JULY 2000
Site Survey Package 4B to ODP Site Survey Panel

Site Surveys for ODP Leg 201 from the NEMO-3 Cruise in support of Proposal 465-ADD1: *Southeast Pacific Paleoceanographic Transects*

Volume 1
Site Descriptions and Maps

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SITE CAR-2C (SE flank of Carnegie Ridge)

1° 52.406'S 82° 46.914' W, water depth–2223 m

SITE OBJECTIVES

CAR-2 will be used to study the Pleistocene history of upwelling and paleoproductivity off Ecuador and the movement of the equatorial front. It will be used to monitor the South Equatorial Current and to monitor the composition of waters that flow into the Panama Basin.

It is located within a sediment section slowly creeping downhill ("mud glacier") on the southeastern margin of the Carnegie Ridge. Seismic reflection profiling has imaged a deformed layer about 250 m deep within the section. A secondary objective at this site will be to drill this layer and determine its physical properties. The sediments above this layer are basically undeformed, as in an ice glacier.

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. The presence of what is probably ash layer L at 10.42 m in the piston core suggests an average late Pleistocene sedimentation rate of 40-50 m/Myr.

GENERAL DESCRIPTION

CAR-2 is situated in a basement scallop along the southeastern flank of the Carnegie Ridge near where the Carnegie Ridge collides with the Peru-Chile Trench (Figure CAR2-1). To the south the sea floor topography steps up from typical depths >4 km south of Sarmiento Ridge (~7°S) to 3 km at the base of the slope on this flank at about 2°S.

The CAR-2 survey was carried out at the upper part of this slope, mainly between about 1500 m and 2500 m (Figure CAR2-2). There is a major channel in the southern end of the survey area, passing just north of a prominent seamount. Sediments above the channel are relatively uniform in thickness, 400-500 m thick (500-600 msec TWTT). There is strong evidence that the sediments are creeping down into the channel. The edge of the channel is marked by "seracs" of the sediment section detaching and falling into it (Figure CAR2-2 and CAR2-3). A disturbed zone, possible representing a detachment, can be imaged at about 250 m below the sea floor (305 msec TWTT) in the vicinity of the proposed CAR-2C drillsite. The "serac" line marks where the sediment passes over a drop in basement level, and there is a separation at the top of the sediment section and the basement outcrop behind (Figure CAR2-4).

NEMO-3 SURVEY

CAR-2 was surveyed between May 29 and May 31 2000 on the R/V Melville NEMO-3 cruise. We surveyed the proposed drillsite with the Melville Seabeam 2000 swathmapping system for bathymetry, a digitally-recorded Knudsen 320B echosounder for high-resolution subbottom profiles, and the OSU multicore and jumbo piston coring system for surface sediment sampling. We used two 150 c.i. GI guns and the Scripps 4-channel hydrophone streamer to digitally acquire seismic reflection profiles. The seismic reflection profile and crossline over CAR-2C are shown in Figures CAR2-5 and -6, and the echosounder profile is shown in Figure CAR2-7. The upper sediments were cored to 19 m depth in the jumbo piston core ME0005A-27JC. The sediment-water interface was sampled with the multicore ME0005A-25MC

LITHOLOGIC DESCRIPTION

Nearest sediment core: ME0005-0027C, taken on NEMO-3; 1° 51.21' S, 82° 47.20'W, 2203 m water depth, 19.18 m sediment recovered

The piston core is olive to olive gray siliceous nannofossil ooze, highly mottled. There is a subtle alteration of colors downcore which probably represents orbital cyclicity. An 18 cm thick ash layer (perhaps Ash layer L, 230 ka) was found between 10.42 and 10.60 mbsf. Below 15 m the lighter layers in the light-dark banding became lighter, and were observed to have higher nannofossil content than in the shallow section.

SEISMIC INTERPRETATION

Primary Site (CAR-2C): CAR-2 survey line 3, JD150 23:19:01Z (SP4137)
Crossline: CAR-2 survey line 6, JD151 10:56:08Z (SP3940)
Location: 1°52.406'S, 82°46.914' W
Site water depth: 2223 m (center beam depth; 2.947 sec TWTT)
Sediment thickness: 0.582 sec (480 m)
Proposed Drilling Depth: 485 m

CAR-2C is located on a gentle slope on the southeast flank of the Carnegie Ridge where it meets the Peru-Chile Trench. The slope appears to have been steepened during this collision and the sediment section is creeping downhill. The shear zone appears to be within the sediments, at a depth of 0.305 sec TWTT (about 245 mbsf, Figure CAR2-5), and we believe from a preliminary seismic interpretation that the failure interval is a biogenic-silica-rich late Miocene to early Pliocene high productivity unit. Basement is located 0.277 sec below the top of the disturbed interval, or at a depth of about 480 m. The region around the proposed drillsite has the same basic stratigraphy, although the upper sediment column at Site CAR-2C is slightly thicker than most of the area.

GEOLOGIC HAZARDS

There are no geological hazards. The section to be drilled is a pelagic siliceous nannofossil ooze over basalt on an aseismic ocean ridge. There is a possibility of some overpressured fluids in the lower section.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/00

Seismic lines, chirp subbottom profiles, and maps for CAR-2 are all included in V.2 of this submission. We also include CD-ROMs of images and SEG-Y files of the seismic reflection data for electronic filing

FIGURES

Fig CAR2-1: Regional location map for CAR-2. Proposed drill site is marked.
Fig CAR2-2: Swathmap bathymetry for the CAR-2 region, from the Nemo-3 site survey. Proposed drill site is marked.

Fig CAR2-3: Migrated seismic image across the “serac” zone on seismic line 5 showing the deformation of the sediment column.

Fig CAR2-4: Seismic line 4 showing the sediments downslope from the basement outcrop of Carnegie Ridge. Sediment is being deformed over the 2 basement steps. The deformation appears to be occurring about halfway through the sediment column

Fig CAR2-5: Bandpass-filtered seismic reflection profile CAR2 line 3 across CAR-2C, from NEMO-3. Proposed drill site is marked.

Fig CAR2-6: Crossline profile CAR2 line 6 across CAR-2C, from NEMO-3. Proposed drill site is marked.

Fig CAR2-7 2-7 kHz Chirp seismic taken along CAR2 Line 3 across the proposed drillsite.

REFERENCES

Mammerickx, J. and Smith, S.M., 1978, Bathymetry of the southeast pacific. Geological Society of America, Map and Chart Series, MC-26.

Figure CAR2-1: Site map showing the position of CAR-2 on the Carnegie Ridge and bathymetry of the northern Nazca Plate. The base map is Mammerickx and Smith (1978).

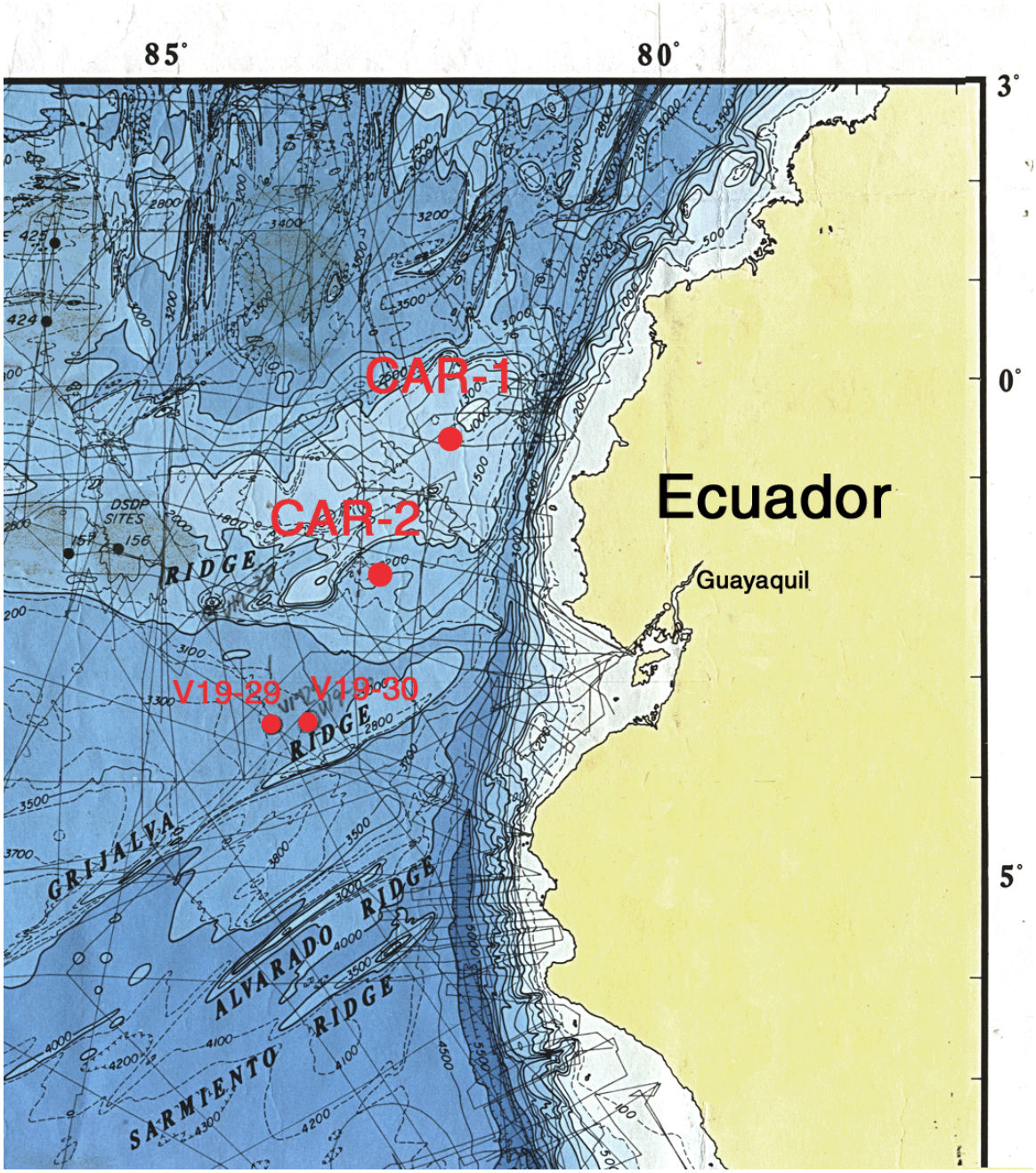


Figure CAR2-2: Swathmap bathymetry for the CAR-2 survey on the NEMO-3 cruise. CAR-2C is located on the southeastern flank of the aseismic Carnegie Ridge.Note the similarities to glacial morphology.

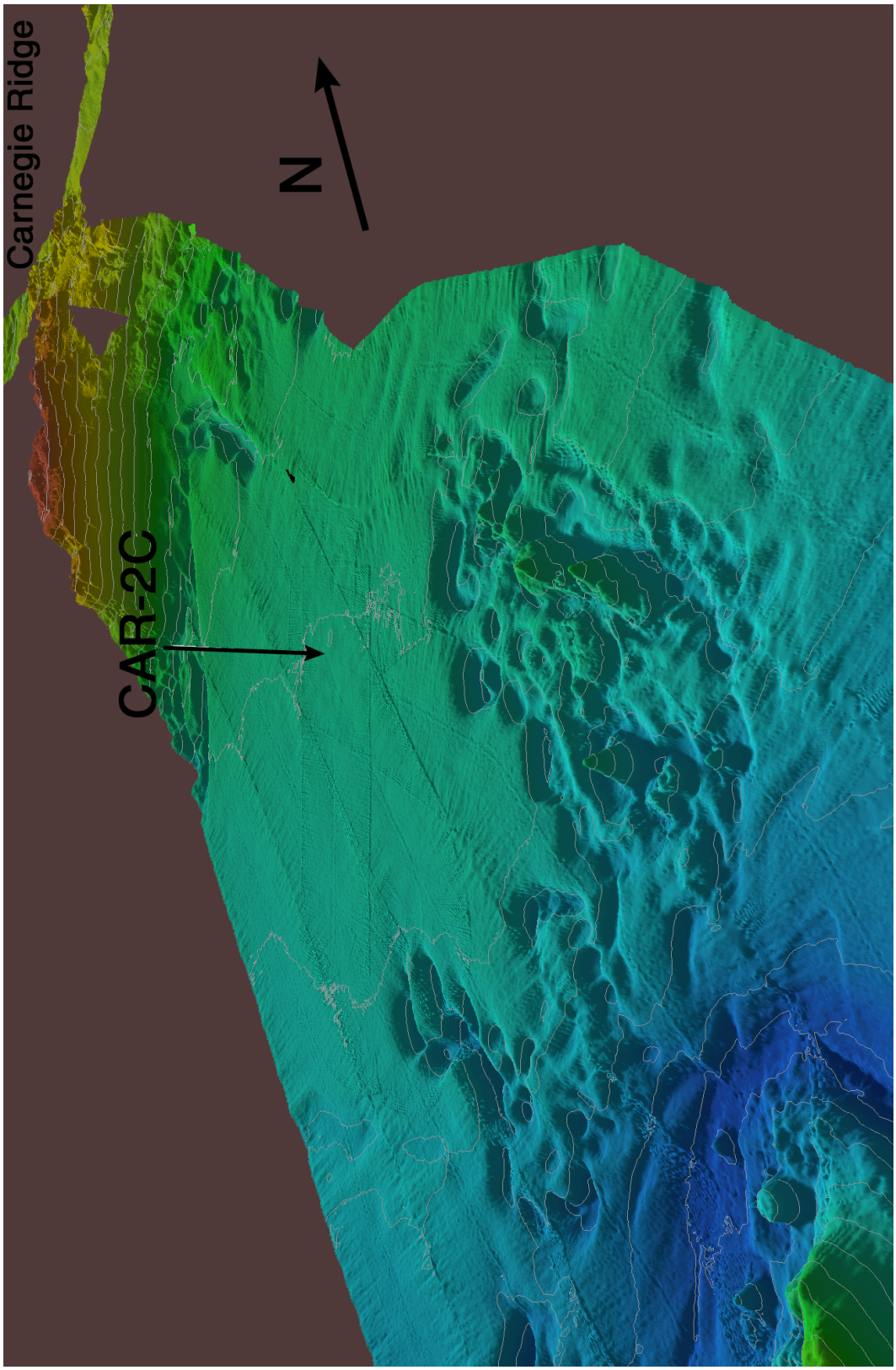


Figure CAR2-3: Migrated seismic image across the “serac” zone on seismic line 5 showing the deformation of the sediment column.

