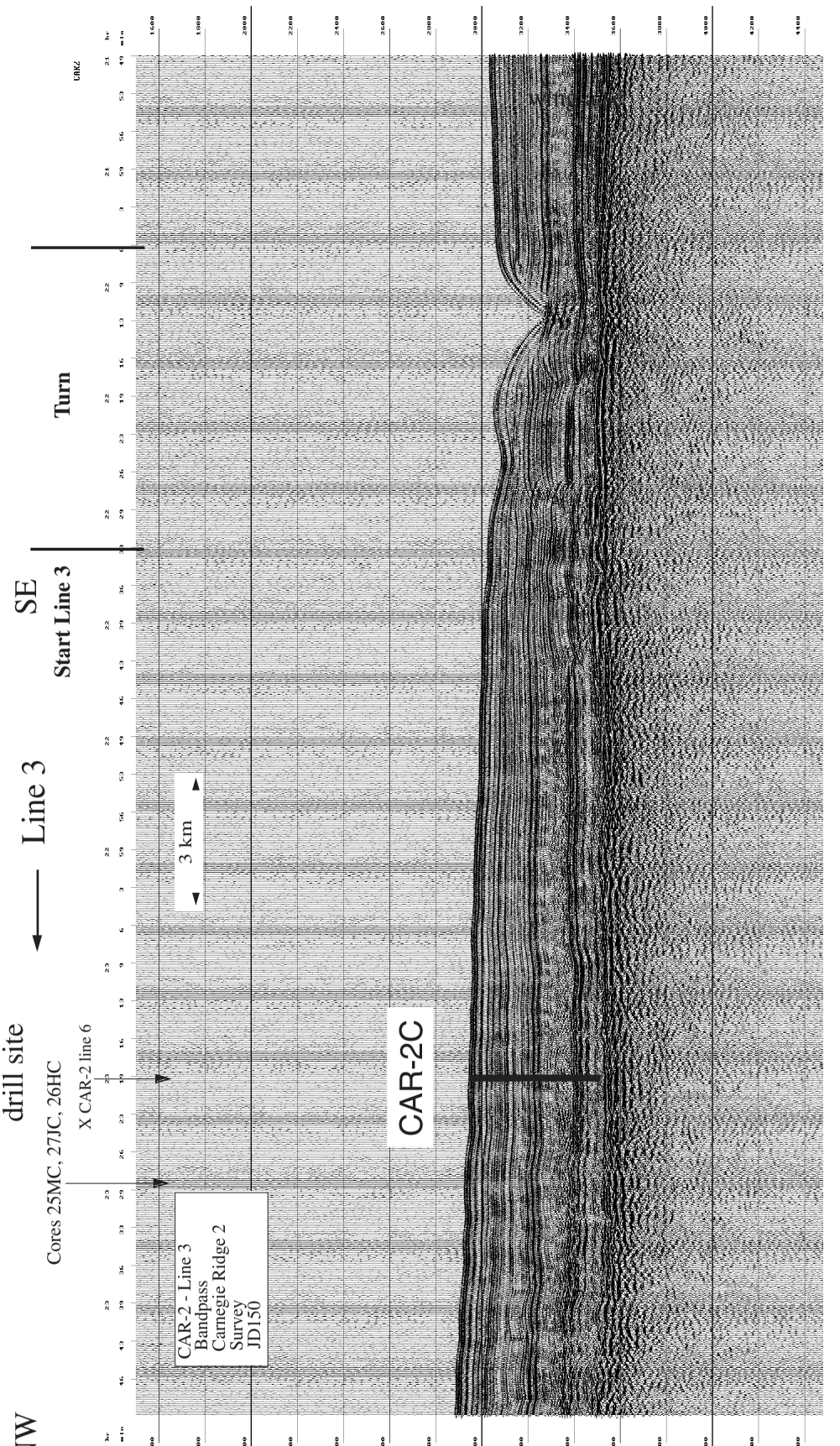
2. Assess subsurface water masses (PCW) at the sill depth of entry into Panama Basin (shallower in older interval).

3. Assess physical properties and structural information in the sediment section, which appears to be creeping downhill ("mud glacier") on the southeastern margin of the Carnegie Ridge. Seismic reflection profiling suggests a deformed layer about 250 m deep within the section.

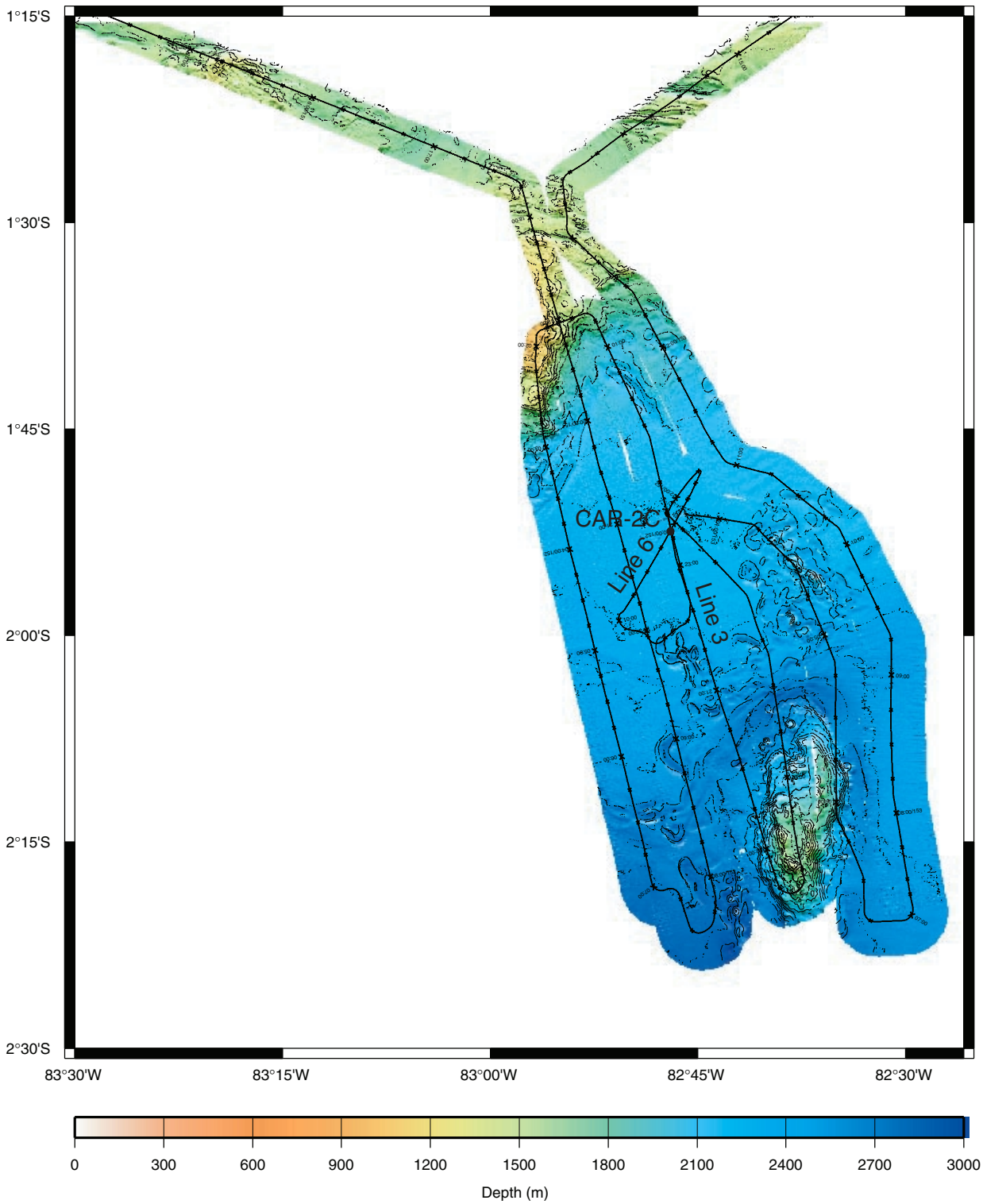
Drilling Program: Triple APC to refusal. Tensor orientation on APC cores. Single XCB to extend one hole to basement or refusal (expected penetration ~480 mbsf).

Logging and Downhole: Triple combo, third-party Lamont MGT, FMS/sonic, GHMT.

Nature of Rock Anticipated: Site survey core is siliceous nannofossil ooze, highly mottled. Expect nannofossil ooze throughout section, with occasional layers (for example, ash layer L, 230 ka [Ninkovitch and Shackleton, 1975] was found between 10.42 and 10.60 mbsf). By analogy with ODP Leg 138, expect some siliceous oozes at depth. Greater lithification at depth—chalk and minor chert possible.


NW
Proposed
CAR-2C
drill site
Cores 25MC, 27JC, 26HC
X CAR-2 line 6
Line 3
3 km
SE
Start Line 3
Turn
CAR-2C
CAR-2 - Line 3
Bandpass
Carnegie Ridge 2
Survey
JD150
Two-way traveltime (ms)

SW
Line 6
NE
End Line 5
Start Line 6
Proposed CAR-2C drill site
X CAR-2 line 2
X CAR-2 line 3
CAR2
CAR-2 - Line 6
Bandpass
Carnegie Ridge 2
Survey
JD151
3 km
change of speed at 10.06
from 10 to 8 knots
CAR-2C
Two-way traveltime (ms)


1°15'S
1°30'S
1°45'S
2°00'S
2°15'S
2°30'S
83°30'W
83°15'W
83°00'W
82°45'W
82°30'W
CAR-2C
Line 6
Line 3
0
300
600
900
1200
1500
1800
2100
2400
2700
3000
Depth (m)

Site: COC-2A

Priority: 3
Position: 5°50.566'N 86°26.674'W
Water Depth: 2042 m
Sediment Thickness: 404 m
Target Drilling Depth: 410 mbsf
Approved Maximum Penetration: 450 mbsf
Seismic Coverage: Sediment thickness: TWTT = 0.49 s (404 m)
Primary Site: 2000 NEMO-3 (*Melville*), COC-2 survey Line 1, JD144 21:02:21z (SP964)
Crossing Line: 2000 NEMO-3 (*Melville*), COC-2 survey Line 3, JD145 08:34:09z (SP3044)

Objectives: The objectives at Site COC-2A are to provide a continuous sedimentary sequence to:

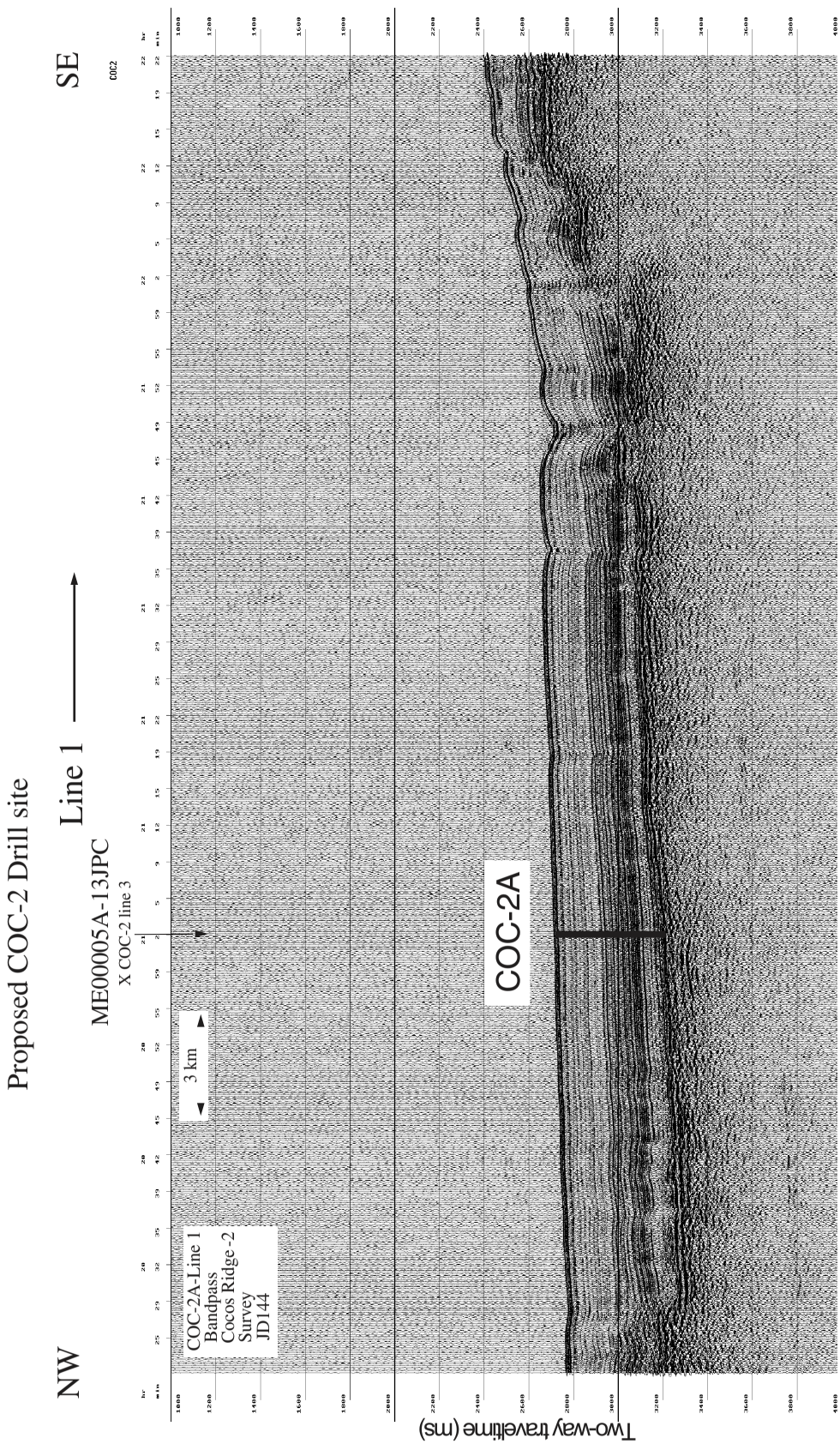
1. Study of the connection between the tropics and northeast Pacific Ocean. The site is located roughly under the modern northern summer position of the Intertropical Convergence Zone.

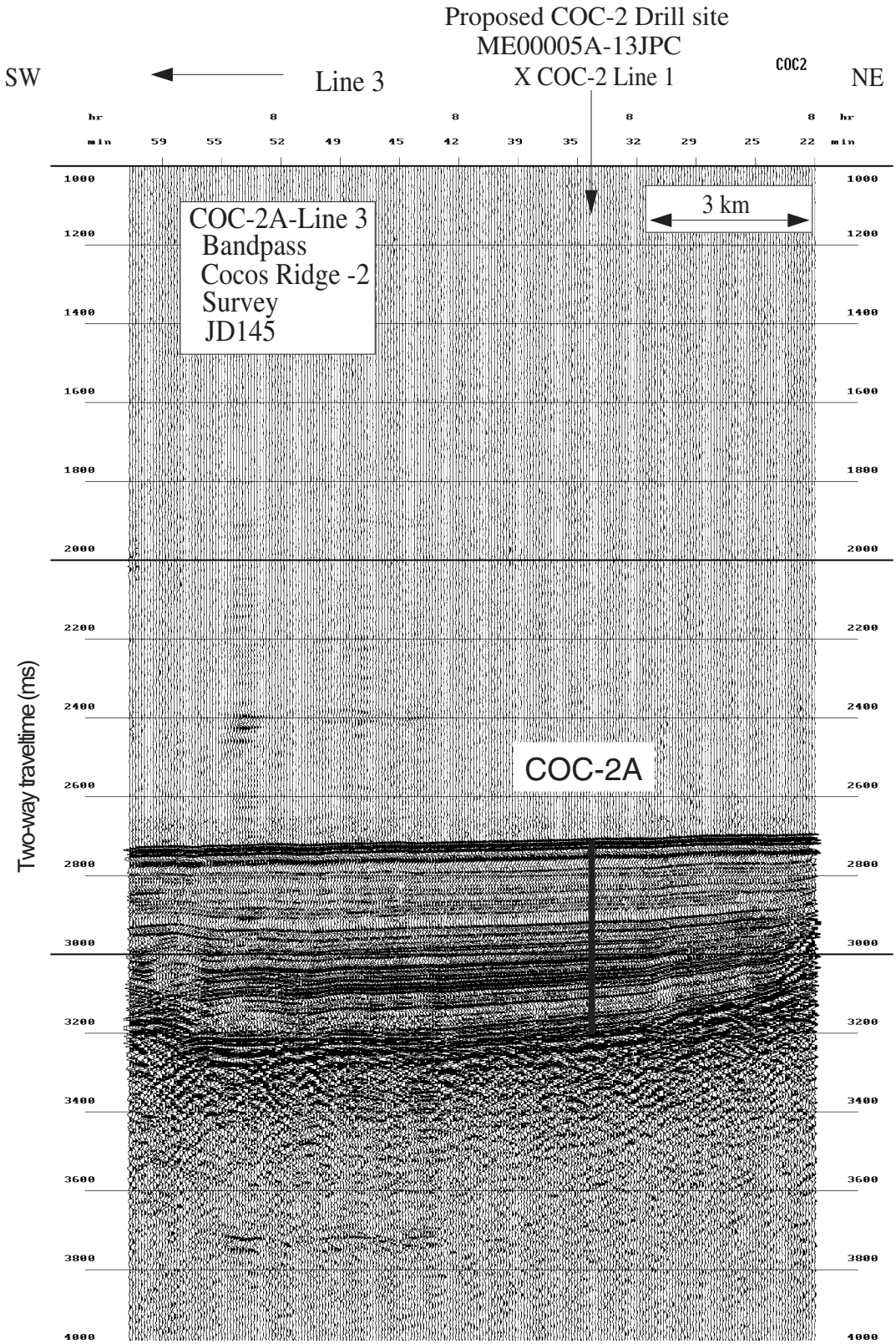
2. Assess carbonate dissolution within Guatemala Basin.