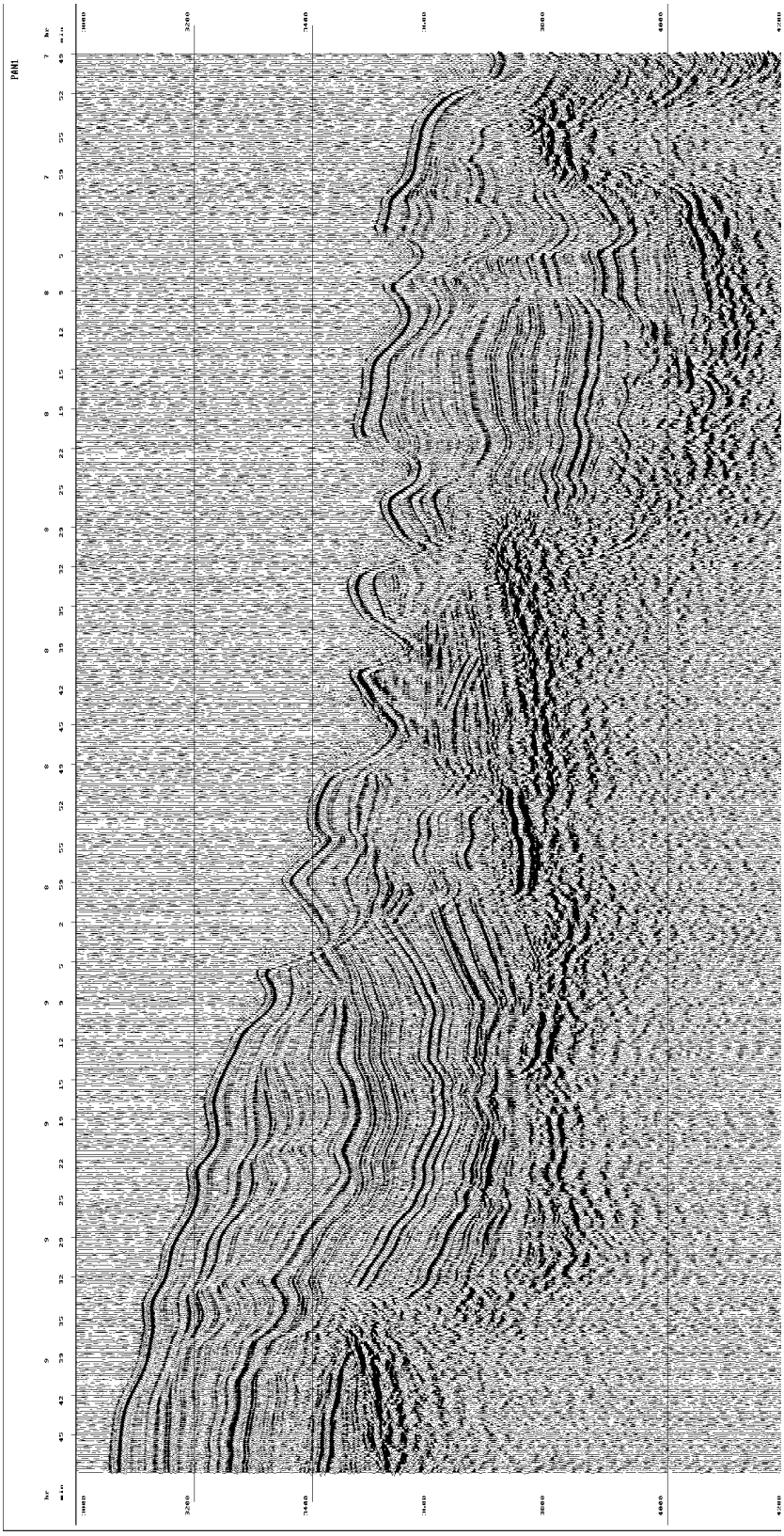
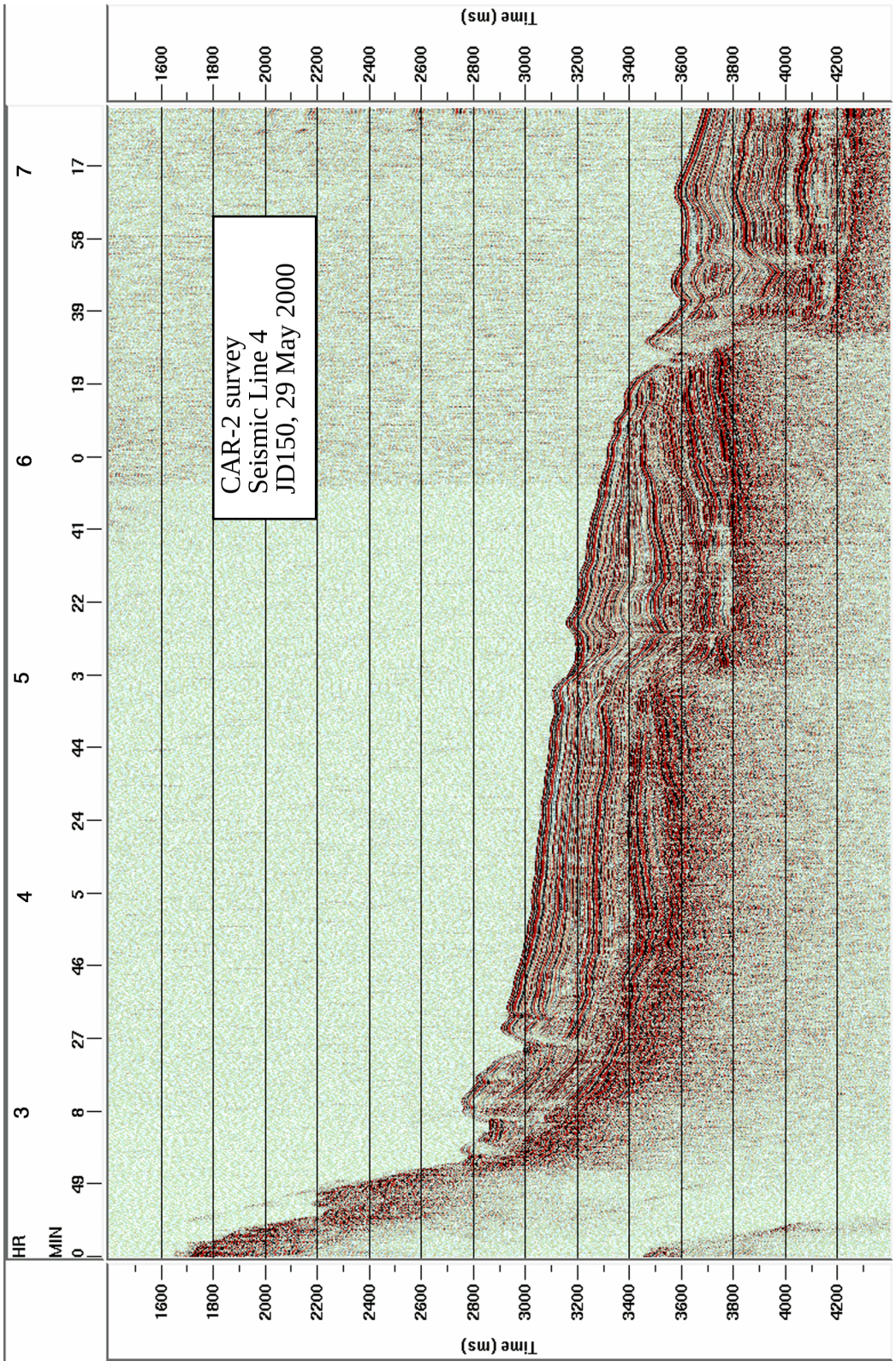
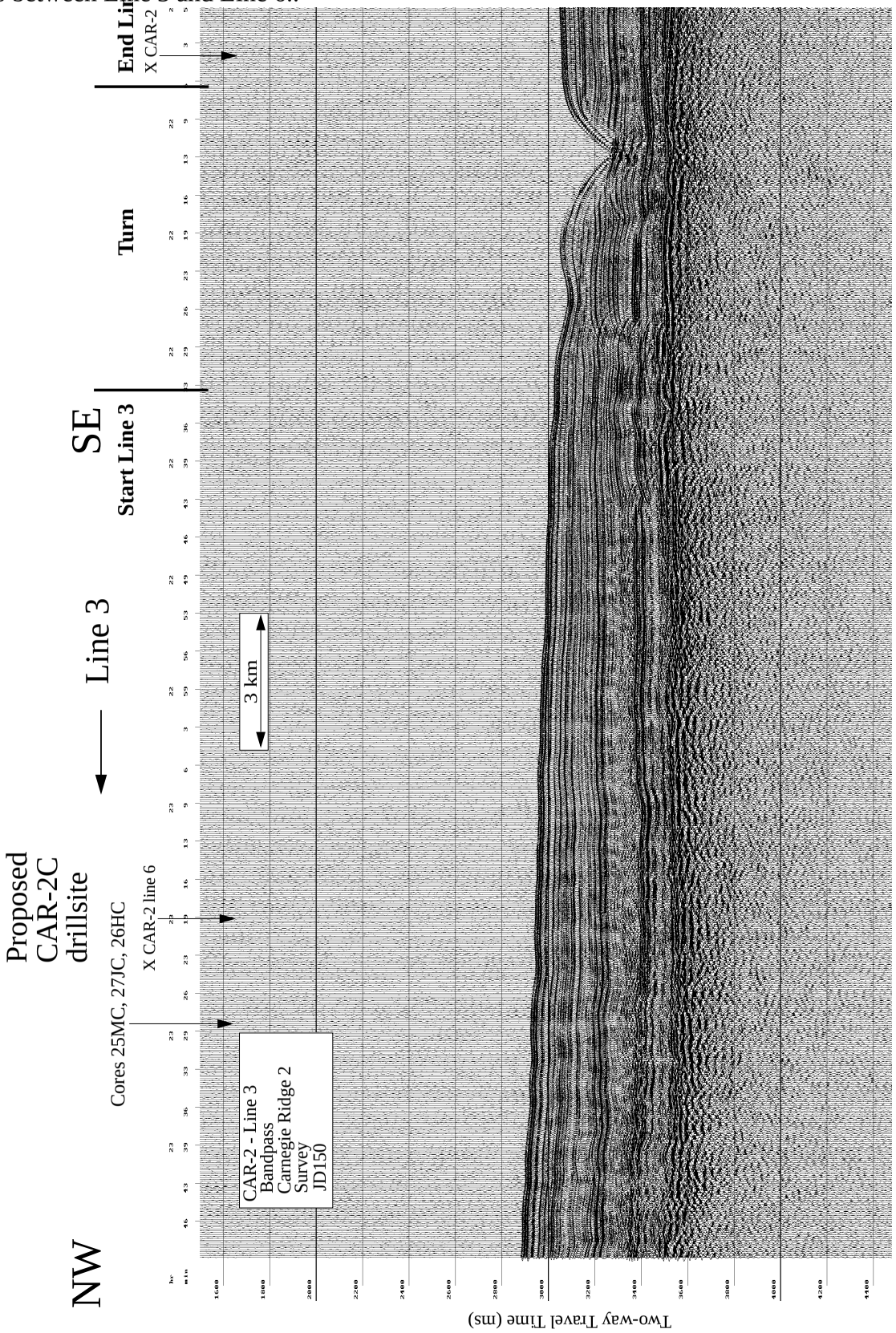


Figure CAR2-4: Seismic line 4 from the basement outcrop of Carnegie Ridge on the upper slope showing sediment being deformed over the 2 basement steps.



FigureCAR2-5 Bandpass-filtered seismic reflection profile showing a segment of CAR2 line 3, showing the dip line through the proposed CAR-2 drillsite. Proposed drillsite location is at the cross between Line 3 and Line 6..



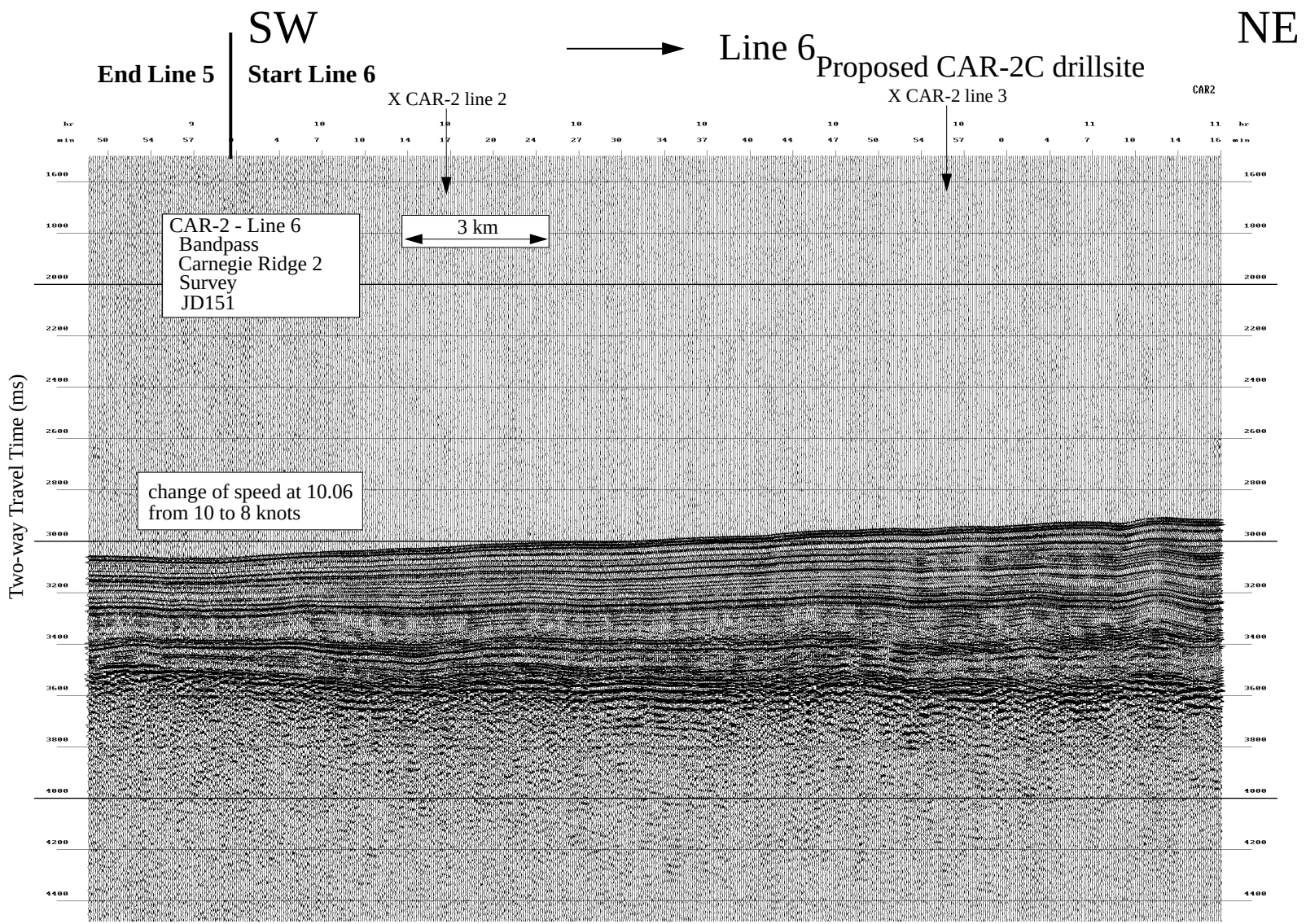


Figure CAR2-6: Seismic crossline CAR2 Line 6 across proposed drillsite.

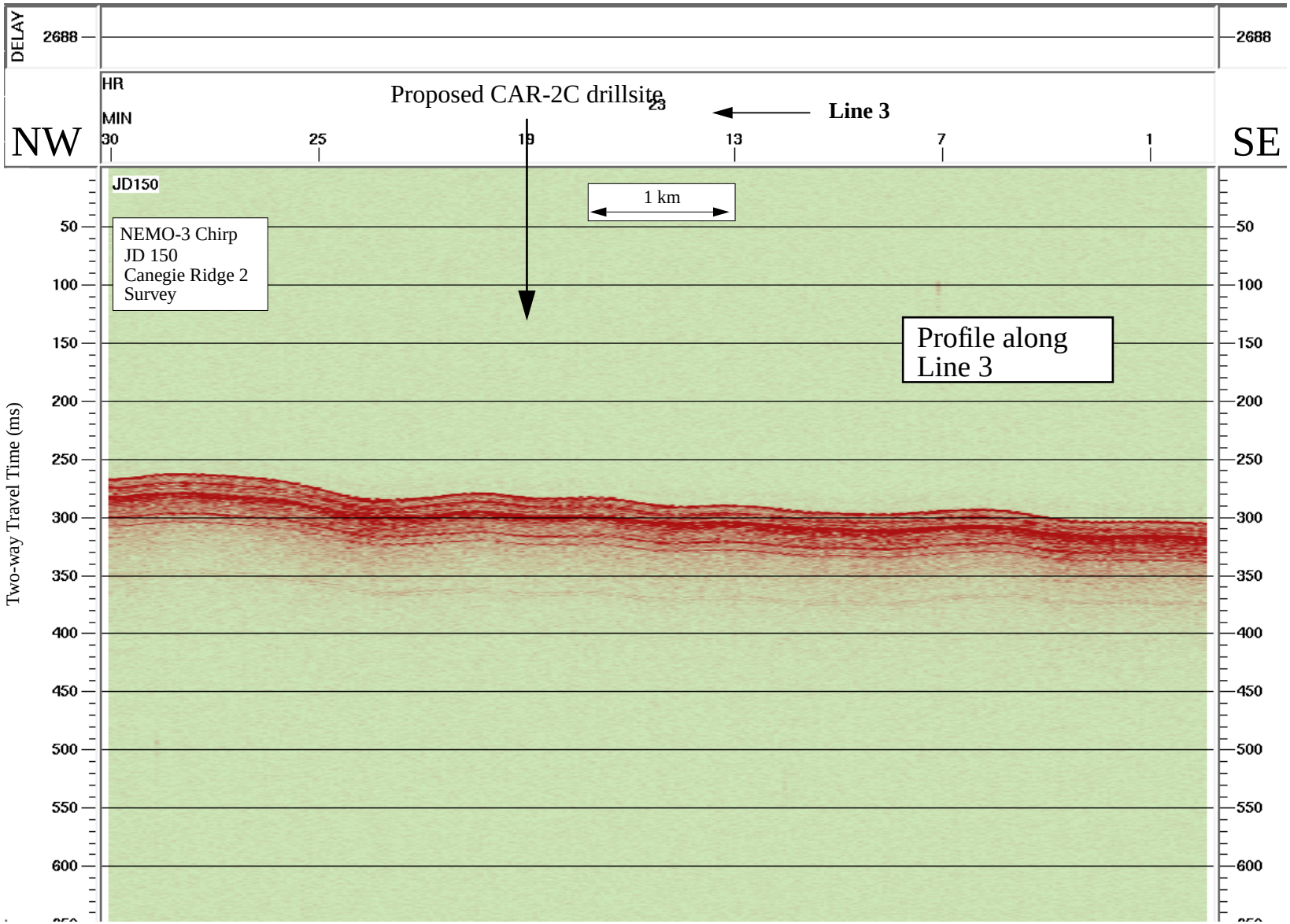


Figure CAR2-7 Chirp seismic taken along CAR2 Line 3 across the proposed drillsite.

SITE CAR-1C (top of eastern Carnegie Ridge)

00° 40.319'S 82° 04.853' W, water depth–1423 m

SITE OBJECTIVES

CAR-1 will be used to study the Pleistocene history of upwelling and paleoproductivity off Ecuador and the movement of the equatorial front. It will be used to monitor the composition of basal intermediate waters, and will be used to monitor the South Equatorial Current.

CAR-1C has been sited in a large flat sediment-covered region on the top of Carnegie Ridge to the southwest of the highest topography we surveyed. While the surface sediment cover is flat, subsurface topography has significant relief, and each local basin has a somewhat different sediment history. We chose the position of CAR-1C in a basin with the highest late Neogene sedimentation.

Because of the shallow depth of CAR-1, 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. The presence of what is probably ash layer L at 11.11 m in the piston core suggests an average late Pleistocene sedimentation rate of about 50 m/Myr.

GENERAL DESCRIPTION

CAR-1 is situated on the broad flat top of the Carnegie Ridge just to the west of the Peru-Chile trench and Ecuador (Figure CAR1-1). The site is just south of the equator and should have been underneath the equatorial divergence region for essentially the entire time since the basalt crust was formed, probably in the middle to early Miocene. Carnegie Ridge is on the Nazca Plate and should follow a Nazca plate backtrack trajectory.

In the region of CAR-1C the entire top of the ridge is sediment-covered and shallow, typically 1400 m deep and covered to a depth of 400-600 msec TWTT (300-500 m). To the northeast, the ridge shallows further and basement outcrops (Figure CAR1-2). CAR-1C is in a very large region of thick sediment cover, extending more than 50 km to the southwest and 20 km to the northeast. This large sediment-covered region is broken up into subbasins by E-W trending basement ridges. One major basement ridge occurs about 9 km north of the proposed drillsite. It has been imaged on CAR1 line 6 (Figure CAR1-3) at 07:53Z on JD 153.

NEMO-3 SURVEY

CAR-1 was surveyed between May 31 and June 2, 2000 on the R/V Melville NEMO-3 cruise. We surveyed the proposed drillsite with the Melville Seabeam 2000 swathmapping system for bathymetry, a digitally-recorded Knudsen 320B echosounder for high-resolution subbottom profiles, and the OSU multicore and jumbo piston coring system for surface sediment sampling. We used two 150 c.i. GI guns and the Scripps 4-channel hydrophone streamer to digitally acquire seismic reflection profiles. The seismic reflection profile and crossline over CAR-1C are shown in Figures CAR1-3 and CAR1-4, and the echosounder profile is shown in Figure CAR1-5. CAR-1C is located on CAR1 Line 6 just to the southwest of the cross with CAR1 Line 12. The upper sediments were cored to 12 m depth in the jumbo piston core ME0005A-31JC. The sediment-water interface was sampled with the multicore ME0005A-29MC. A second jumbo piston core (ME0005A-34JC) was taken on the northeast rise at 746 m and recovered foram sand.

LITHOLOGIC DESCRIPTION

Nearest sediment core: ME0005-0031JC, taken on NEMO-3; 00° 30.80' S, 81° 59.70'W, 1323 m water depth, 12.26 m sediment recovered

The piston core is dark olive to dark olive gray 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). Some pyritization occurs lower in the core.

SEISMIC INTERPRETATION

Primary Site (CAR-1C): CAR-1 survey line 6, JD153 07:18:23Z (SP2626; CDP 6427)
Crossline: CAR-1 survey line 12,
Location: 00°40.319'S, 82°04.853' W
Site water depth: 1423 m (center beam depth; 1.896 sec TWTT)
Sediment thickness: 0.604 sec (513 m)
Proposed Drilling Depth: 518 m

CAR-1C is located on an almost flat section of the top of the Carnegie Ridge. We have chosen to site the proposed drillsite to the south of the prominent subsurface ridge because we observe an expanded upper sediment section here. North of the ridge the lower sediment section is better developed. By comparison of the seismic section to that developed for the cores of Leg 138 to the west (Bloomer et al., 1995), we have been able to estimate the rates of sediment deposition within the basin. If our identification is correct, the basal sediments at CAR-1C began accumulating near the middle-late Miocene boundary and the average sedimentation rate has been relatively constant at about 30 m/Myr since then, with the exception of 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.

GEOLOGIC HAZARDS

There are no geological hazards. The section to be drilled is a pelagic foraminiferal ooze with nannofossils over basalt on an aseismic ocean ridge.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/00

Seismic lines, chirp subbottom profiles, and maps for CAR-1 are all included in V.2 of this submission. We also include CD-ROMs of images and SEG-Y files of the seismic reflection data for electronic filing

FIGURES

Fig CAR1-1: Regional location map for CAR-1. Proposed drill site is marked.
Fig CAR1-2: Swathmap bathymetry for the CAR-1 region, from the Nemo-3 site survey. Proposed drill site is marked.

Fig CAR1-3: Bandpass-filtered seismic reflection profile CAR1 Line 6 across CAR-1C, from NEMO-3. Proposed drill site is marked, and our correlation to the Bloomer et al. (1995) seismic stratigraphy is labeled.

Fig CAR1-4: Crossline profile CAR1 Line 12 just to the northeast of CAR-1C, from NEMO-3. Line crossing with Line 6 is marked.

Figure CAR1-5 2-7 kHz Chirp Seismic taken along CAR1 Line 6 across the proposed drillsite.

REFERENCES

Bloomer, S.F., Mayer, L.A. and Moore, T.C., jr., 1995, Seismic stratigraphy of the eastrn equatorial pacific ocean: Paleoceanographic implications, in Pisias, N. G., Mayer, L. A., Janecek, T. R., Palmer-Julson, A. and van Andel, T. H., eds., Proceedings of the ocean drilling program, scientific results: College Station, TX, Ocean Drilling Program, p. 537-553.

Mammerickx, J. and Smith, S.M., 1978, Bathymetry of the southeast pacific. Geological Society of America, Map and Chart Series, MC-26.

Figure CAR1-1: Site map showing the position of CAR-1 on the Carnegie Ridge and bathymetry of the northern Nazca Plate. The base map is Mammerickx and Smith (1978).

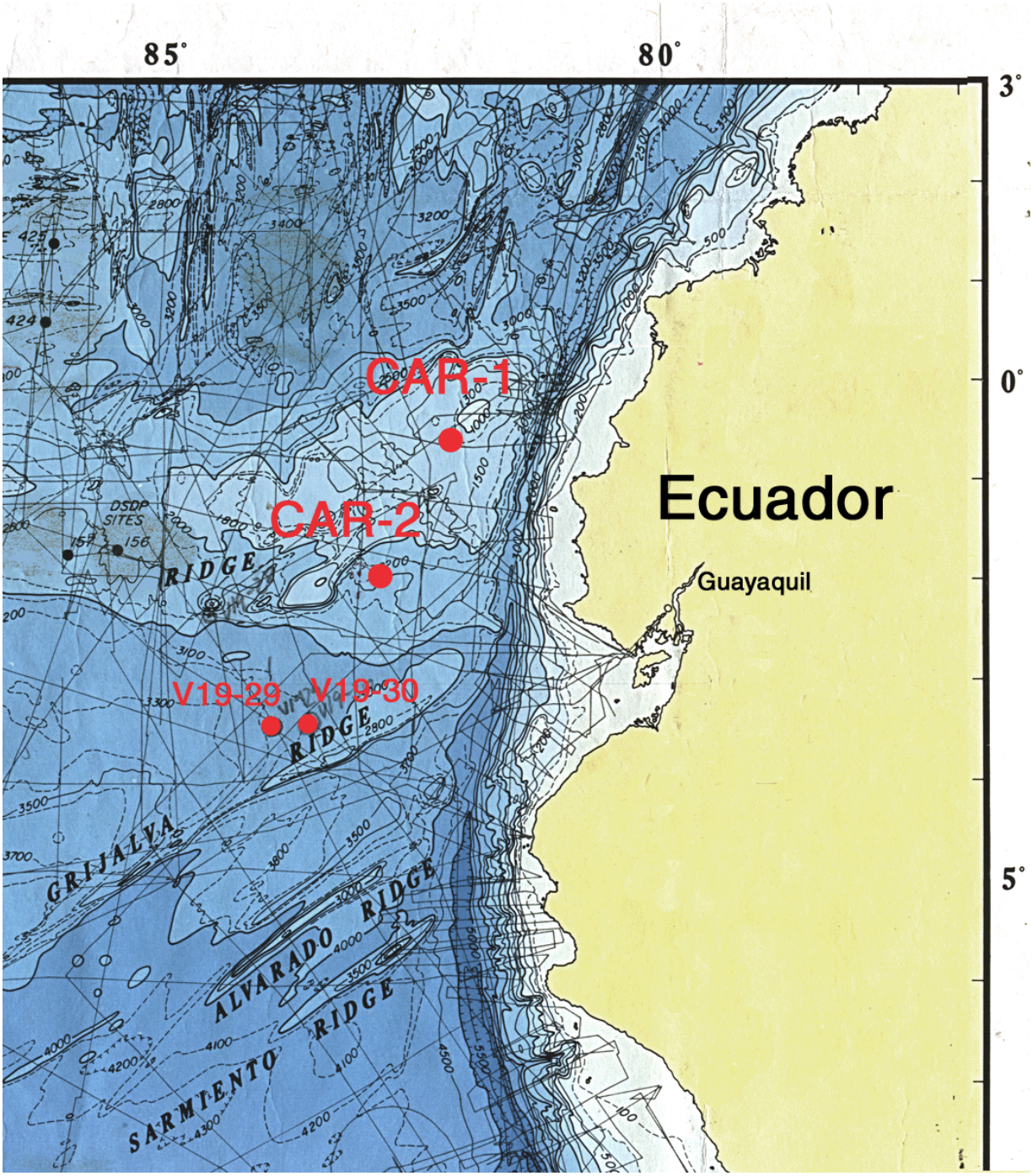
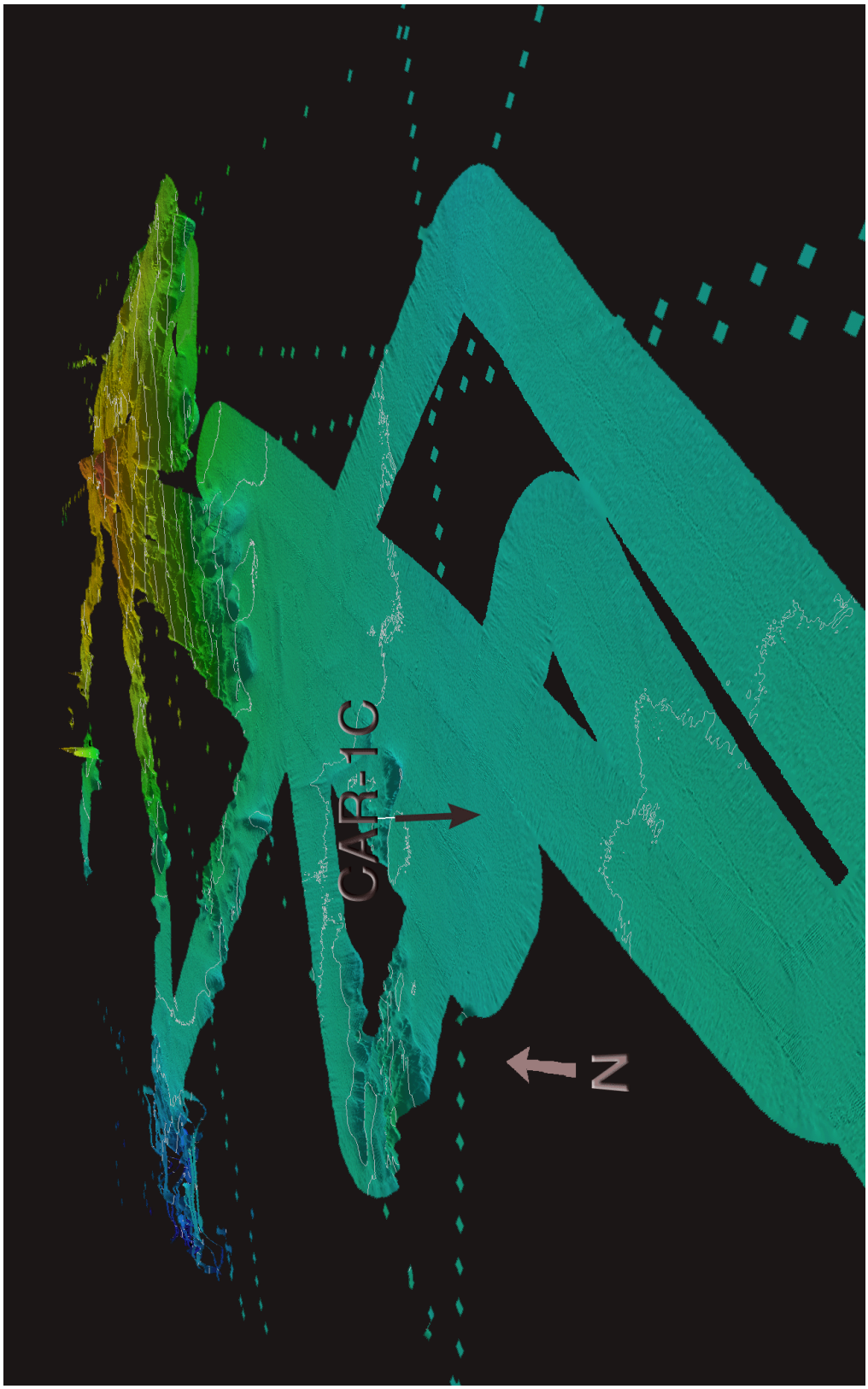


Figure CAR1-2: Swathmap bathymetry for the CAR-1 survey on the NEMO-3 cruise. CAR-1C is located on the flat topography about 1400 meters below sea level to the southwest of the highest point on the Carnegie Ridge.



FigureCAR1-3 Bandpass-filtered seismic reflection profile showing a segment of CAR1 line 6, through the proposed CAR-1C drillsite. Proposed drillsite location is just southwest of the cross between Line 6 and Line 12..