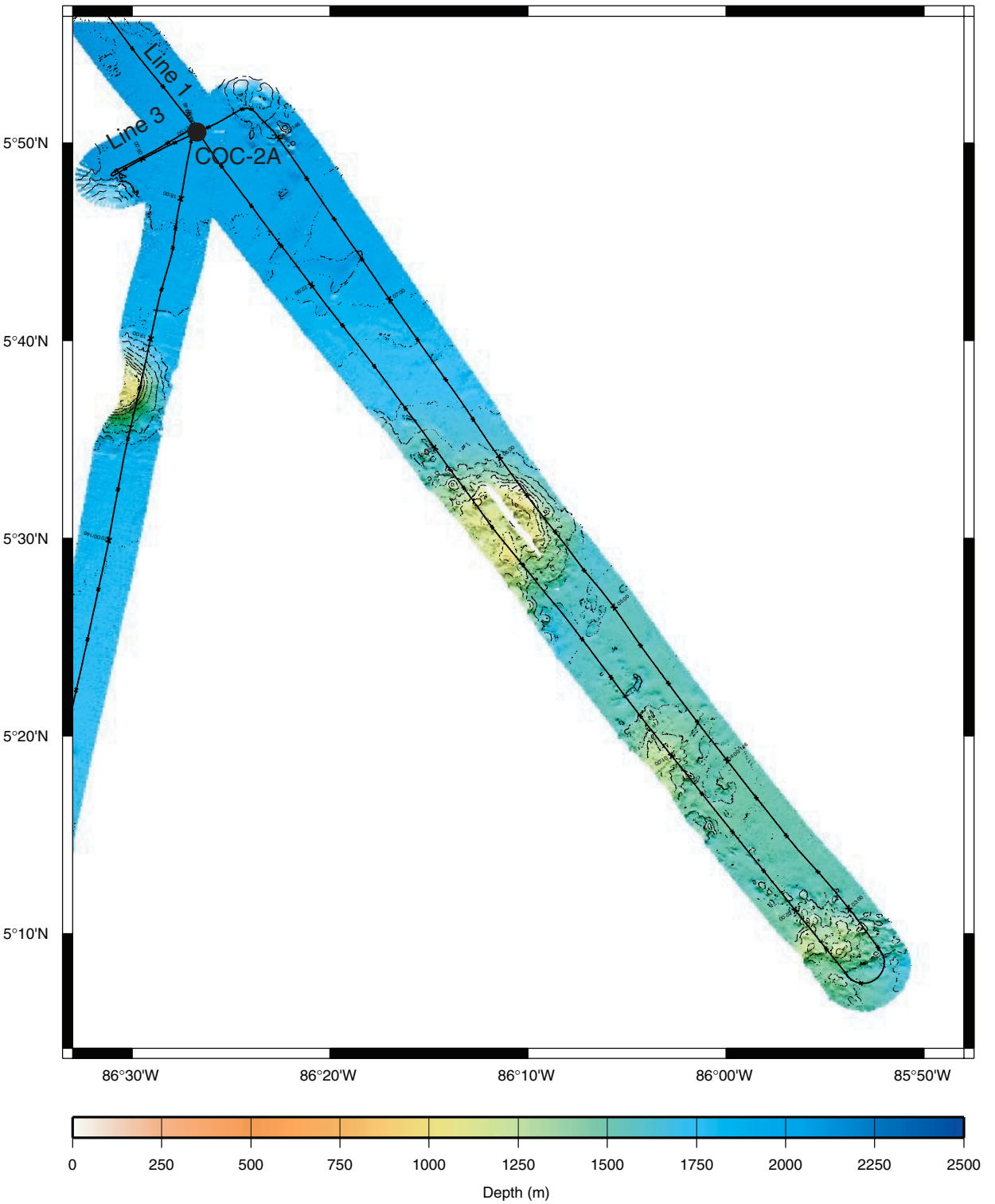
Drilling Program: Triple APC to refusal. Tensor orientation on APC cores. Single XCB to extend one hole to basement or refusal (expected penetration ~280 mbsf).

Logging and Downhole: Triple combo, third-party Lamont MGT, FMS/sonic, GHMT.

Nature of Rock Anticipated: Nannofossil ooze, lithifying to chalk at depth. Crustal age of 10-15 m.y. and a sediment thickness (from the seismic survey) of 404 m yields an average Neogene sedimentation rate of 25-40 m/m.y. Basement is likely composed of volcanics from Galapagos hotspot.


Proposed COC-2 Drill site
NW
Line 1
SE
ME00005A-13JPC
X COC-2 line 3
COC2
3 km
COC-2A-Line 1
Bandpass
Cocos Ridge-2
Survey
JD144
COC-2A
Two-way traveltime (ms)


Proposed COC-2 Drill site
ME00005A-13JPC
X COC-2 Line 1
SW
Line 3
COC2
NE
hr
min
8
59
55
52
49
45
42
39
35
32
29
25
22
3 km
COC-2A-Line 3
Bandpass
Cocos Ridge -2
Survey
JD145
COC-2A
Two-way traveltime (ms)
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000


Line 1
Line 3
COC-2A
5°50'N
5°40'N
5°30'N
5°20'N
5°10'N
86°30'W
86°20'W
86°10'W
86°00'W
85°50'W
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
Depth (m)

Site: COC-3A

Priority: 2
Position: 4°37.089´N, 86°42.334´W
Water Depth: 919 m
Sediment Thickness: 143 m
Target Drilling Depth: 150 mbsf
Approved Maximum Penetration: 150 mbsf
Seismic Coverage: Sediment thickness: 0.183 s (143 m)
Primary Site: 2000 NEMO-3 (*Melville*), COC-3 survey Line 4, JD146 01:09:09z (SP416)
Crossing line: 2000 NEMO-3 (*Melville*), COC-3 survey Line 7

Objectives: The objectives at Site COC-3A are to provide a continuous sedimentary sequence to:

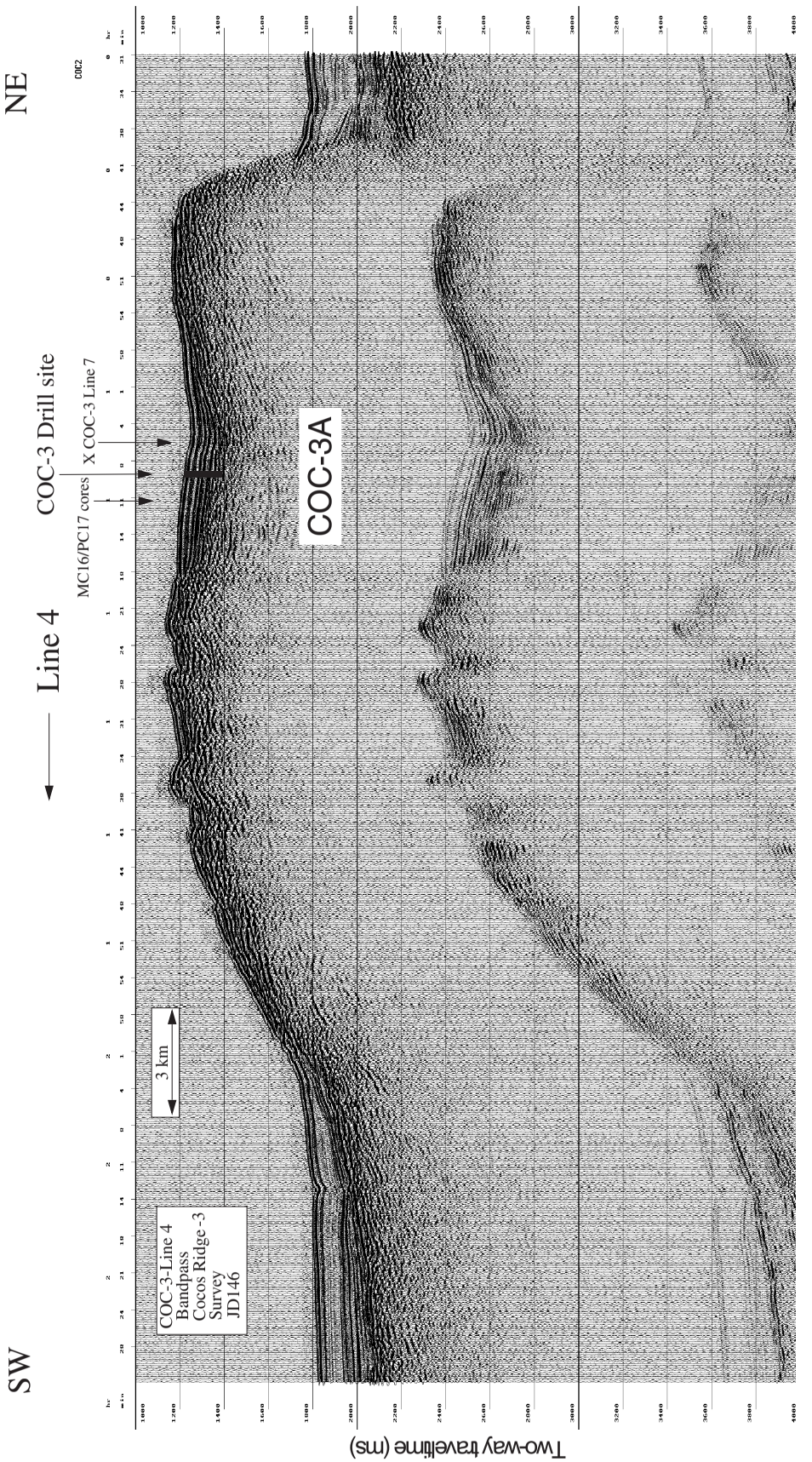
1. Sample lower intermediate waters.