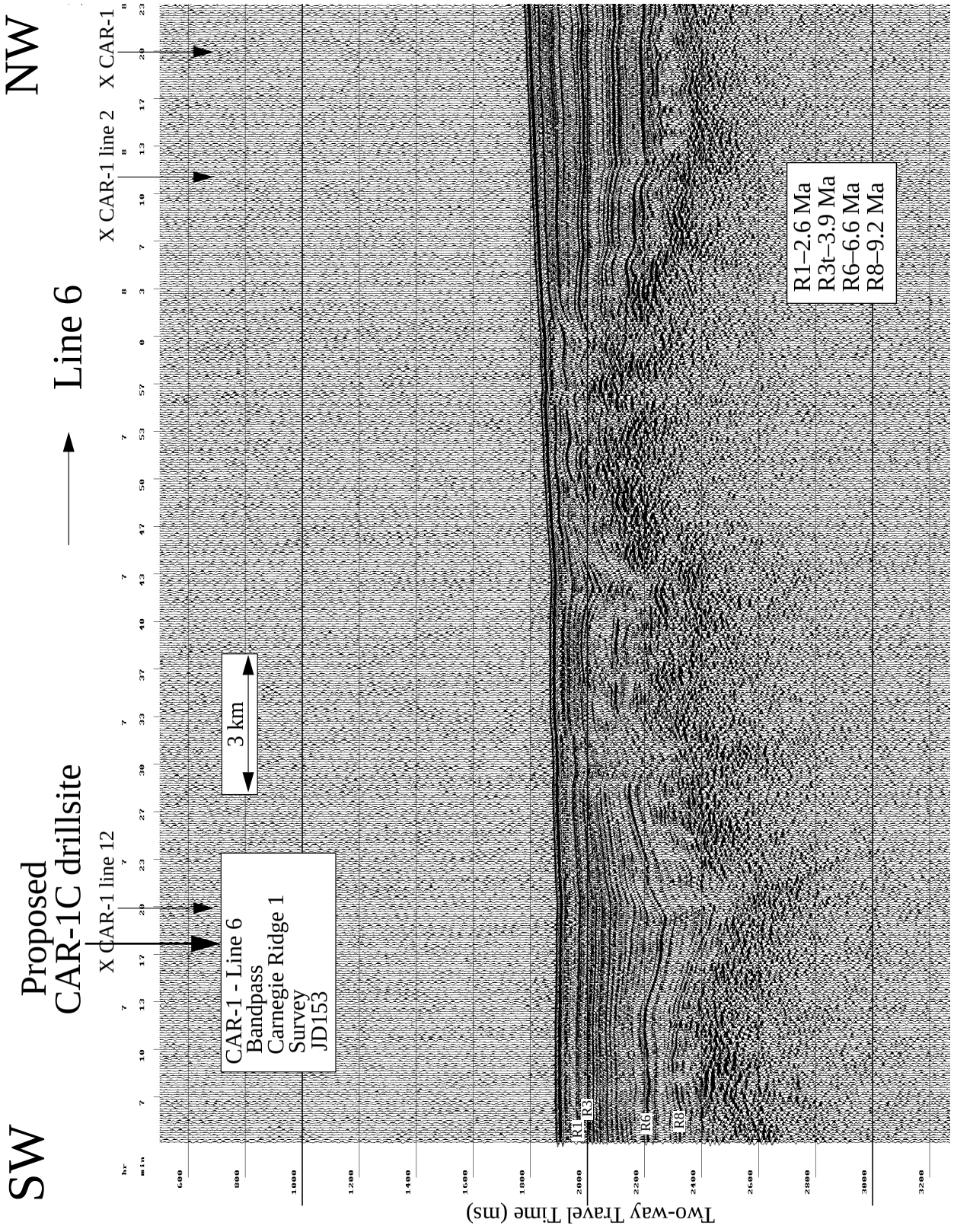
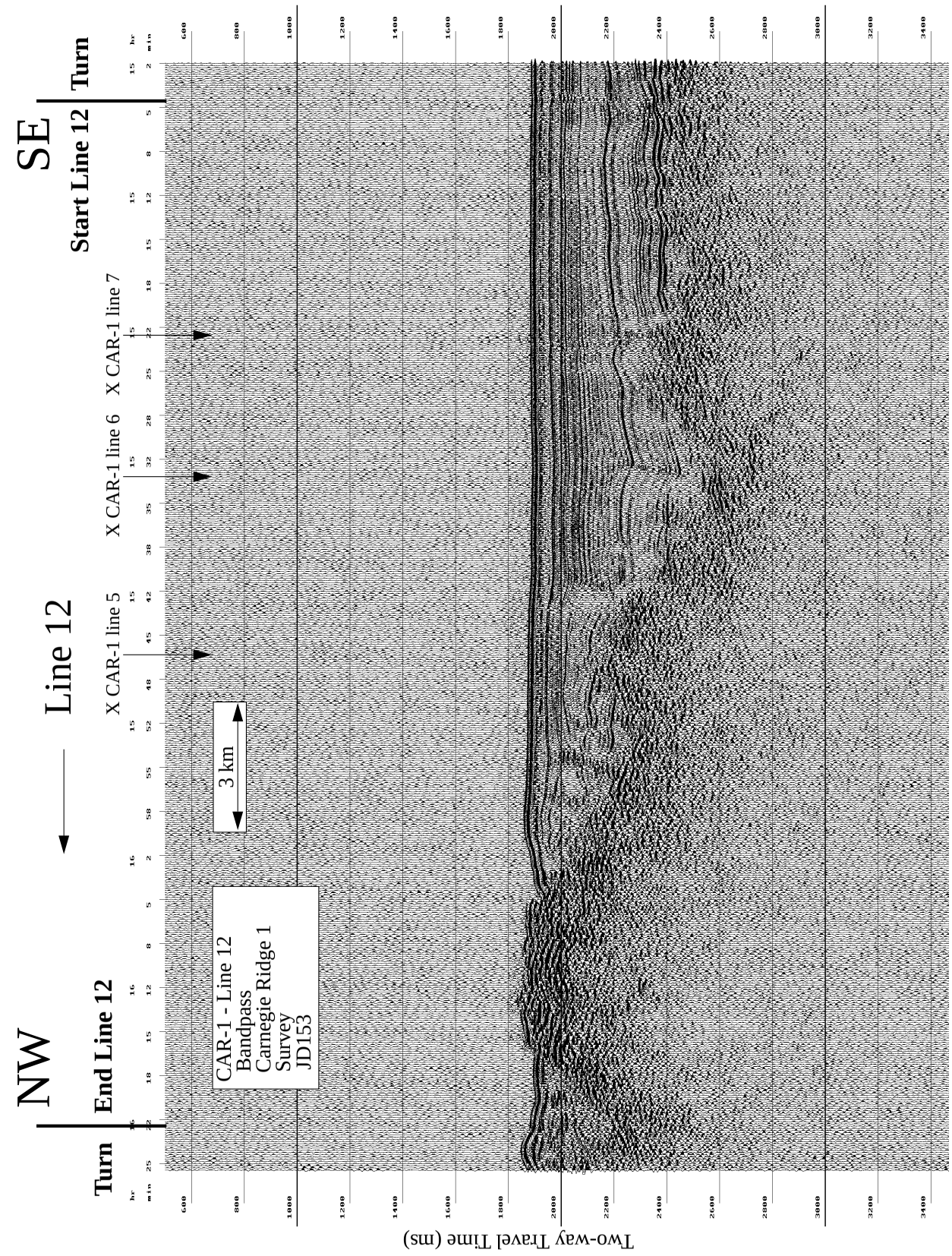


Figure CAR1-4: Seismic crossline CAR1 Line 12 across proposed drillsite.



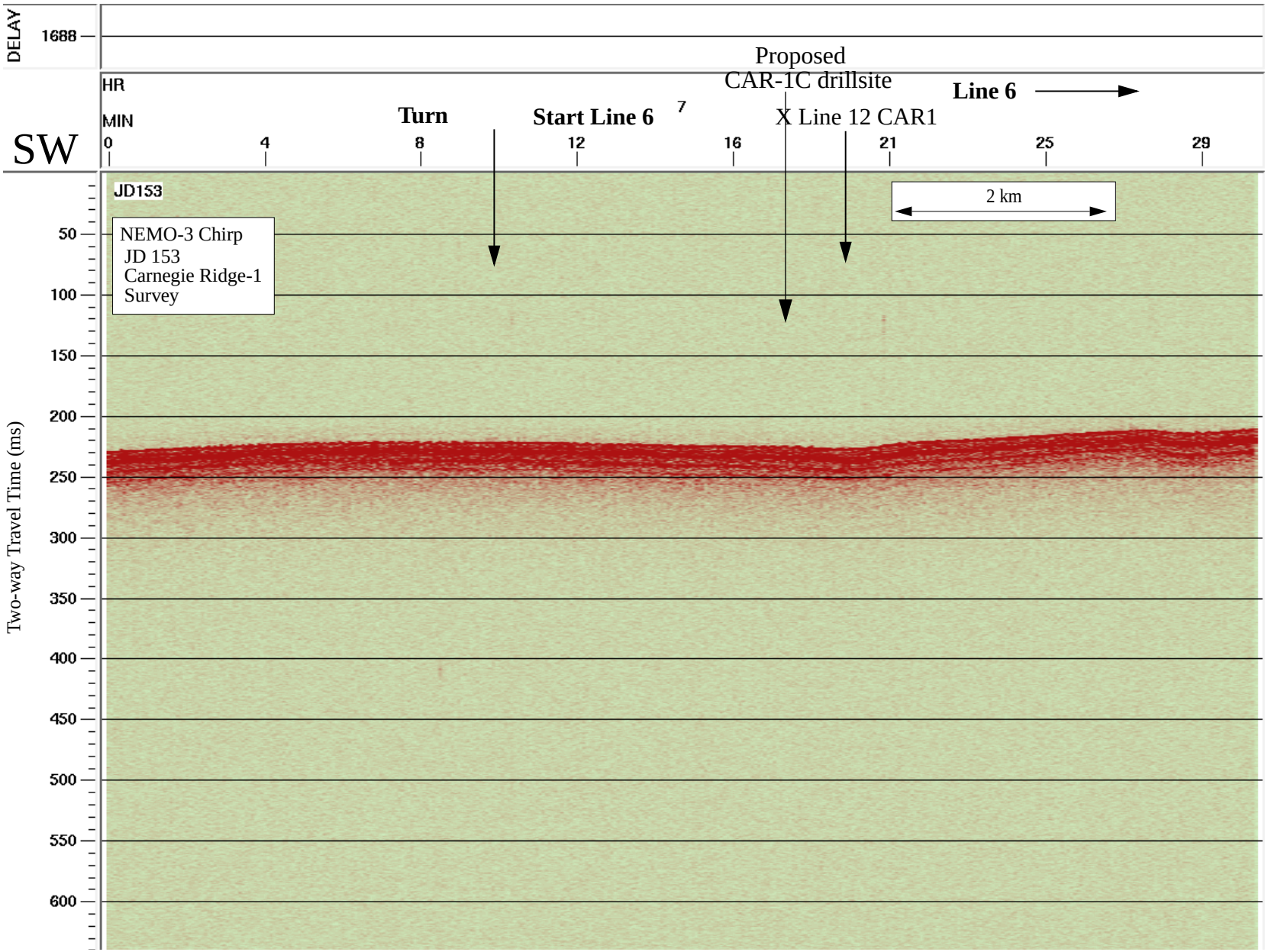


Figure CAR1-5 Chirp Seismic taken during Seismic Line 3 across the proposed drillsite.

SITE PAN-2 (Panama Basin Equatorial site)

00° 01.312'N 86° 42.334' W, water depth–2941 m

SITE OBJECTIVES

PAN-2 will be used to study variability in equatorial upwelling on time scales ranging from the millennial to megayear, from the Late Pliocene to the Holocene. It has an average sedimentation rate over the last 3 million years of 90 m/Myr, easily allowing the resolution of millennial-scale climate processes. Because it lies on the Nazca Plate, which has a flat backtrack path with respect the spin axis, it has been within 10' of the equator for its entire history.

GENERAL DESCRIPTION

PAN-2 is located on 3 Ma crust formed at the Galapagos Spreading Center (Hey, 1977) within the Panama Basin (Figure PAN2-1). On NEMO-3 we crossed the GSC rise crest at 00°51'N on the transit to PAN-2, a little less than 100 km north of the proposed drillsite. PAN-2 is located in classic abyssal hill topography (Figure PAN2-2), with typical relief of 200-300 m between ridges and basins. The basins are all filled with sediment, ranging from 250 to >350 msec TWTT in thickness (~200-300 m), while the ridges have 0 to >100 m of sediment (Figure PAN2-4).

We chose PAN-2 in the abyssal valley closest to the equator. The basin forms a regional low--it is the lowest point in the region we surveyed, and collects somewhat higher sedimentation than other basins in the vicinity. Based upon its location in magnetic anomaly C2An.2n (Hey, 1977), the basement age should be 3.15 Ma (Cande and Kent, 1995). With a sediment thickness estimated at 282 m, the average sedimentation rate at PAN-2 should be 90 m/Myr.

NEMO-3 SURVEY

PAN-2 was surveyed 27 May 2000 on the R/V Melville NEMO-3 cruise. We surveyed the proposed drillsite with the Melville Seabeam 2000 swathmapping system for bathymetry, a digitally-recorded Knudsen 320B echosounder for high-resolution subbottom profiles, and the OSU multicore and jumbo piston coring system for surface sediment sampling. We used two 150 c.i. GI guns and the Scripps 4-channel hydrophone streamer to digitally acquire seismic reflection profiles. The seismic reflection profile and crossline over PAN-2 are shown in Figures PAN2-3 and PAN2-4, and the echosounder profile is shown in Figure PAN2-5. PAN-2 is located on PAN2 Line 5 at the cross with PAN2 Line 1. The upper sediments were cored to 19.27 m depth in the jumbo piston core ME0005A-24JC. The sediment-water interface was sampled with the multicore ME0005A-21MC.

LITHOLOGIC DESCRIPTION

Nearest sediment core: ME0005A-24JC (Jumbo Core, taken on NEMO-3 expedition), location 0°01.30'N, 86°27.79'W, water depth 2941m, core length 19.27m.

Description: Olive Gray to dark olive colored, diatom-nannofossil ooze. Foraminifera and sponge spicules are common to abundant, and radiolarians are rare to common. Core is heavily burrow mottled throughout, and contains some open burrows, suggesting significant bioturbation. Ash layer at 988 cm, if assumed to be ash layer 'L' (230 ka, Ninkovich and Shackleton, 1975) suggests a sedimentation rate of 43 m/ma. Nearby piston core Y69-71 has a prominent ash layer at 660 cm

in MIS-5a, equivalent to the Los Chocoyos (D) ash (84 ka; Drexler et al., 1980). If this is the 988 cm ash in 24JC, the sedimentation rate is 118 m/Myr.

SEISMIC INTERPRETATION

Primary Site (PAN-2): PAN2 Line 5, 21:08:30Z JD148 (SP2348)
Crossline: PAN2 Line 1
Location: 00°01.312'N 86°27.723' W
Site water depth: 2941 m center beam depth (3.917 sec)
Sediment thickness: 0.362 sec (282 m @ 1560 m/sec)
Proposed Drilling Depth: 287 m

PAN-2 is located in a typical pelagic basin in abyssal hill topography within the Panama Basin. We chose this particular basin because the average sedimentation rate based upon total sediment thickness and sediment reflectors averages 30 to 40% higher than in other basins within the survey area.

GEOLOGIC HAZARDS

There are no geologic hazards. The sediments are pelagic and the basement is 3 Ma mid-ocean ridge basalt.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/00

Seismic lines, chirp subbottom profiles, and maps for PAN-2 are all included in V.2 of this submission. We also include CD-ROMs of images and SEG-Y files of the seismic reflection data for electronic filing

FIGURES

Fig PAN2-1: Location map for PAN-2 on the map of Mammerickx and Smith (1981). Proposed drill site is marked.

Fig PAN2-2: Swathmap bathymetry for the PAN-2 region, from the Nemo-3 site survey. Proposed drill site is marked.

Fig PAN2-3: Bandpass-filtered seismic reflection profile PAN2 line 5 across PAN-2, from Nemo-3. Proposed drill site is marked.

Fig PAN2-4: Crossline PAN2 Line 1 through the proposed PAN-2 drillsite

Fig PAN2-5: 2-7 kHz Chirp subbottom profile PAN2 line 5 across PAN-2 from the NEMO-3 survey. Proposed drill site is marked.

REFERENCES

Cande, S.C., and D.V. Kent, Revised calibration of the geomagnetic polarity timescale for the Late Cretaceous and Cenozoic, *Journal of Geophysical Research, 100 (B4)*, 6093-6095,

Drexler, J.W., W.I. Rose, jr, R.S.J. Sparks, and M.T. Ledbetter, The Los Chocoyos Ash, Guatemala: a major stratigraphic marker in Middle America and in three ocean basins, *Quaternary Research, 13*, 327-345, 1980.

Hey, R., Tectonic evolution of the Cocos-Nazca spreading center, *Geological Society of America Bulletin, 88*, 1404-1420, 1977.

Mammerickx, J. and Smith, S.M., 1981, Bathymetry of the southeast pacific. *Geological Society of America, Map and Chart Series*, MC-43.

Ninkovich, D., and N.J. Shackleton, Distribution, stratigraphic position and age of ash layer "L" in the Panama Basin region, *Earth and Planetary Science Letters, 27*, 20-34, 1975.

Figure PAN2-1: Site map showing the position of PAN-2 in the Panama Basin and bathymetry of the northern Nazca Plate. The base map is Mammerickx and Smith (1981).