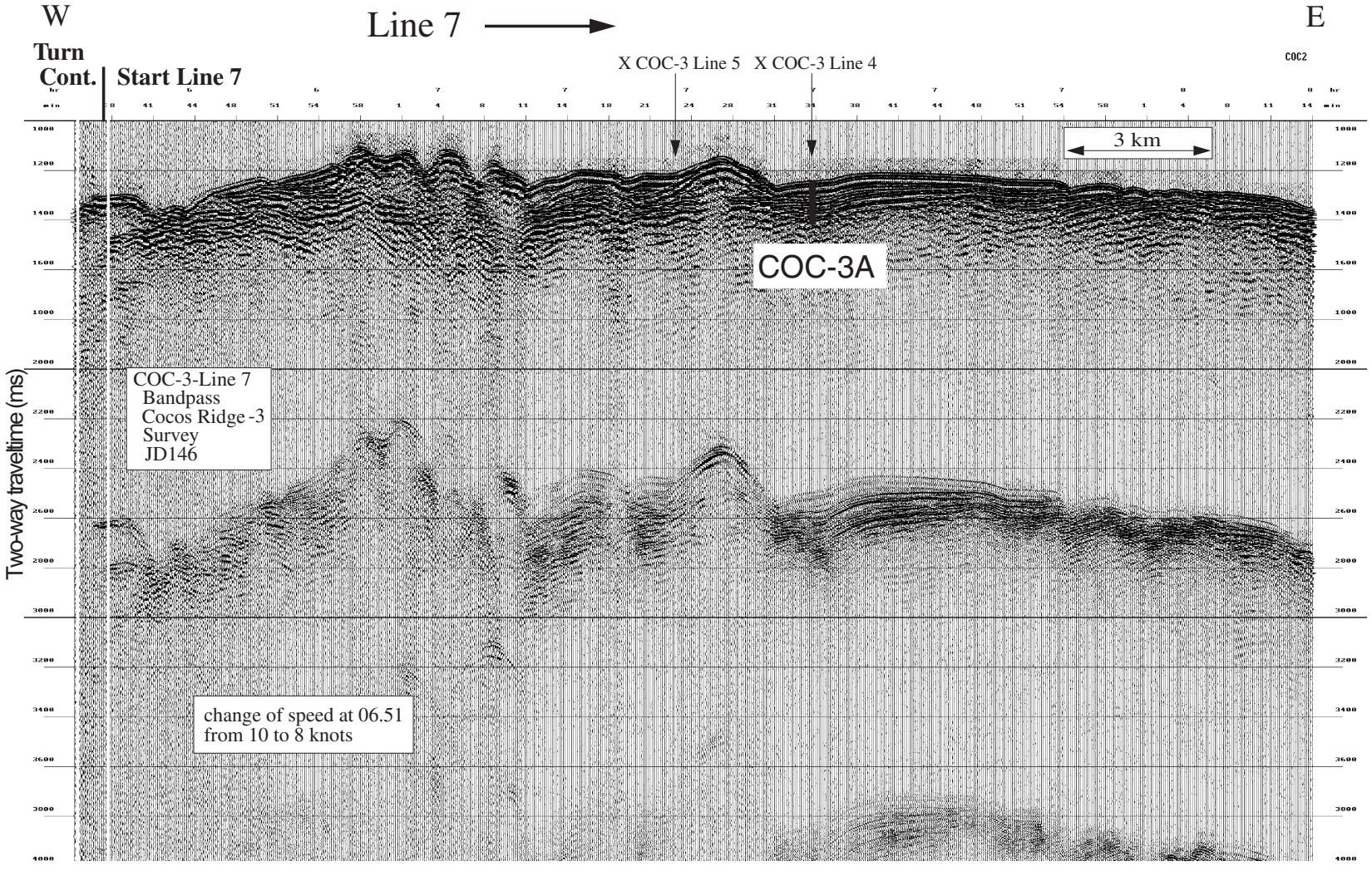
2. Assess variations of the low-salinity, shallow pycnocline region of the Northern Panama Basin.

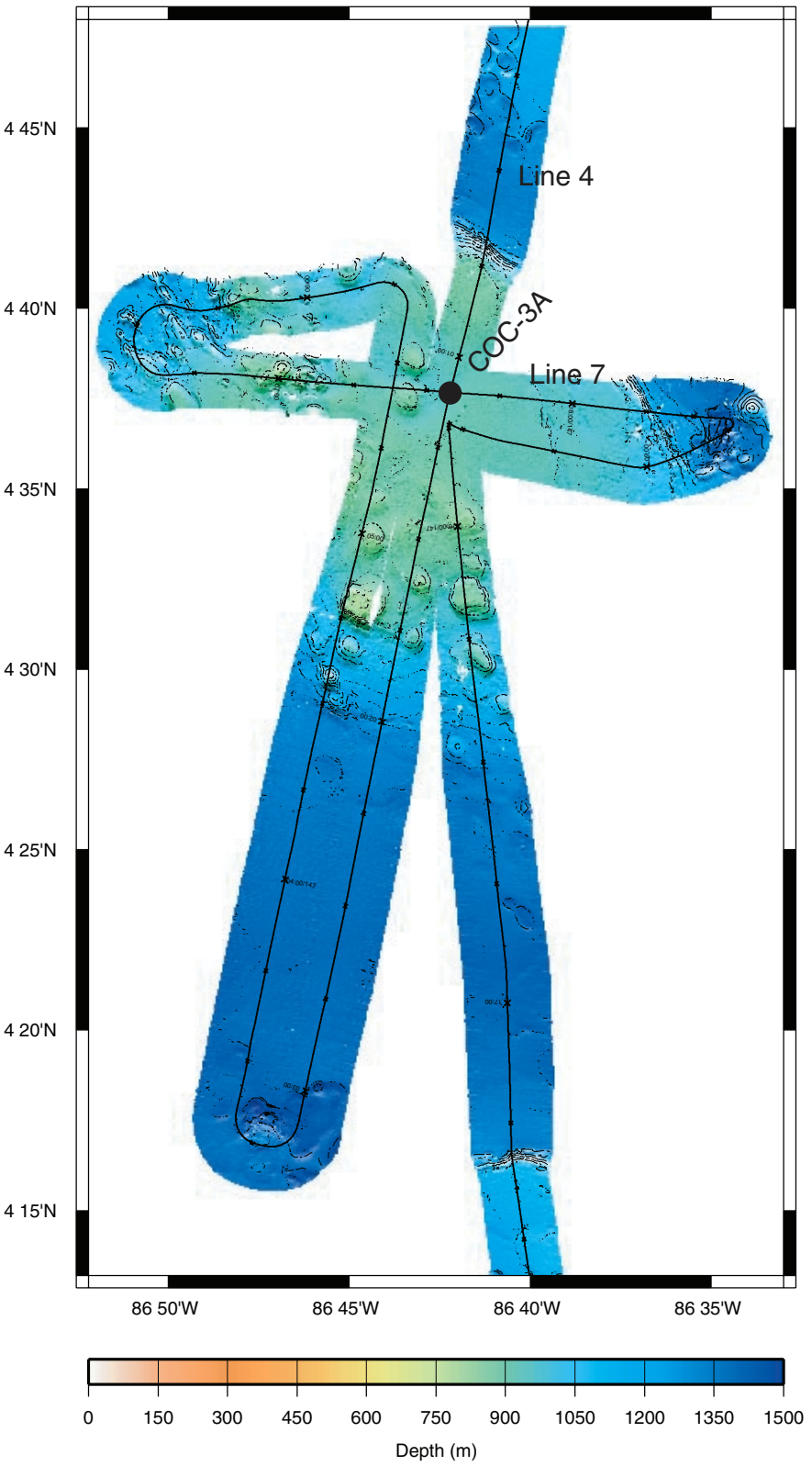
Drilling Program: Triple APC to refusal. Tensor orientation on APC cores.

Logging and Downhole: None

Nature of Rock Anticipated: Site survey core is composed of sandy foram ooze with occasional dispersed ash. The basement age should be 5-7 Ma (assuming hotspot crust, Christie et al., 1992), which implies a sedimentation rate of 20-30 m/m.y. If acoustic basement is younger coral or an erosion surface, sedimentation rate may be higher.


SW
NE
Line 4
COC-3 Drill site
X COC-3 Line 7
MC16/PC17 cores
COC-3A
3 km
COC-3-Line 4
Bandpass
Cocos Ridge -3
Survey
JD146
Two-way traveltime (ms)


W
Line 7
E
Turn
Cont.
Start Line 7
X COC-3 Line 5
X COC-3 Line 4
COC2
3 km
COC-3A
COC-3-Line 7
Bandpass
Cocos Ridge -3
Survey
JD146
Two-way traveltime (ms)
change of speed at 06.51
from 10 to 8 knots


4 45'N
4 40'N
4 35'N
4 30'N
4 25'N
4 20'N
4 15'N
Line 4
COC-3A
Line 7
86 50'W
86 45'W
86 40'W
86 35'W
0
150
300
450
600
750
900
1050
1200
1350
1500
Depth (m)

Site: COC-4A

Priority: 2 (Alternate to COC-3A)
Position: 7°51.352´N 83°36.402´W
Water Depth: 1370 m
Sediment Thickness: 461 m
Target Drilling Depth: 250 mbsf
Approved Maximum Penetration: 250 mbsf
Seismic Coverage: Sediment thickness: 0.559 s (461 m at 1650 m/s velocity)
Primary Line: 2000 NEMO-3 (*Melvill*e), COC-4 Line 5, JD158 09:09:05z (SP3295)
Crossing Line: 2000 NEMO-3 (*Melville*), COC-4 Line 7

Objectives: The objectives at Site COC-4A are to provide a continuous sedimentary sequence to:

1. Monitor the composition of basal intermediate waters and upper deep waters at the northern edge of the Panama Basin.

2. Monitor the Costa Rica Current and the movement of the intertropical convergence zone.

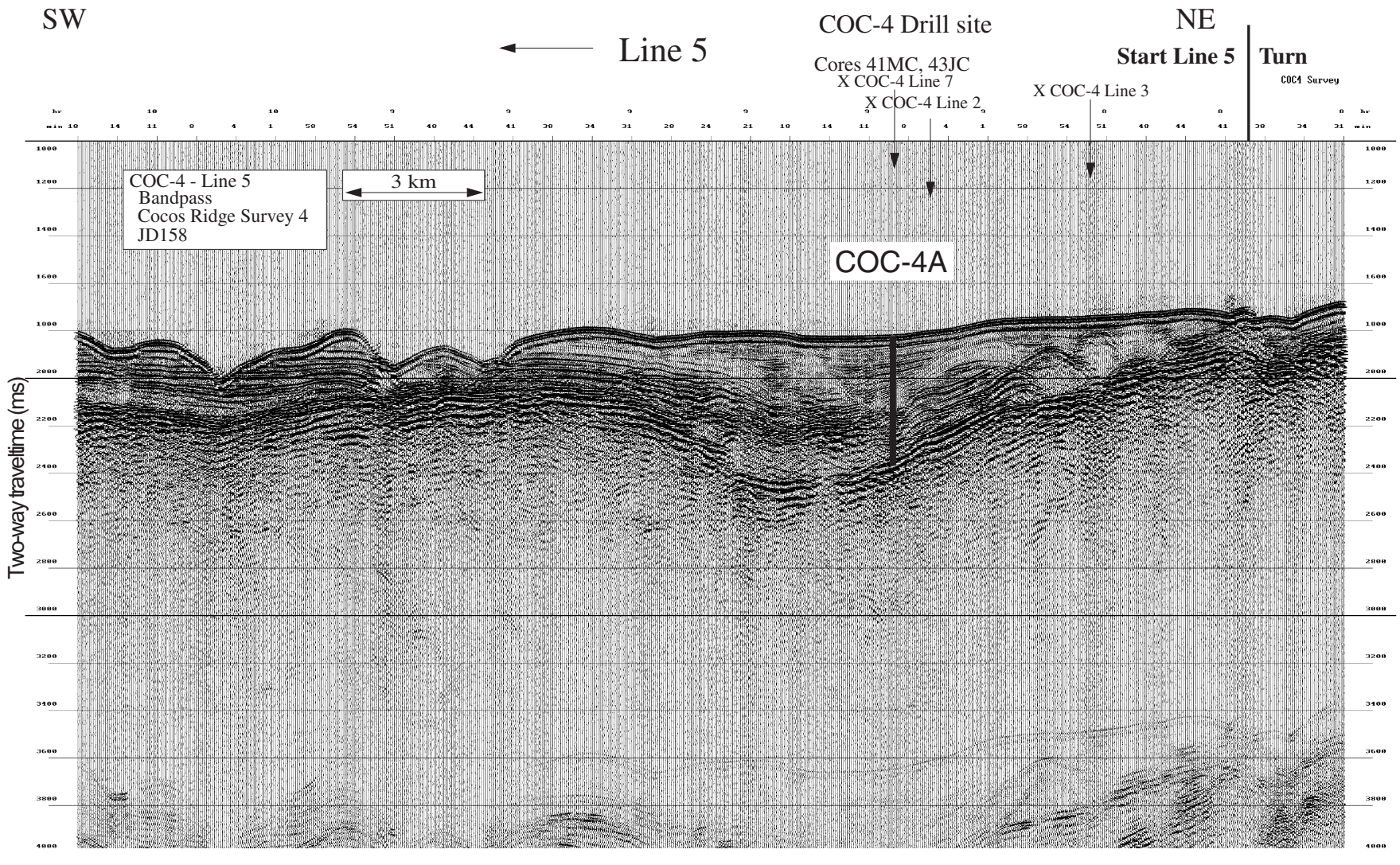
3. Monitor upwelling along the Costa Rica Margin.

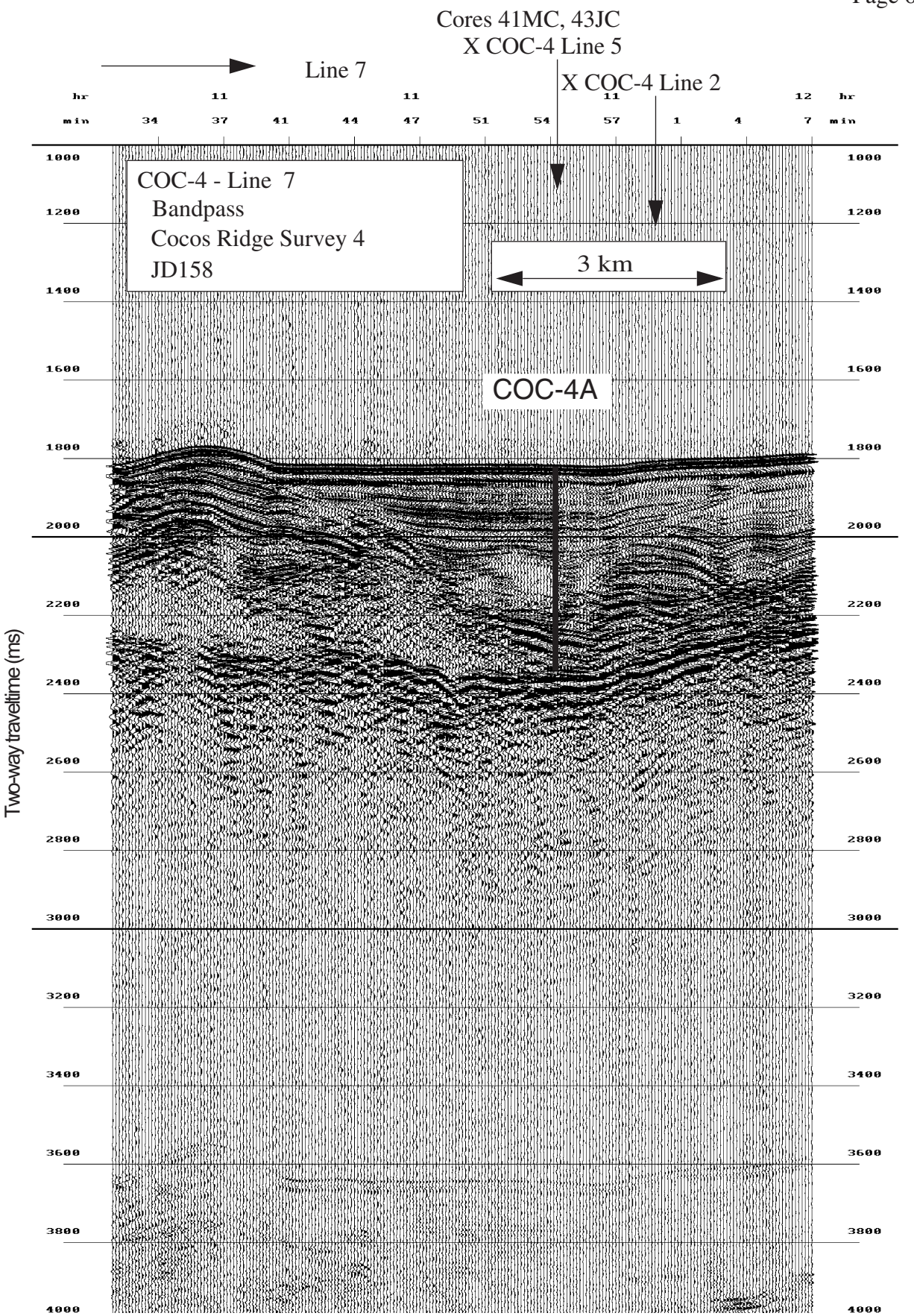
4. Examine a middle Miocene shallow pelagic section from the Galapagos region.