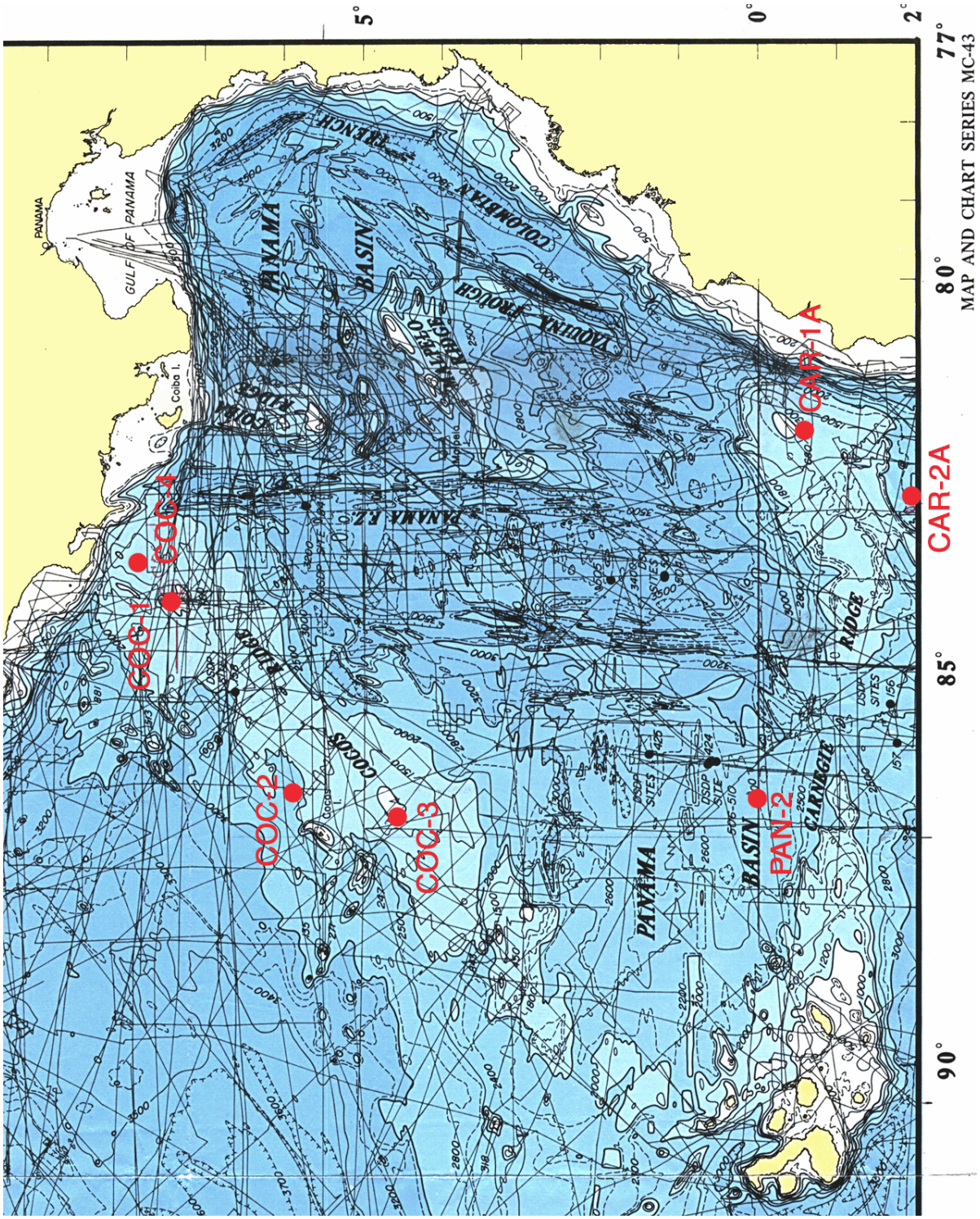
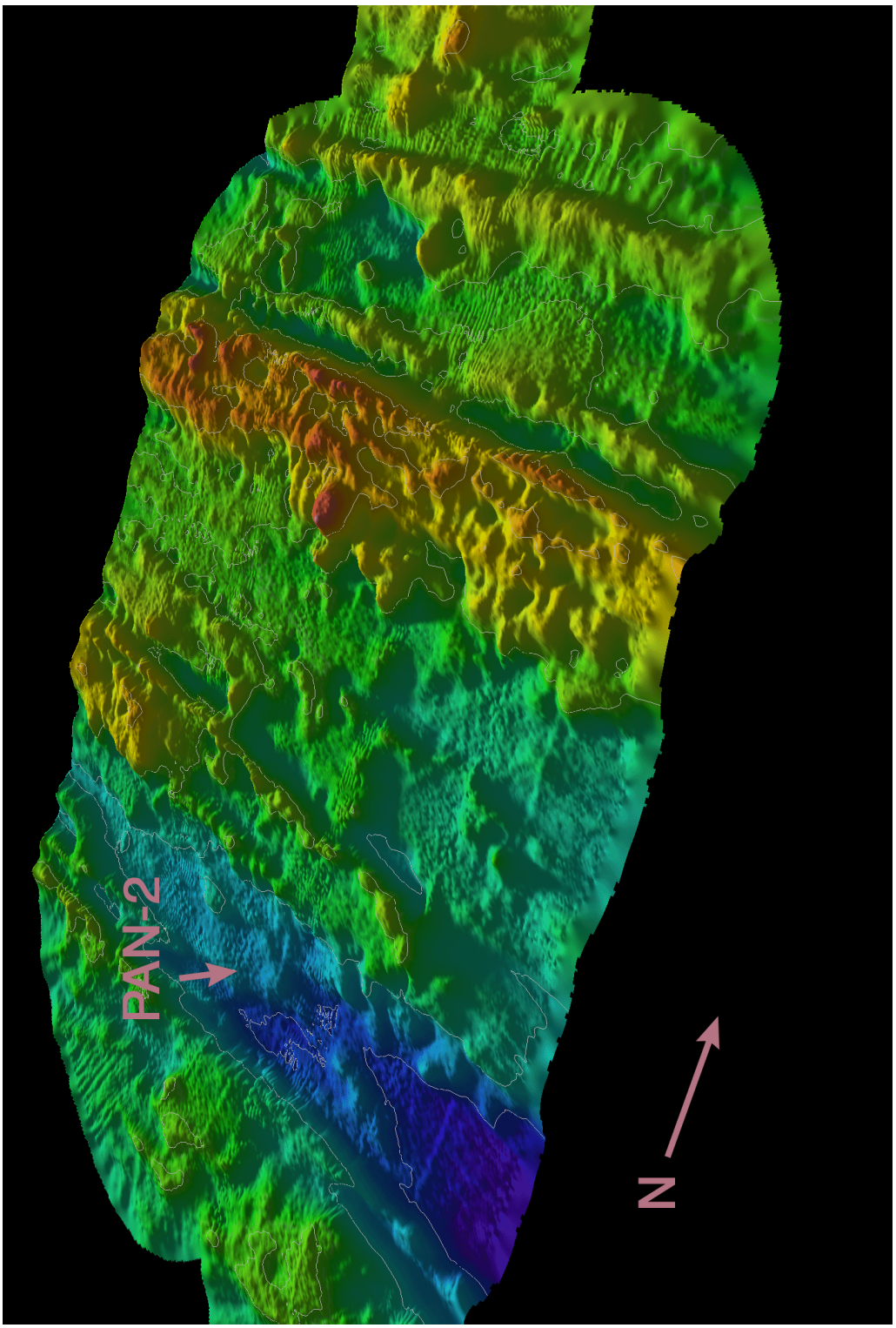


Figure PAN2-2: Swathmap bathymetry for the PAN-2 survey on the NEMO-3 cruise. The proposed drillsite is marked.



FigurePAN2-3: Bandpass-filtered seismic reflection profile PAN2 line 5 across PAN-2, from the NEMO-3 survey

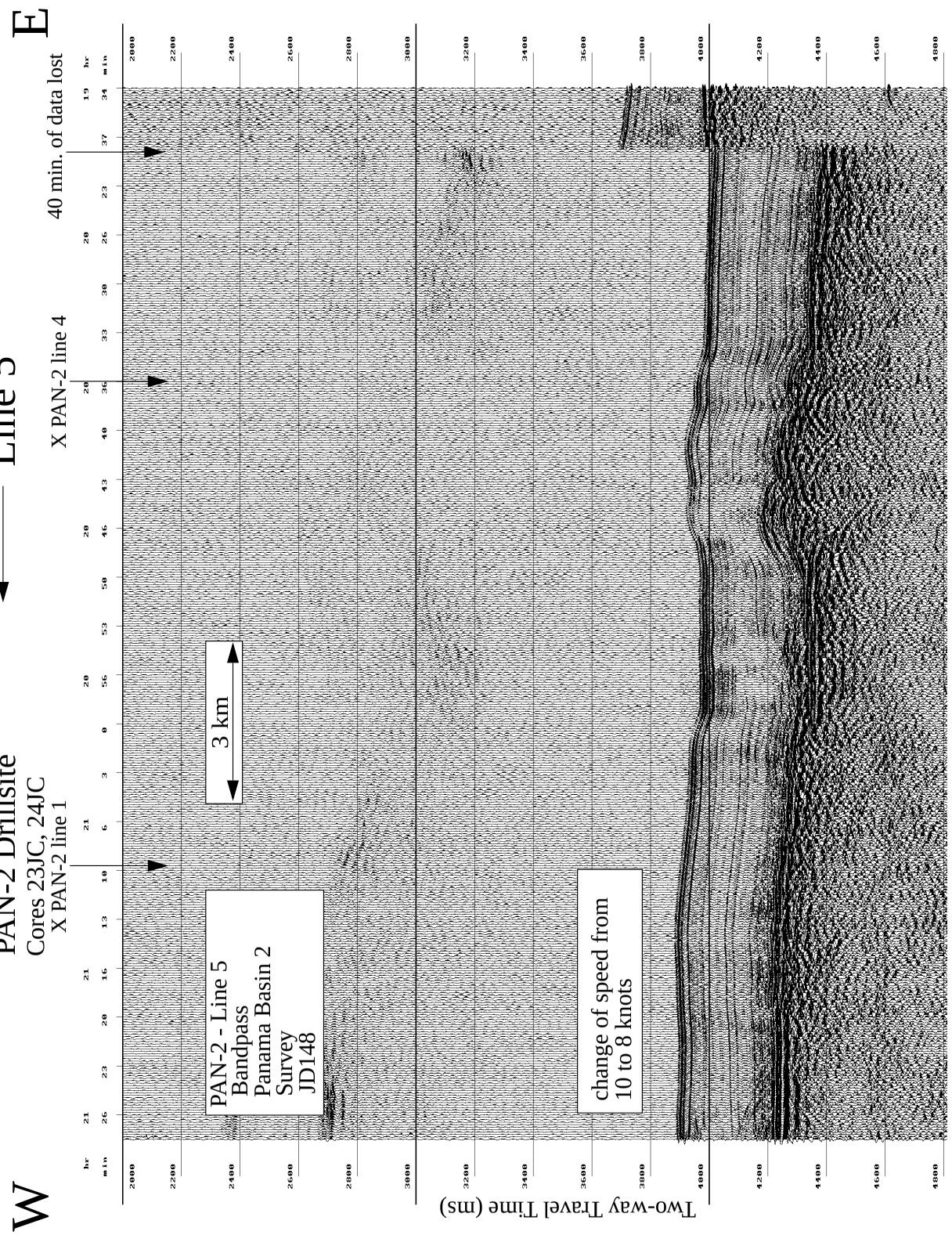
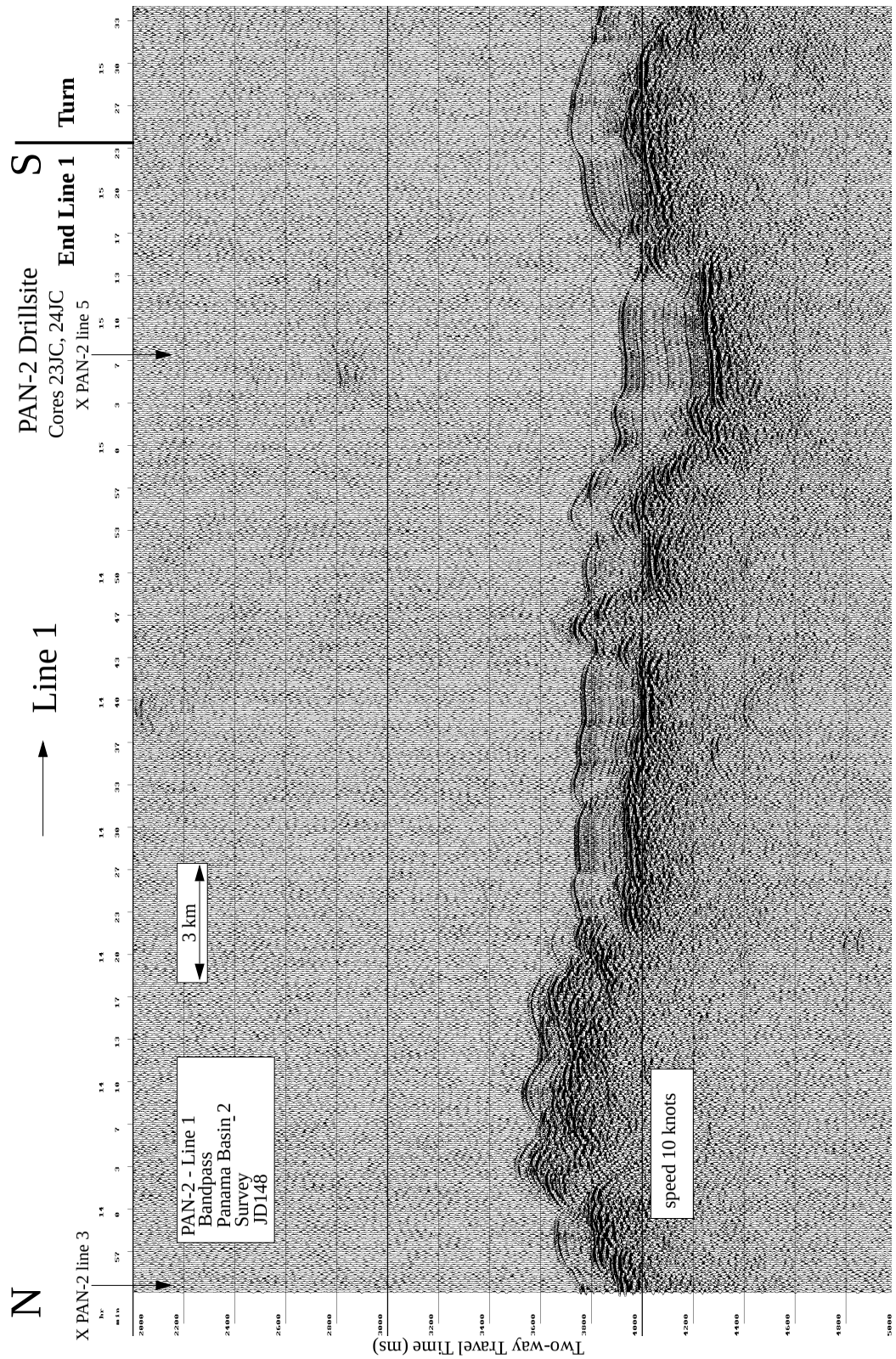


Figure PAN2-4: Crossline PAN2 Line 1 through proposed PAN-2 drillsite.



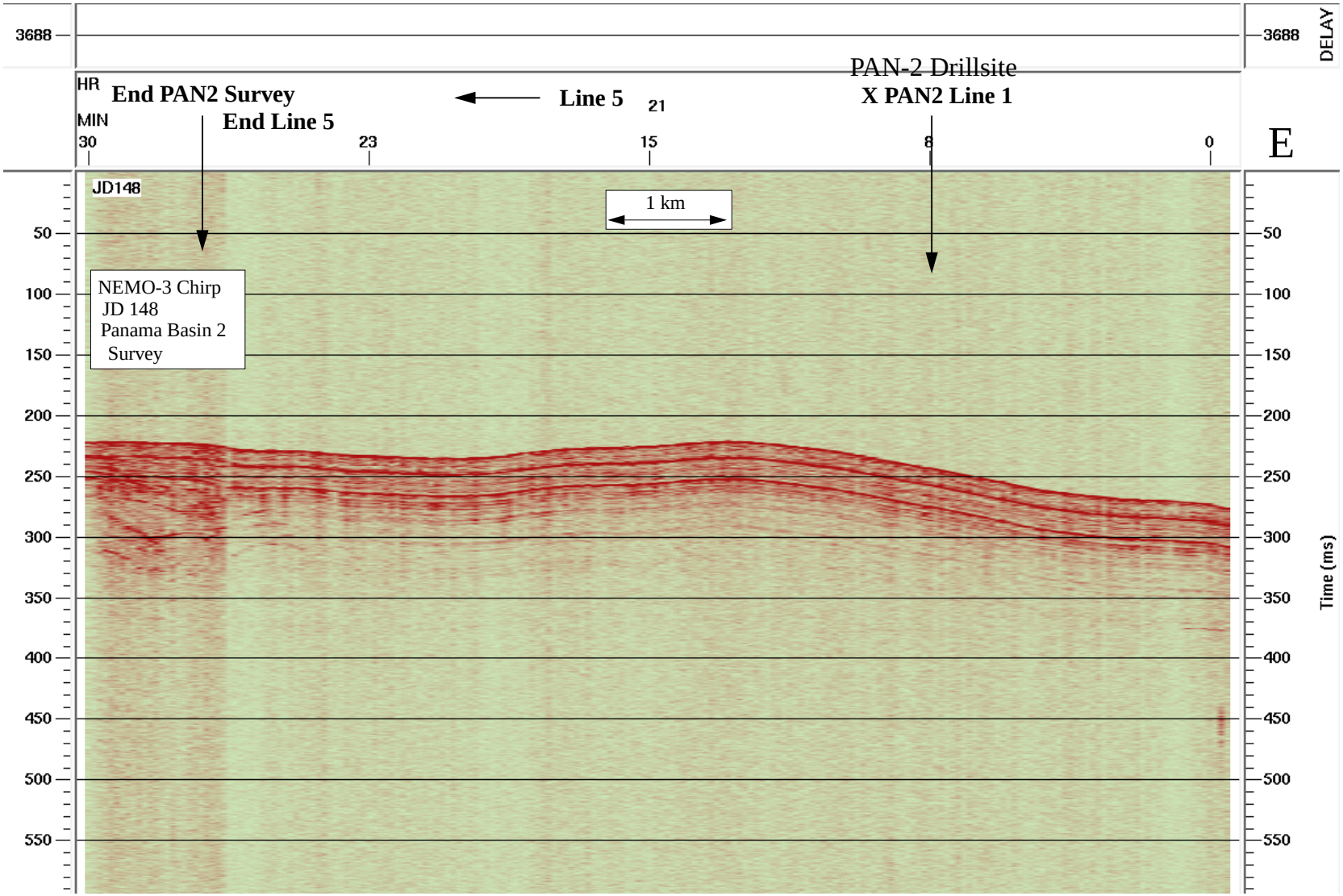


Figure PAN2-5: Chirp subbottom profile PAN2 line 5 across PAN-2, from the NEMO-3 survey

SITE COC-3 (SW Crest of Cocos Ridge)

4° 37.089'N 86° 42.334' W, water depth–919 m

SITE OBJECTIVES

COC-3 will monitor the composition of basal intermediate waters at the northern edge of the Panama Basin, and will be used to monitor the North Equatorial Countercurrent and the movement of the intertropical convergencezone. COC-3 has been sited in the caldera of a large volcano on the top of Cocos Ridge to the SSW of COC-2 (Figure COC3-1). The volcanic edifice is the shallowest point on the Cocos Ridge in this vicinity.

Because of the shallow depth of COC-3, 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.

GENERAL DESCRIPTION

COC-3 is situated in a shallow (~900 m deep) basin within a large volcano at the crest of the Cocos ridge about a degree south of Cocos Island (Figure COC3-1). The volcanic edifice is roughly circular, >25 km across, flat-topped, and covered with smaller eruptive centers. We count 13 in the area swathmapped on NEMO-3 (Figure COC3-2). Basement relief from the ridge to the top of the volcanic edifice is about 300 m (Figure COC3-3). The basin where COC-3 is located appears constructional and we see reflections of possible lava flows tilted toward the basin in the basement. The basin contains up to about 150 m of sediment. We chose COC-3 to be near the thickest sediment section.

NEMO-3 SURVEY

COC-3 was surveyed 25 May 2000 on the R/V Melville NEMO-3 cruise. We surveyed the proposed drillsite with the Melville Seabeam 2000 swathmapping system for bathymetry, a digitally-recorded Knudsen 320B echosounder for high-resolution subbottom profiles, and the OSU multicore and jumbo piston coring system for surface sediment sampling. We used two 150 c.i. GI guns and the Scripps 4-channel hydrophone streamer to digitally acquire seismic reflection profiles. The seismic reflection profile and crossline over COC-3 are shown in Figures COC3-3 and COC3-4, and the echosounder profile is shown in Figure COC3-5. COC-3 is located on COC3 Line 4 just to the south of the cross with COC3 Line 7. The upper sediments were cored to 13.79 m depth in the jumbo piston core ME0005A-17JC. The sediment-water interface was sampled with the multicore ME0005A-15MC.

LITHOLOGIC DESCRIPTION

Nearest sediment core: ME0005A-17JC (Jumbo Core, taken on NEMO-3 expedition); 4°36.82'N, 86°42.23'W, water depth 905m, core length 13.79m.

Description: Light gray to olive sandy foram ooze. Core is lightly mottled thorughout, and color contacts are gradational, suggesting oxygenated bottom waters and bioturbation. Occasional dispersed ash.

SEISMIC INTERPRETATION

Primary Site (COC-3): COC-3 survey line 4, JD146 01:09:09Z (SP416)
Crossline: COC-3 survey line 7,
Location: 4° 37.089'N, 86° 42.334' W
Site water depth: 919 m (center beam depth; 1.216 sec TWTT)
Sediment thickness: 0.183 sec (143 m)
Proposed Drilling Depth: 148 m

COC-3 is located on on the crest of the Cocos Ridge, within a > 25 km-wide volcanic edifice. Because the highest priority objective is to sample lower intermediate waters, it is located in the shallowest basin we could find, at about 900 m water depth. We chose the position because it has as thick a sediment section as we could find. The basement age should be late Miocene (Hey, 1977) and implies a sedimentation rate greater than 14 m/Myr.

GEOLOGIC HAZARDS

There are no geological hazards. The section to be drilled is a pelagic foraminiferal ooze over basalt on an aseismic ocean ridge.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/00

Seismic lines, chirp subbottom profiles, and maps for COC-3 are all included in V.2 of this submission. We also include CD-ROMs of images and SEG-Y files of the seismic reflection data for electronic filing

FIGURES

Fig COC3-1: Regional location map for COC-3 from Mammerickx and Smith (1981). Proposed drill site is marked.

Fig COC3-2: Swathmap bathymetry for the COC-3 region, from the Nemo-3 site survey. Proposed drill site is marked.

Fig COC3-3: Bandpass-filtered seismic reflection profile COC3 Line 4 across COC-3, from NEMO-3. Proposed drill site is marked.

Fig COC3-4: Crossline profile COC3 line 7 just to the north COC-3, from NEMO-3. the crossing with Line 4 is marked.

Figure COC3-5: 2-7 kHz Chirp Seismic taken along COC3 Line 4 across the proposed drillsite.

REFERENCES

Mammerickx, J. and Smith, S.M., 1981, Bathymetry of the southeast pacific. *Geological Society of America, Map and Chart Series*, MC-43.

Hey, R., Tectonic evolution of the Cocos-Nazca spreading center, *Geological Society of America Bulletin, 88*, 1404-1420, 1977.

Figure COC3-1: Site map showing the position of COC-1 on the Cocos Ridge and bathymetry of the northern Nazca Plate. The base map is Mammerickx and Smith (1978).

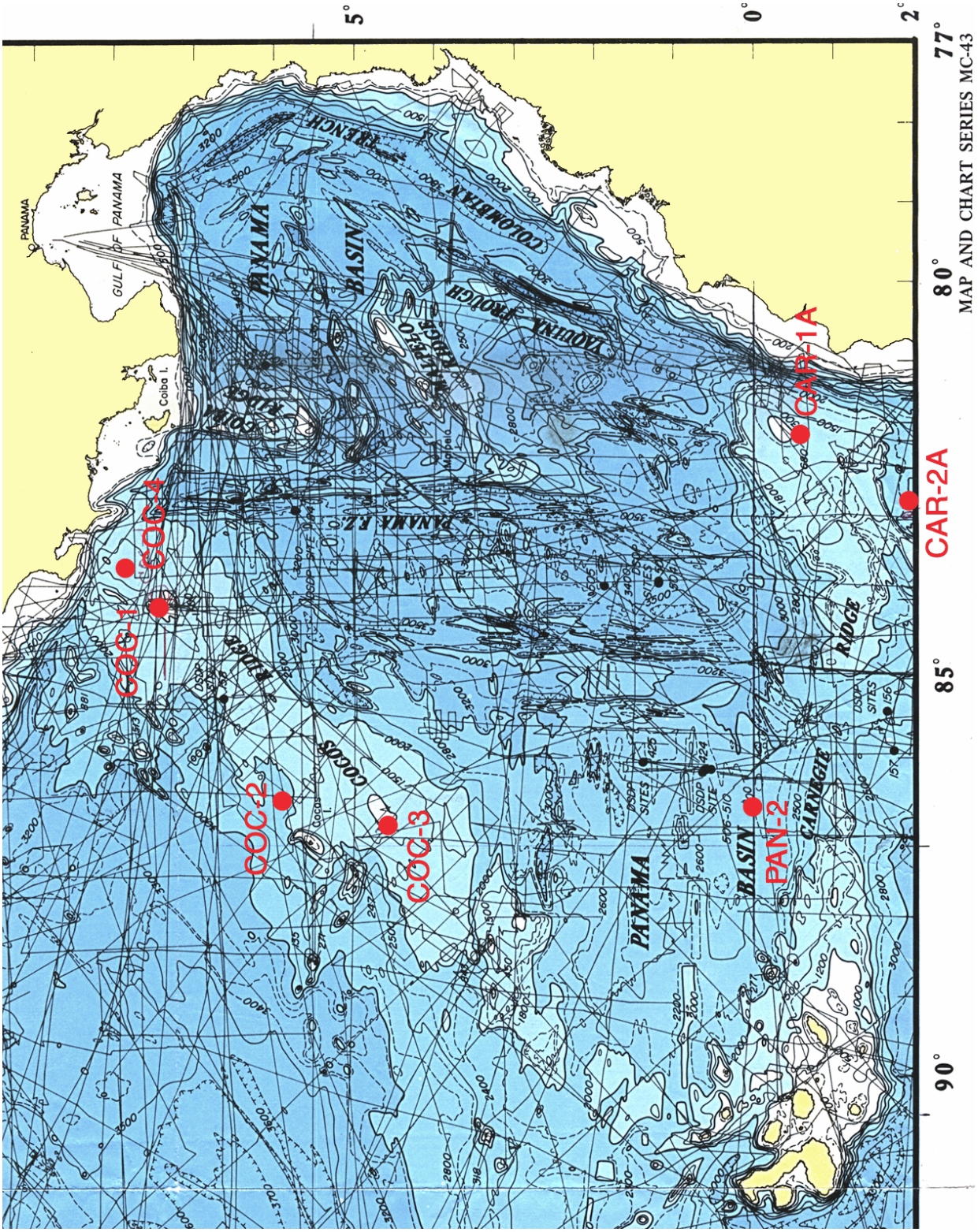
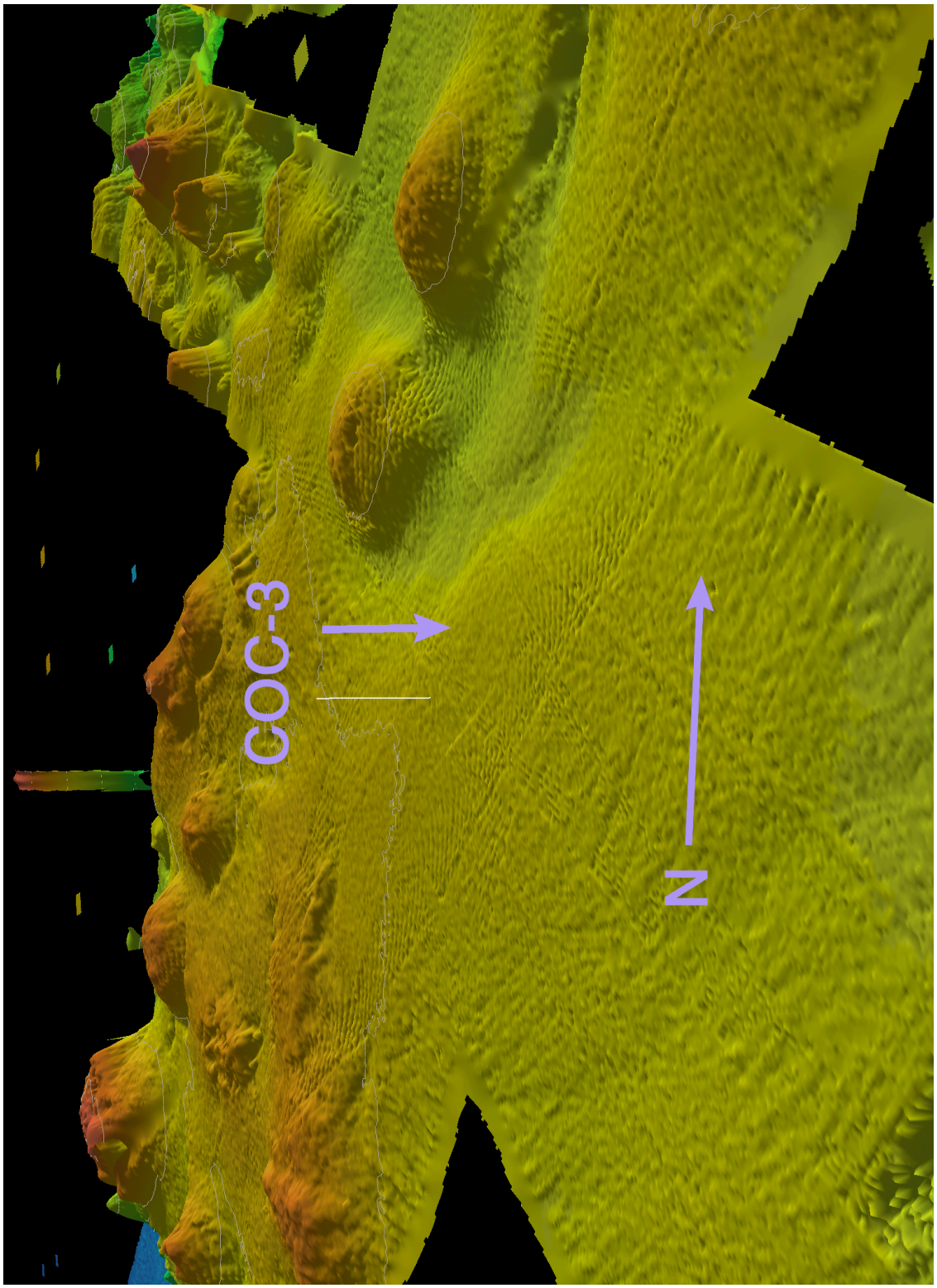


Figure COC3-2: Swathmap bathymetry for the COC-3 survey on the NEMO-3 cruise. COC-3 is marked.



FigureCOC3-3 Bandpass-filtered seismic reflection profile showing a segment of COC3 line 4, through the proposed COC-3 drillsite. Proposed drillsite location is just south of the cross between Line 4 and Line 7..

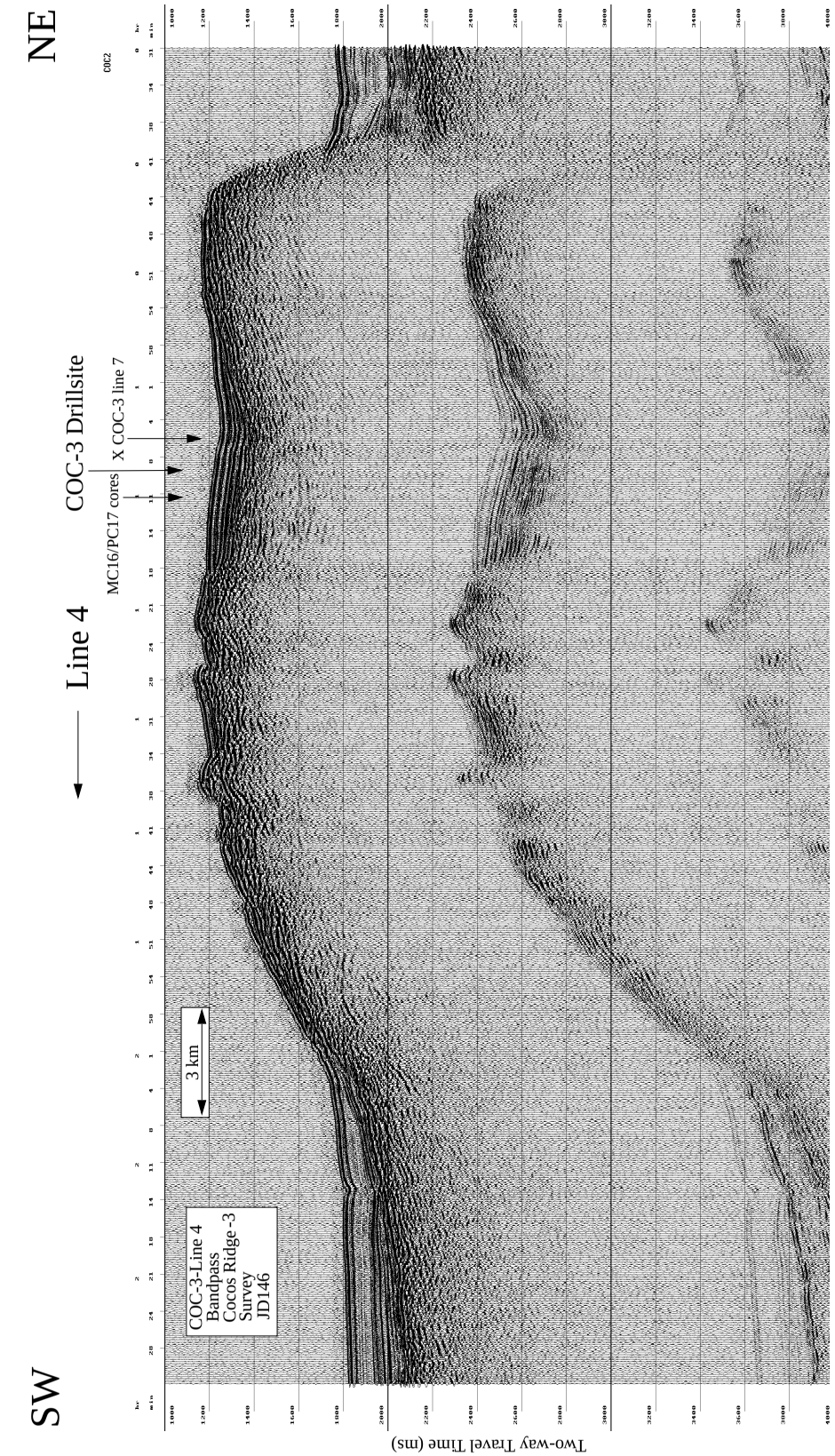
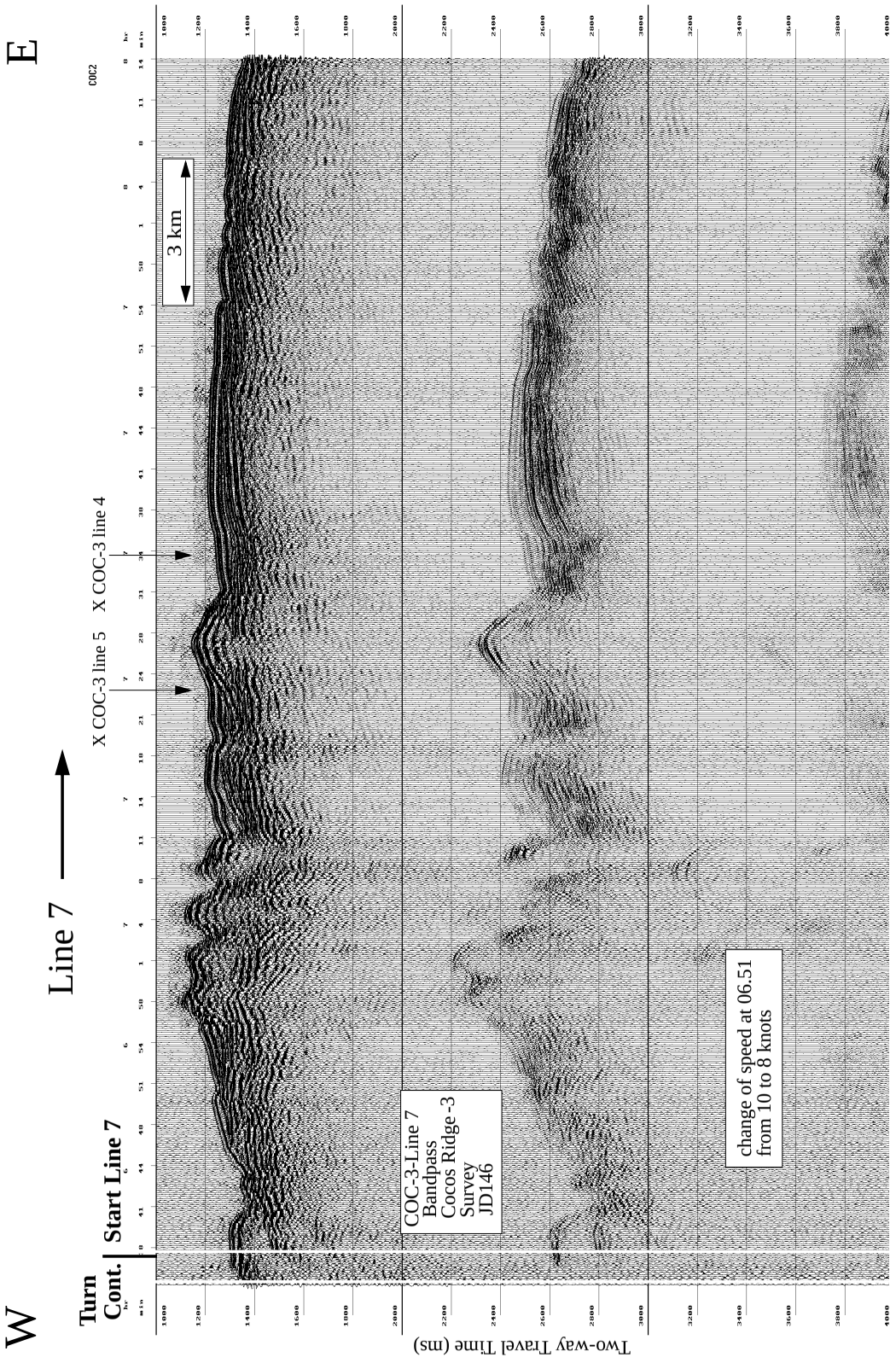


Figure COC3-4 Seismic crossline COC3 Line 7 near proposed drillsite.