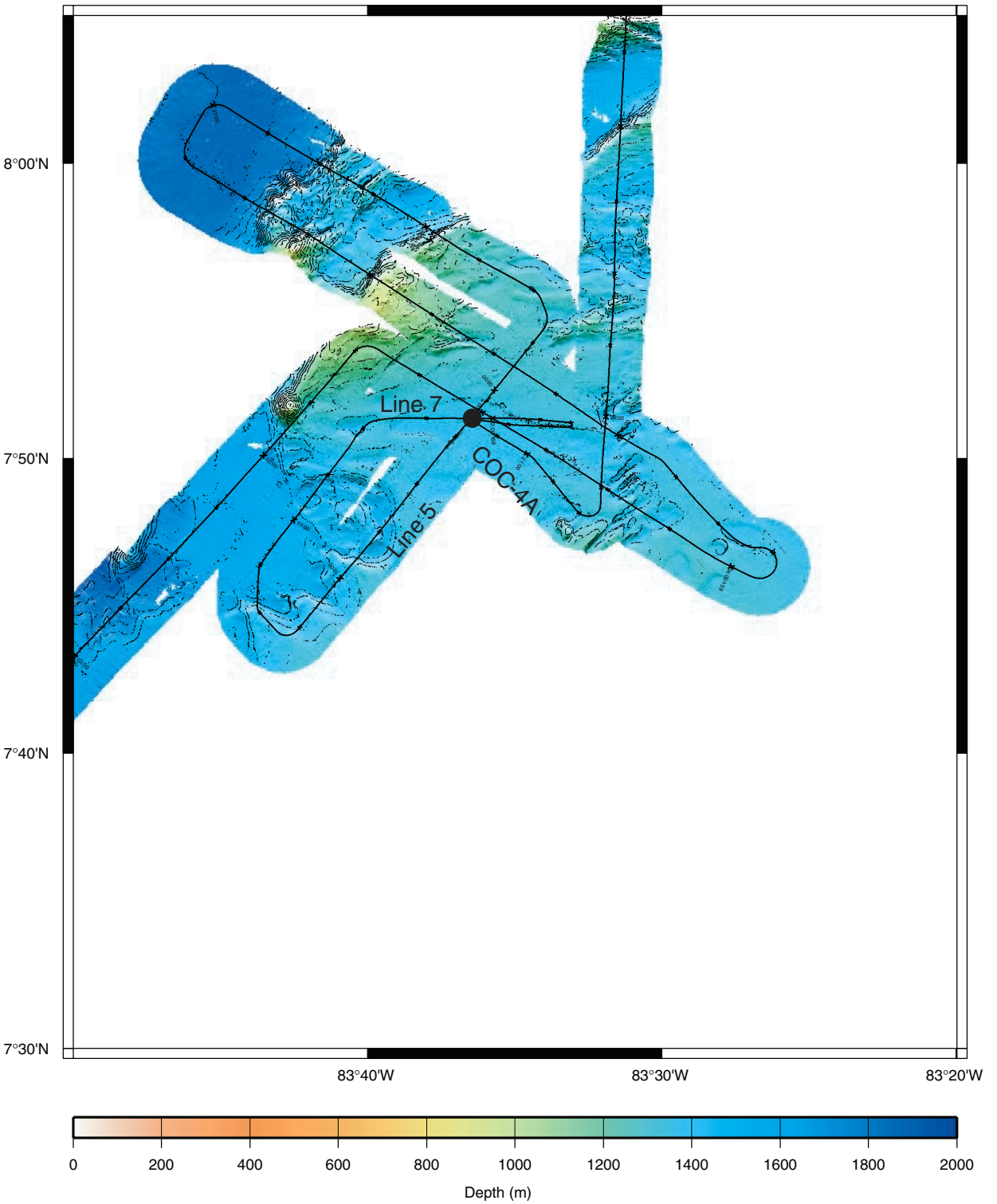
Drilling Program: Triple APC to refusal. Tensor orientation on APC cores. Single XCB if needed to extend one hole to maximum approved penetration ~250 mbsf.

Logging and Downhole: Triple combo, third-party Lamont MGT, FMS/sonic, GHMT.

Nature of Rock Anticipated: Site COC-4 is located in a graben on the crest of the Cocos Ridge, within the region of strong hemipelagic sedimentation from Costa Rica. Site survey core is composed of dark olive gray clay. The hemipelagic sediment-filled modern graben is of uncertain age, but if it is Pleistocene in origin, the sedimentation rate is on the order of 150 m/m.y. (the graben sediments are ~300 m thick).


SW
Line 5
COC-4 Drill site
Cores 41MC, 43JC
X COC-4 Line 7
X COC-4 Line 2
X COC-4 Line 3
NE
Start Line 5
Turn
COC4 Survey
COC-4 - Line 5
Bandpass
Cocos Ridge Survey 4
JD158
3 km
COC-4A
Two-way traveltime (ms)


Cores 41MC, 43JC
X COC-4 Line 5
Line 7
X COC-4 Line 2
hr
min
11
34
37
41
44
11
47
51
54
11
57
1
4
12
7
COC-4 - Line 7
Bandpass
Cocos Ridge Survey 4
JD158
3 km
COC-4A
Two-way traveltime (ms)
1000
1200
1400
1600
1800
2000
2200
2400
2600
2800
3000
3200
3400
3600
3800
4000


8°00'N
7°50'N
7°40'N
7°30'N
83°40'W
83°30'W
83°20'W
Line 7
COC-4A
Line 5
0
200
400
600
800
1000
1200
1400
1600
1800
2000
Depth (m)

Site: NAZCA-10A

Priority: 1
Position: 21°21.54´S, 81°26.16´W
Water Depth: 1323 m
Sediment Thickness: 200 m
Target Drilling Depth: 200 mbsf
Approved Maximum Penetration: 250 mbsf
Seismic Coverage: Sediment Cover TWTT = 0.26 s (200 m)
Primary Line: 970322 (*Revelle*), Line NAZ-1B-5, 2201z, SP366
Crossing Line: 970322 (*Revelle*), Line NAZ-1B-2, 1402z, SP267
Crossing Line: 970322 (*Revelle*), Line NAZ-1B-1, 1119z, SP314

Objectives: The objectives at Site NAZCA-10A are to provide a continuous sedimentary sequence to:

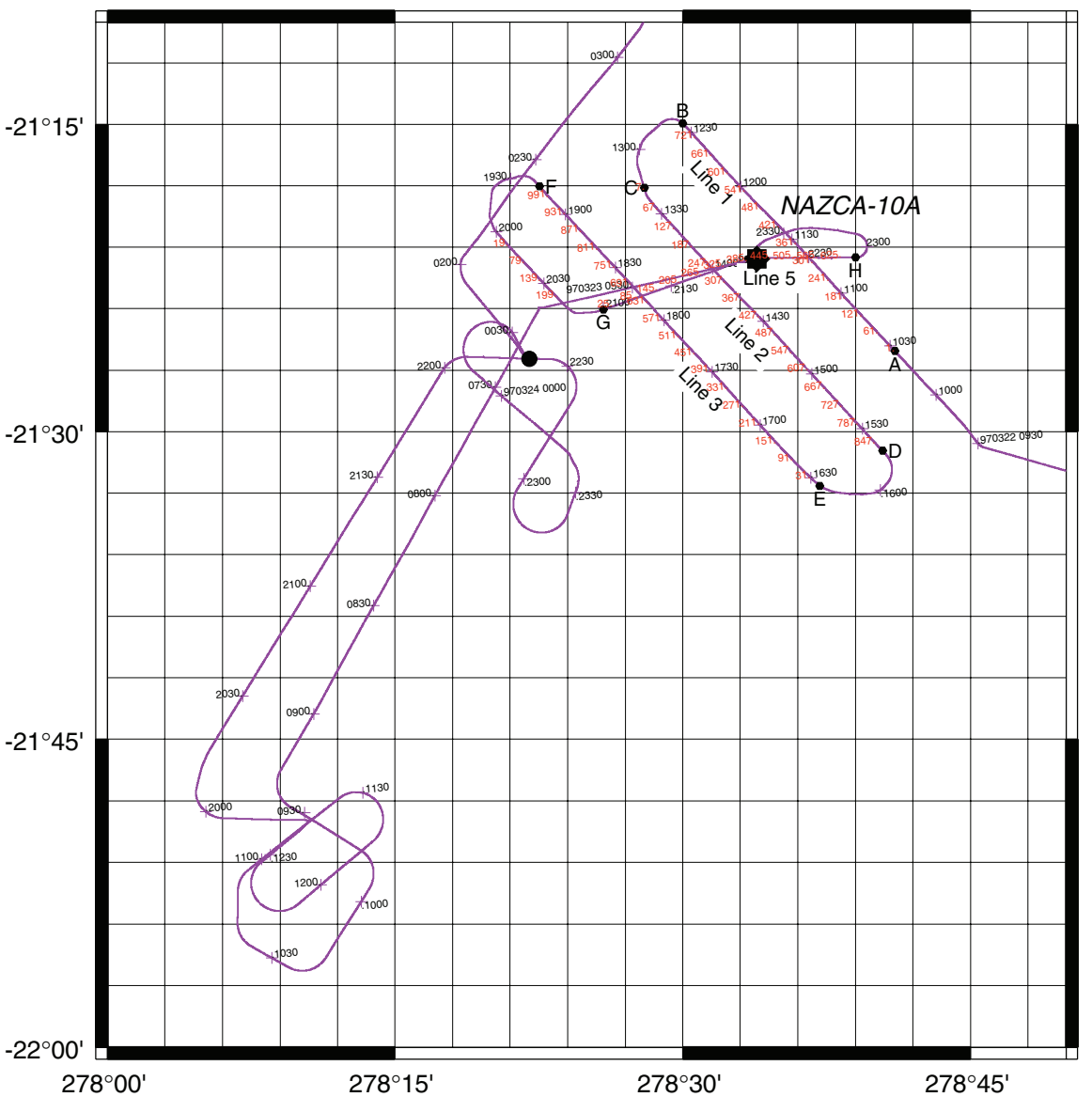
1. Monitor changes in the boundary between Pacific Deep Water and Antarctic Intermediate Water (AAIW) (or in older intervals, the core of AAIW), in a subtropical area away from the continental margin, where primary production is low. Because sedimentation rates are low (<10 m/Ma), this is expected to be a relatively low-resolution record.