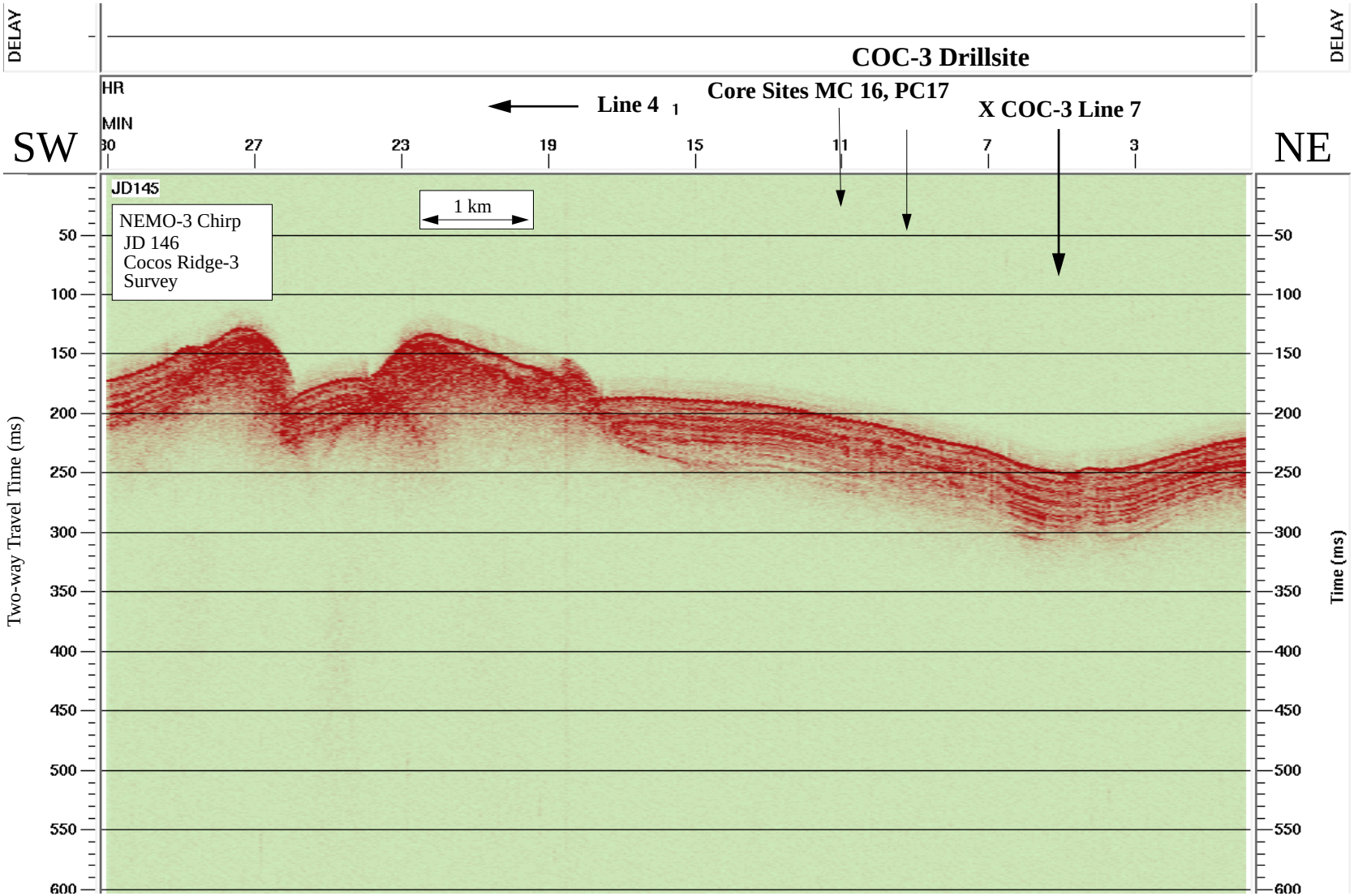


Figure COC3-5 Chirp Seismic taken along COC3 Line 4 across the proposed drillsite.

SITE COC-2 (SW Cocos Ridge)

5° 50.566'N 86° 26.674' W, water depth–2042 uncorr. m

SITE OBJECTIVES

COC-2 will be useful for studies of the connection between the tropics and NE Pacific Ocean. It is located roughly under the modern northern summer position of the Intertropical Convergence Zone . In the late Pleistocene, this region has a time series of $CaCO_3$ mass accumulation rate distinctive from the Pacific equatorial region (Lyle et al., submitted). Lyle et al. (submitted) observed a strong coherence with obliquity in a nearby core and speculated that the region experiences a relatively strong north Pacific influence.

Because of its relatively shallow depth, the sediments have experienced little carbonate dissolution. The relatively large size of the basin also makes it an effective sediment trap--the sediments appear to retain the fine sediment fraction. While we have no information yet on surface sedimentation rates, assuming a crustal age of 10-15 Myr and a sediment thickness (from the seismic survey) of 400 m yields an average Neogene sedimentation rate of 25-40 m/Myr.

GENERAL DESCRIPTION

COC-2 is situated on the northern flank of the Cocos Ridge in a basin ringed by small volcanos (Figures COC2-1 and COC2-2) . The basement topography is relatively flat and the sediments have filled an area greater than 20 km by 10 km to a depth of about 400 m. This site has always been near or above the 2 km water depth, and should provide a means to sample intermediate waters 1 km or less in the early part of the late Miocene.

NEMO-3 SURVEY

COC-2 was surveyed between May 23 and May 24 2000 on the R/V Melville NEMO-3 cruise. We surveyed the proposed drillsite with the Melville Seabeam 2000 swathmapping system for bathymetry, a digitally-recorded Knudsen 320B echosounder for high-resolution subbottom profiles, and the OSU multicore and jumbo piston coring system for surface sediment sampling. We used two 150 c.i. GI guns and the Scripps 4-channel hydrophone streamer to digitally acquire seismic reflection profiles. The seismic reflection profile and crossline over COC-2 are shown in Figures COC2-3 and COC2-4, and the echosounder profile is shown in Figure COC2-5. The upper sediments were cored to 12 m depth in the jumbo piston core ME0005A-13JC. The sediment-water interface was sampled with the multicore ME0005A-14MC

LITHOLOGIC DESCRIPTION

Nearest sediment core: ME0005-0013PC, taken on NEMO-3; 5° 50.79' N, 86° 26.92'W, 2045 m water depth, 12.11 m sediment recovered

The piston core is olive to gray foraminiferal clays, highly mottled. There is an alternation between zones rich and more poor in siliceous microfossils downcore.

SEISMIC INTERPRETATION

Primary Site (COC-2): COC-2 survey line 1, JD144 21:02:21 Z(SP 964)

crossline: COC-2 survey line 3, JD145 08:34:09Z (SP 3044)

Location: 5° 50.566' N 86° 26.674' W
Site water depth: 2048 m (center beam depth; 2.714 sec TWTT)
Sediment thickness: 0.49 sec (404 m)
Proposed Drilling Depth: 409 m

COC-2 is in a large pelagic basin situated about halfway between the crest of the Cocos Ridge and the depth of normal oceanic crust in the Guatemala Basin to the north. The COC-2 survey consisted of two lines to the crest of the ridge and a third crossline across the middle of the basin. The sediment reflectors follow the gentle slope of the basement, indicating little complications by sedimentation processes.

GEOLOGIC HAZARDS

There are no geological hazards. The section to be drilled is pelagic carbonates over basalt on an aseismic ocean ridge.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/00

Seismic lines, and chirp subbottom profiles for COC-2 are all included in V.2 of this submission. We also include CD-ROMs of images and SEG-Y files of the seismic reflection data for electronic filing

FIGURES

Fig COC2-1: Location map for COC-2. Proposed drill site is marked.
Fig COC2-2: Swathmap bathymetry for the COC-2 region, from the NEMO-3 site survey. Proposed drill site is marked.
Fig COC2-3: Bandpass-filtered seismic reflection profile COC2 line 1 across COC-2, from Nemo-3. Proposed drill site is marked.
Fig COC2-4: Crossline profile COC2 line 3 across COC-2, from Nemo-3. Proposed drill site is marked.
Fig COC2-5: 2-7 kHz Chirp subbottom profile from COC2 line 1 across COC-2, from NEMO-3. Proposed drill site is marked

REFERENCES

Lyle, M., Mix, A. and Pisias, N., submitted, 2000, Patterns of $CaCO_3$ deposition in the eastern tropical Pacific Ocean for the last 150 kyr: Evidence for a southeast Pacific depositional spike at 18 ka. Paleoceanography.

Mammerickx, J. and Smith, S.M., 1981, Bathymetry of the southeast pacific. Geological Society of America, Map and Chart Series, MC-43.

Figure COC2-1: Site map showing the position of COC-2 on the Cocos Ridge. The map is from Mammerickx and Smith, 1981

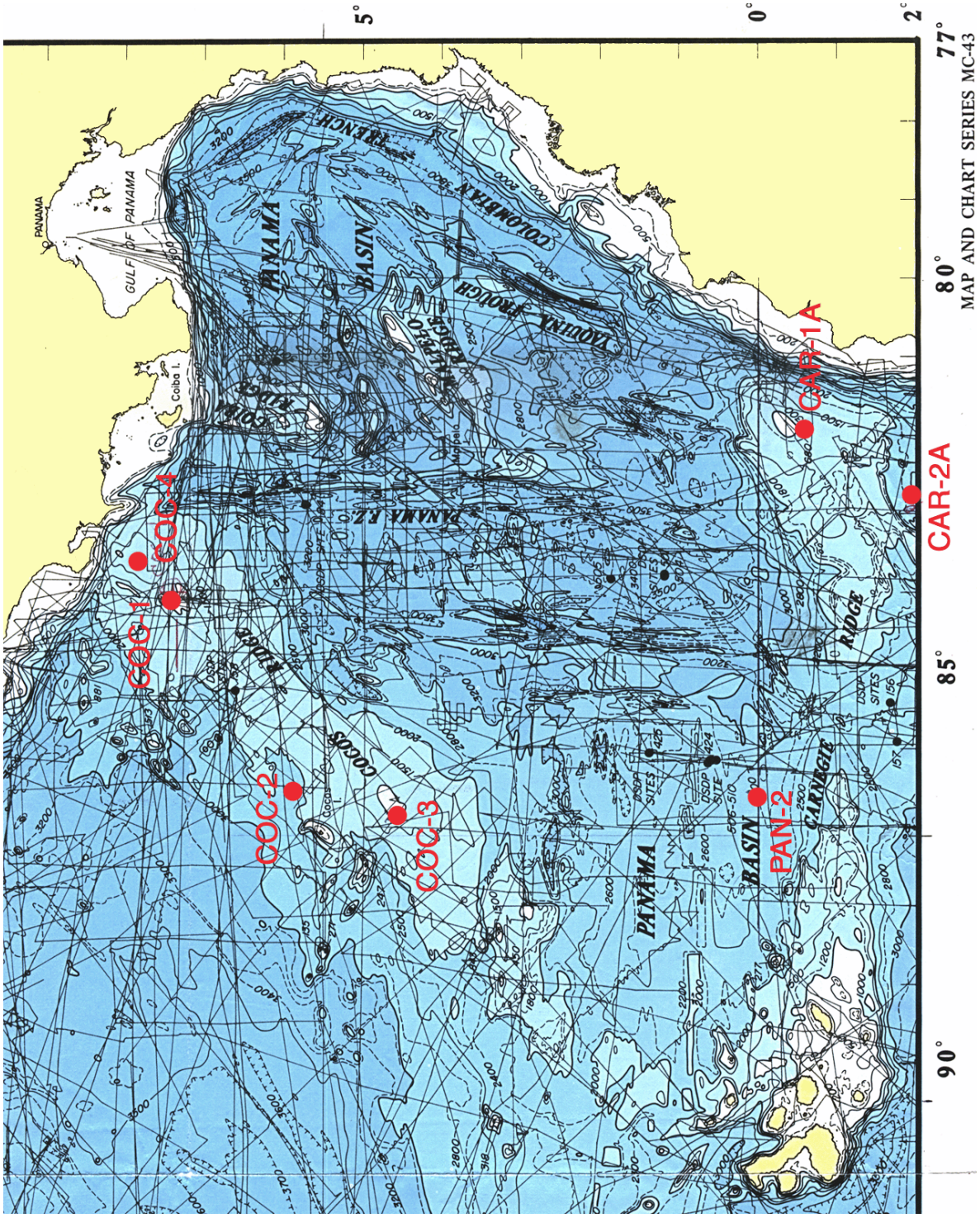
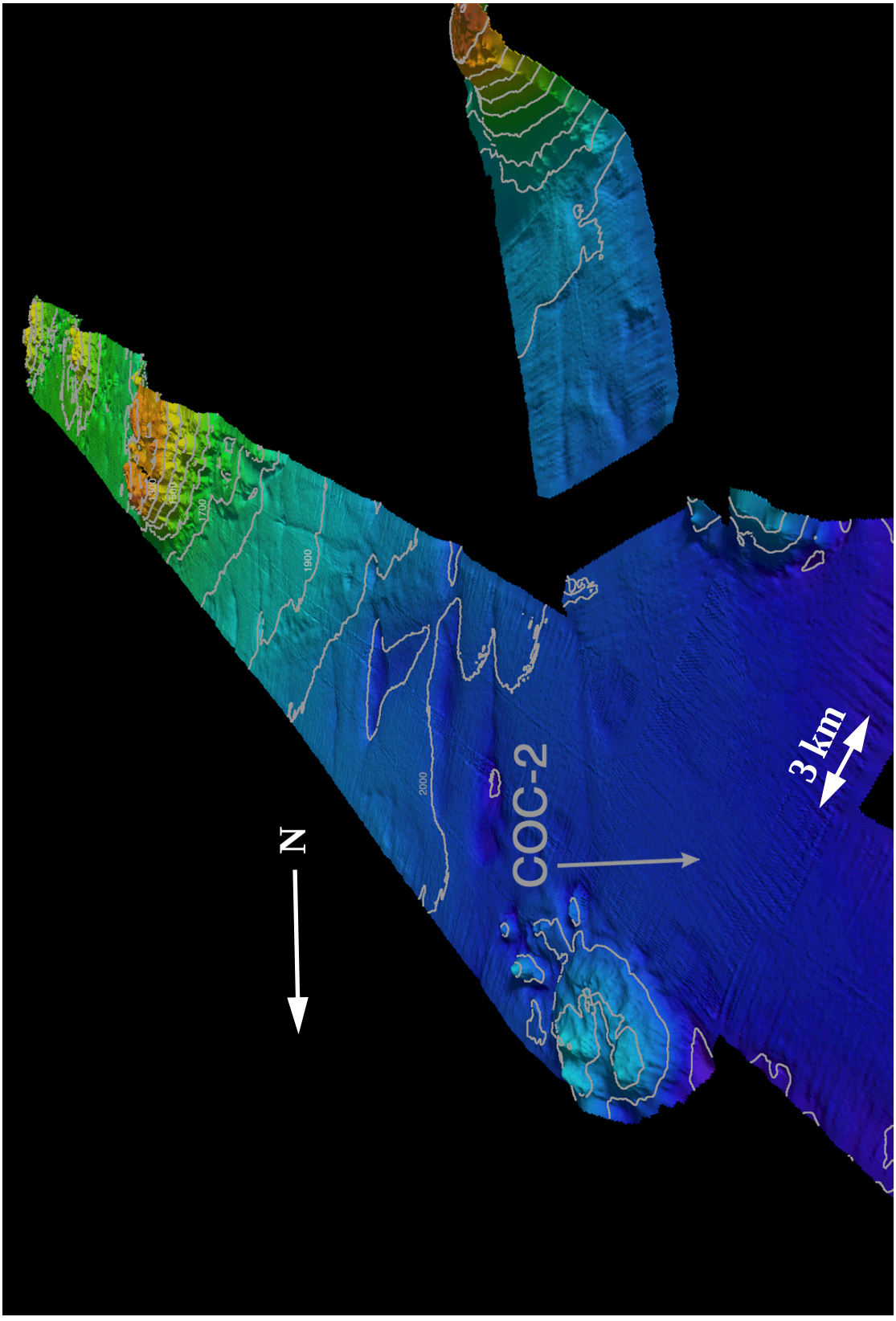


Figure COC2-2: Swathmap bathymetry for the COC-2 survey on the NEMO-3 cruise. COC-2 is located on the northern flank of the aseismic Cocos Ridge..