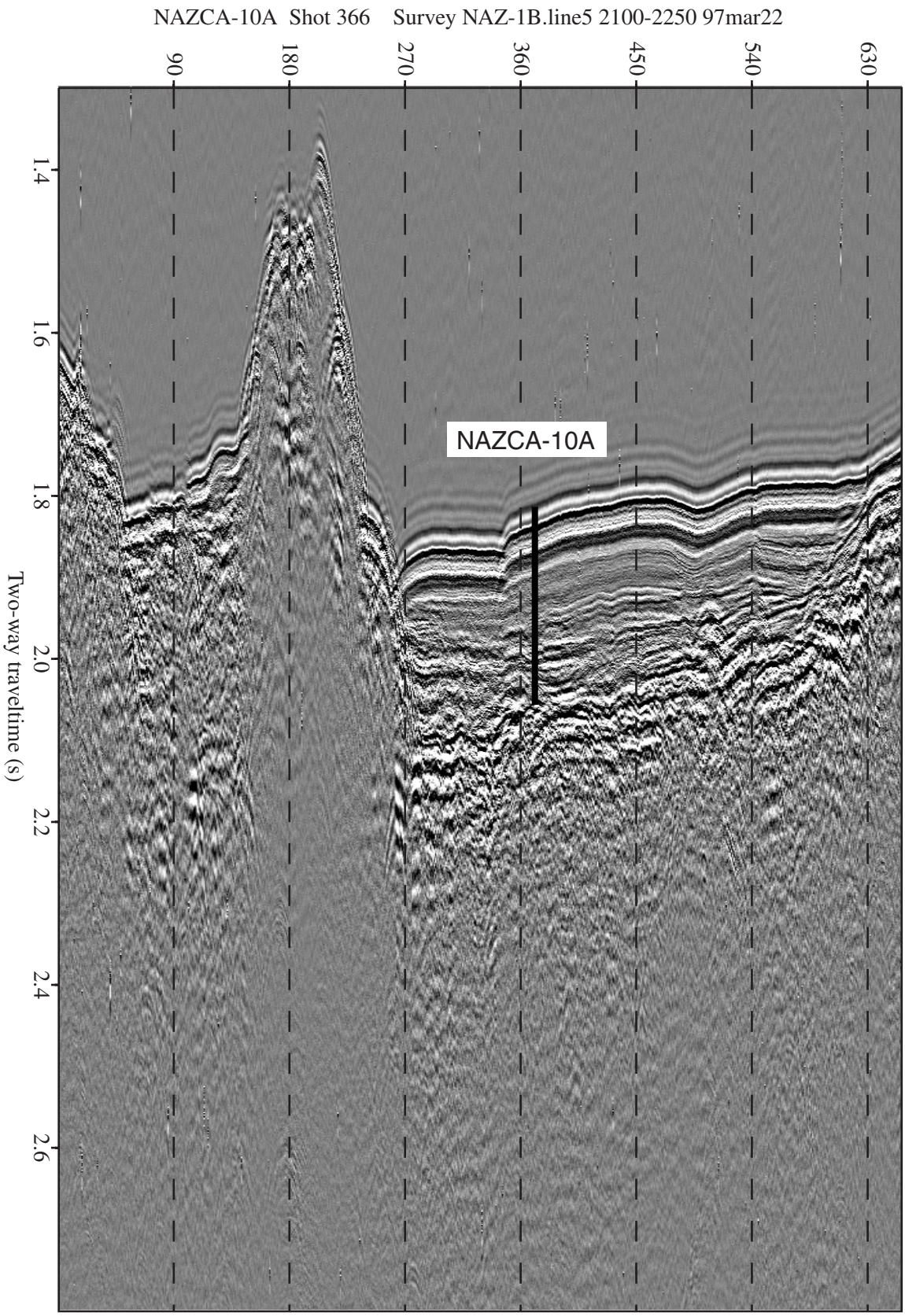
2. Assess climate changes of the southern subtropical Pacific during Neogene and perhaps into Oligocene time (basal age 30-35 Ma, assuming basalt hotspot crust—younger if erosional surface or drowned reef).

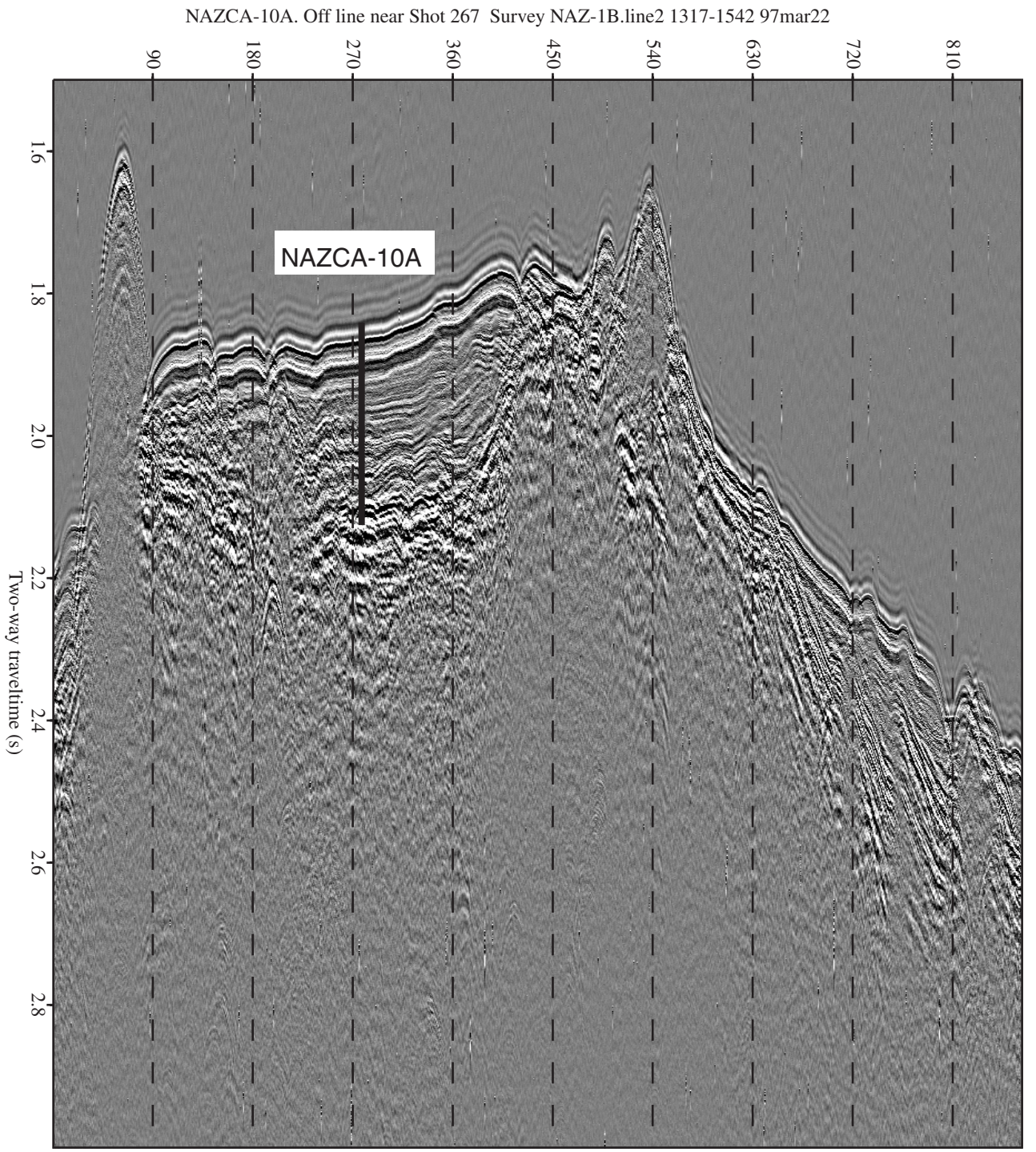
Drilling Program: Triple APC to refusal. Tensor orientation on APC cores. If needed, single XCB to deepen one hole to basement or XCB refusal (expected total penetration ~200 mbsf).

Logging and Downhole: None.

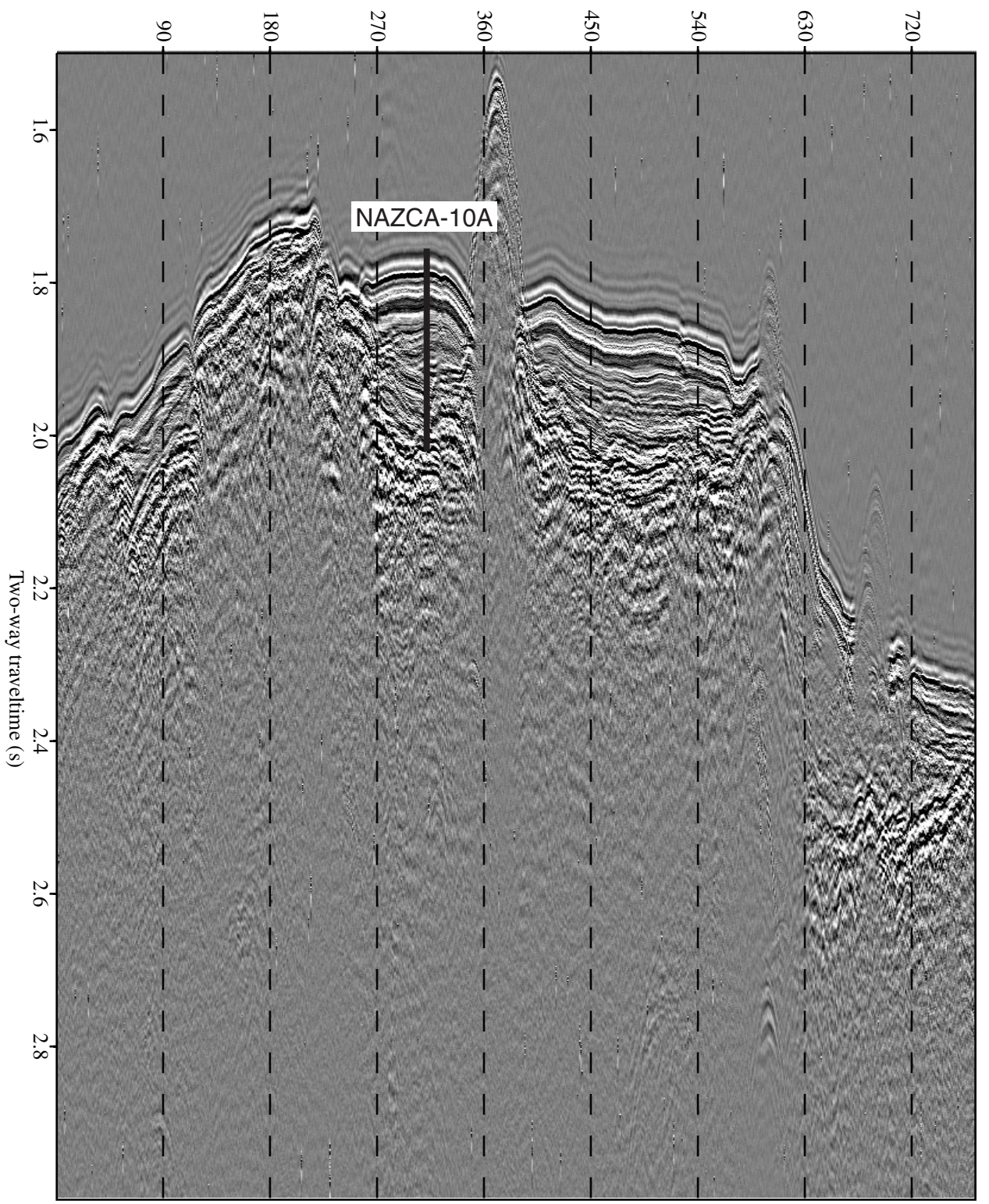
Nature of Rock Anticipated: Pelagic foraminiferal ooze with nannofossils. Deeper intervals may be partly lithified. Some hiatuses may be present. Acoustic basement may be coral or an erosion surface on hotspot volcanics, as some parts of the shallow rise crest appear to be flat (sea level) erosional features.

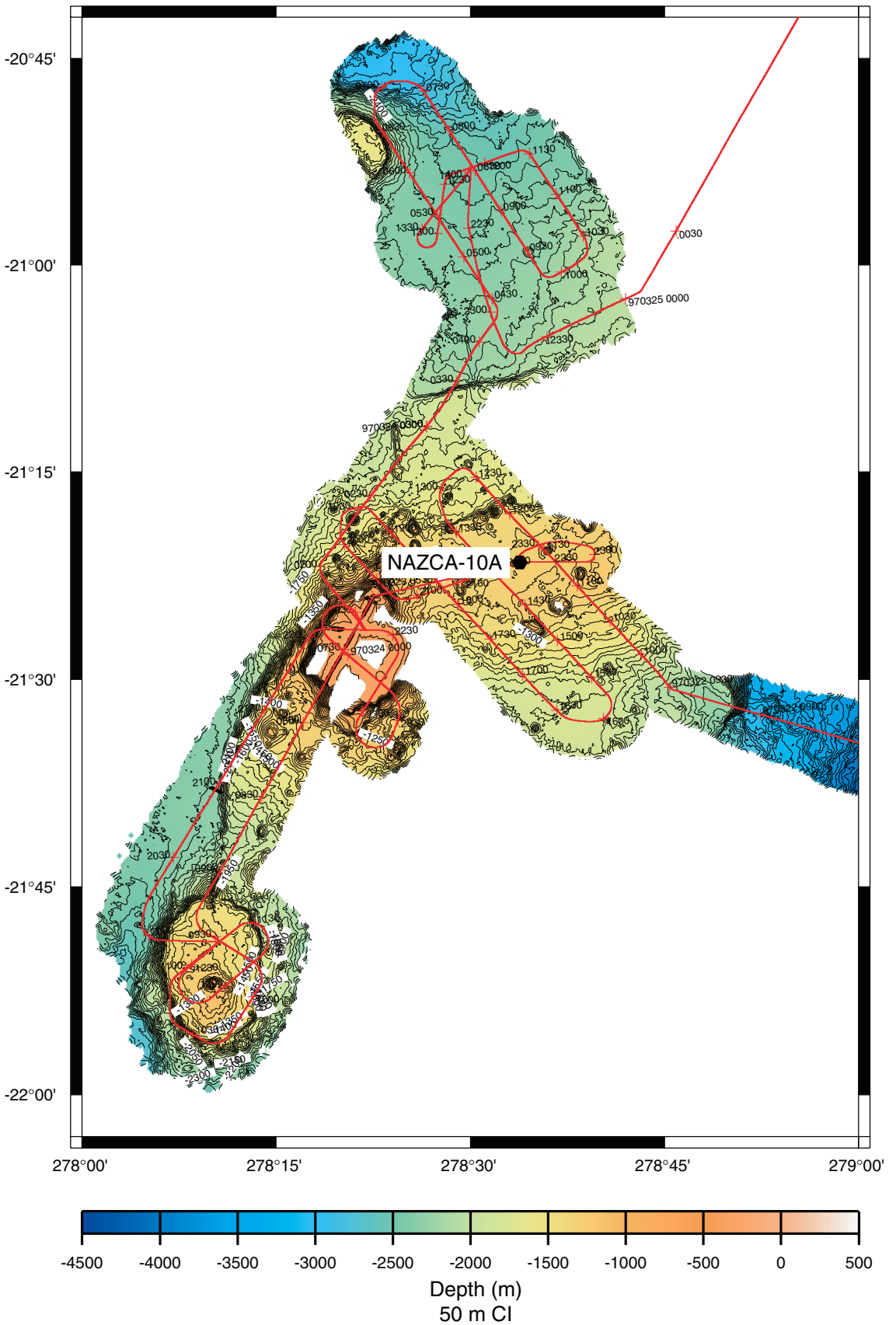

-21°15'
-21°30'
-21°45'
-22°00'
278°00'
278°15'
278°30'
278°45'
NAZCA-10A
Line 1
Line 2
Line 3
Line 5
A
B
C
D
E
F
G
H
970322 0930
970323 0530
970324 0000


NAZCA-10A Shot 366 Survey NAZ-1B.line5 2100-2250 97mar22
90
180
270
360
450
540
630
NAZCA-10A
1.4
1.6
1.8
2.0
2.2
2.4
2.6
Two-way traveltime (s)


NAZCA-10A. Off line near Shot 267 Survey NAZ-1B.line2 1317-1542 97mar22
90
180
270
360
450
540
630
720
810
NAZCA-10A
1.6
1.8
2.0
2.2
2.4
2.6
2.8
Two-way traveltime (s)

NAZCA-10A Off line near Shotpoint 314. Survey NAZ-1B.line1 1027-1235 97mar22




-20°45'
-21°00'
-21°15'
-21°30'
-21°45'
-22°00'
278°00'
278°15'
278°30'
278°45'
279°00'
NAZCA-10A
970324 0000
970325 0000
-4500
-4000
-3500
-3000
-2500
-2000
-1500
-1000
-500
0
500
Depth (m)
50 m CI