FigureCOC2-3 Bandpass-filtered seismic reflection profile COC-2 Line 1 from the NEMO-3 survey. Site COC-2 is at the cross of line 1 and line 3

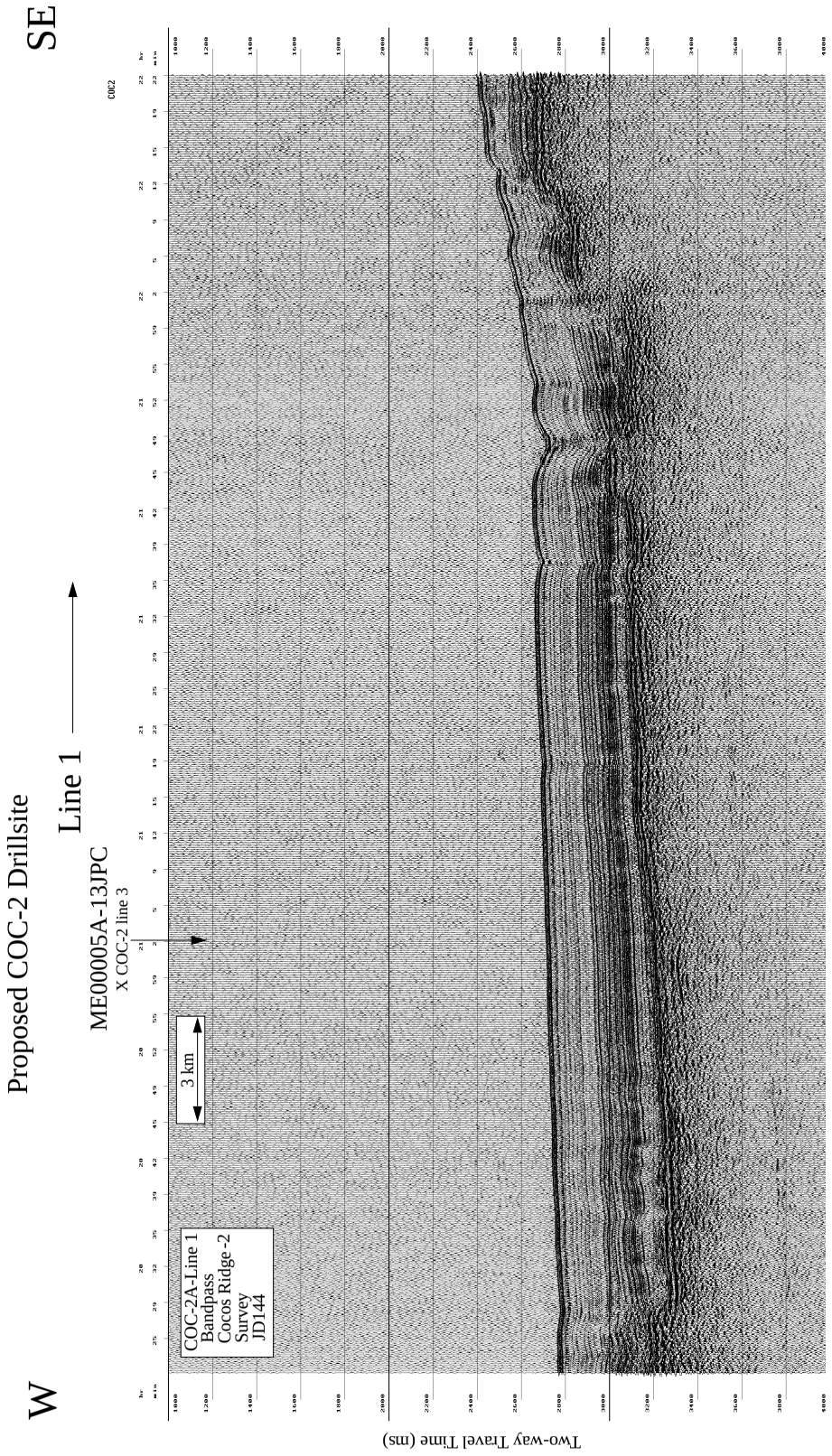
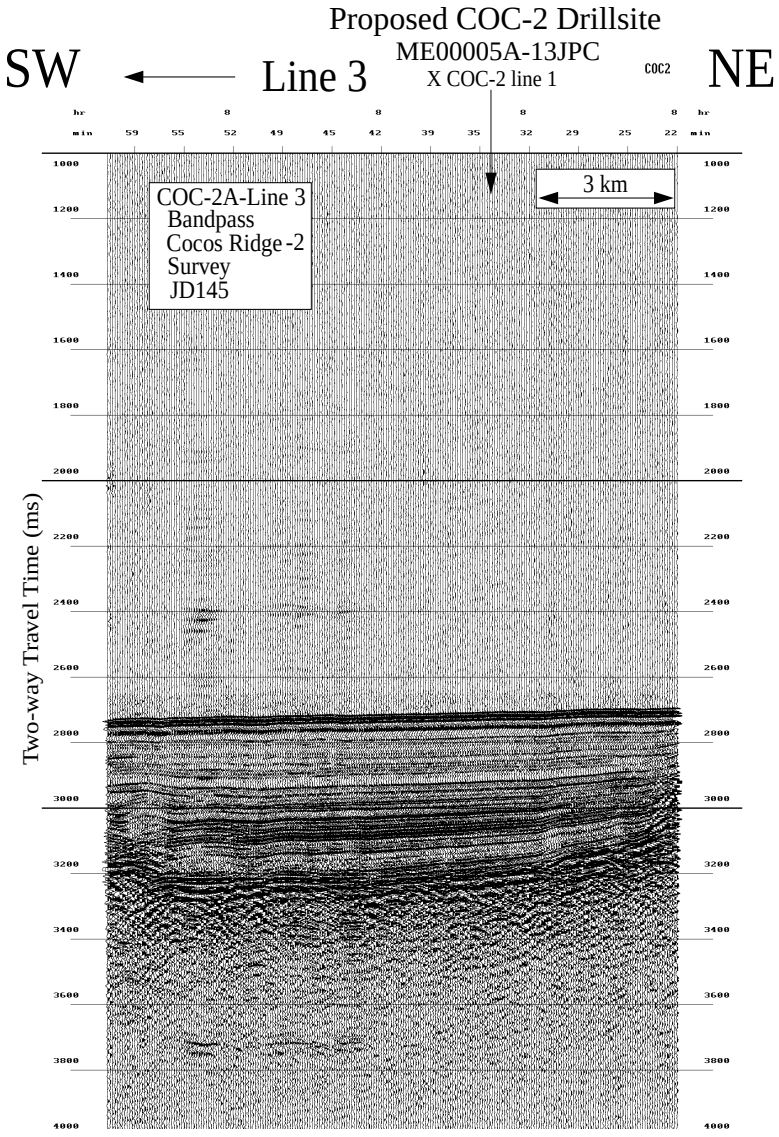


Figure COC2-4: Seismic crossline COC2 Line 3 across proposed drillsite COC-2



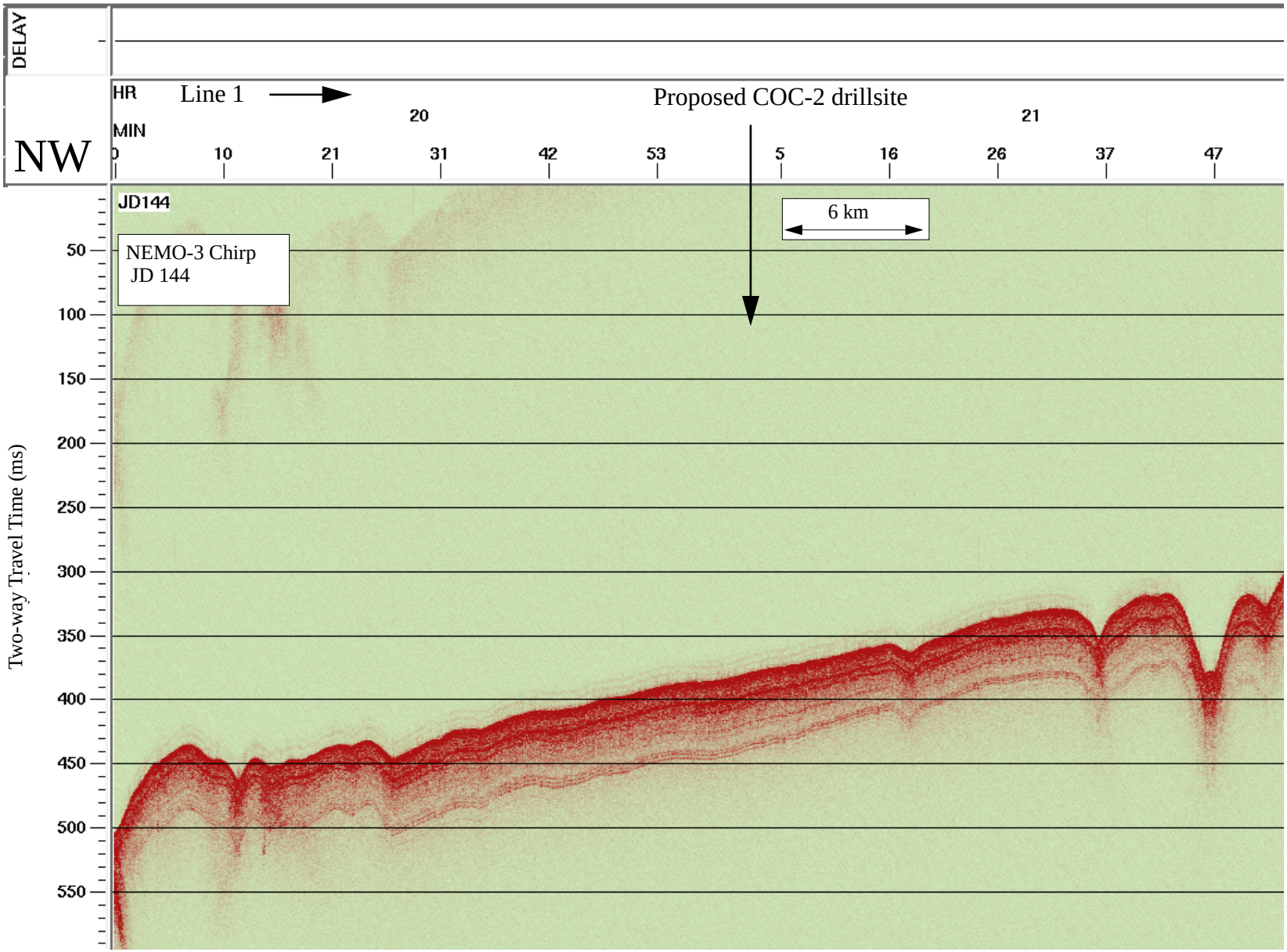


Figure COC2-5 Chirp Seismic taken during Seismic Line 1 across COC-2

SITE COC-1 (NE Crest of Cocos Ridge)

7° 18.646'N 84° 07.309' W, water depth–1007 m

SITE OBJECTIVES

COC-1 will monitor the composition of basal intermediate waters at the northern edge of the Panama Basin, and will be used to monitor the North Equatorial Countercurrent and coastal upwelling near Costa Rica.

COC-1C has been sited in a small basin on the top of Cocos Ridge near the position where the Cocos Ridge collides with Costa Rica (Figure COC1-1). It is near the shallowest point on the Cocos Ridge in this vicinity. We chose the position of COC-1C in a small but somewhat deformed basin.

Because of the shallow depth of COC-1, 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. The presence of discoasters in the multicore surface samples suggests that there is a moderate amount of sediment reworking in the vicinity.

GENERAL DESCRIPTION

COC-1 is situated in a shallow (~1000 m deep) sedimentary basin at the crest of the Cocos ridge immediately west of where the ridge collides with the Mesoamerican Trench. The basin has experienced some deformation as indicated by some unconformable reflectors in the sediment sequence. The basement age is probably middle to late early Miocene, and the sediment began filling the basin at a somewhat later date. The deformation of the sediments within the basin would suggest that the basin was formed as part of the subduction process of the Cocos Ridge, or perhaps in the late Miocene.

The COC-1 basin contains 250-400 m of sediment and is surrounded by volcanic terrain. On all sides except to the northwest (which we didn't survey), volcanic basement outcrops within 3-4 km of the basin center. The basin deepens to the south, suggesting a downdropped graben.

NEMO-3 SURVEY

COC-1 was surveyed June 4 to June 5, 2000 on the R/V Melville NEMO-3 cruise. We surveyed the proposed drillsite with the Melville Seabeam 2000 swathmapping system for bathymetry, a digitally-recorded Knudsen 320B echosounder for high-resolution subbottom profiles, and the OSU multicore and jumbo piston coring system for surface sediment sampling. We used two 150 c.i. GI guns and the Scripps 4-channel hydrophone streamer to digitally acquire seismic reflection profiles. The seismic reflection profile and crossline over COC-1C are shown in Figures COC1-3 and COC1-4, and the echosounder profile is shown in Figure COC1-5. COC-1C is located on COC1 Line 4 just to the south of the cross with COC1 Line 7. The upper sediments were cored to 12 m depth in the jumbo piston core ME0005A-40JC. The sediment-water interface was sampled with the multicore ME0005A-38MC.

LITHOLOGIC DESCRIPTION

Nearest sediment core: ME0005-0040JC, taken on NEMO-3; 7° 19.00' N, 84° 06.80'W, 1004 m water depth, 12.41 m sediment recovered

The piston core is dark olive to dark olive gray foram-nanno ooze with some biosiliceous debris. Colors alternate downcore suggesting carbonate cycles. The sediments are mottled throughout. Some reworking of Pliocene sediments into recent material is indicated by the presence of discoasters in the core, including at 11 cm in the adjoining multicore samples.

SEISMIC INTERPRETATION

Primary Site (COC-1C): COC-1 survey line 4, JD157 10:51:08Z (SP3908; CDP 3908)
Crossline: COC-1 survey line 7
Location: 7° 18.646'N, 84° 07.309' W
Site water depth: 1007 m (center beam depth; 1.342 sec TWTT)
Sediment thickness: 0.441 sec (353 m)
Proposed Drilling Depth: 358 m

COC-1C is located on on the crest of the Cocos Ridge, near where it is being subducted into the Mesoamerican trench. Because the highest priority objective is to sample lower intermediate waters, it is located in the shallowest basin we could find, at about 1000 m water depth. We chose the position because it has both an expanded upper (Pleistocene?) sediment sequence and one of the thickest sequences of earlier sediments. The upper sediment sequence is 80 m thick, and if it is Pleistocene in age, its sedimentation rate is greater than 40 m/Myr.

GEOLOGIC HAZARDS

There are no geological hazards. The section to be drilled is a pelagic foraminiferal ooze over basalt on an aseismic ocean ridge.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/00

Seismic lines, chirp subbottom profiles, and maps for COC-1 are all included in V.2 of this submission. We also include CD-ROMs of images and SEG-Y files of the seismic reflection data for electronic filing

FIGURES

Fig COC1-1: Regional location map for COC-1. Proposed drill site is marked.

Fig COC1-2: Swathmap bathymetry for the COC-1 region, from the Nemo-3 site survey. Proposed drill site is marked.

Fig COC1-3: Bandpass-filtered seismic reflection profile COC1 Line 4 across COC-1C, from NEMO-3. Proposed drill site is marked.

Fig COC1-4: Crossline profile COC1 Line 7 just to the north of COC-1C, from NEMO-3. Line crossing with Line 4 is marked.

Figure COC1-5: 2-7 kHz chirp Seismic taken along COC1 line4 across the proposed drillsite.

REFERENCES

Mammerickx, J. and Smith, S.M., 1981, Bathymetry of the southeast pacific. Geological Society of America, Map and Chart Series, MC-43.

Figure COC1-1: Site map showing the position of COC-1 on the Cocos Ridge and bathymetry of the northern Nazca Plate. The base map is Mammerickx and Smith (1981).

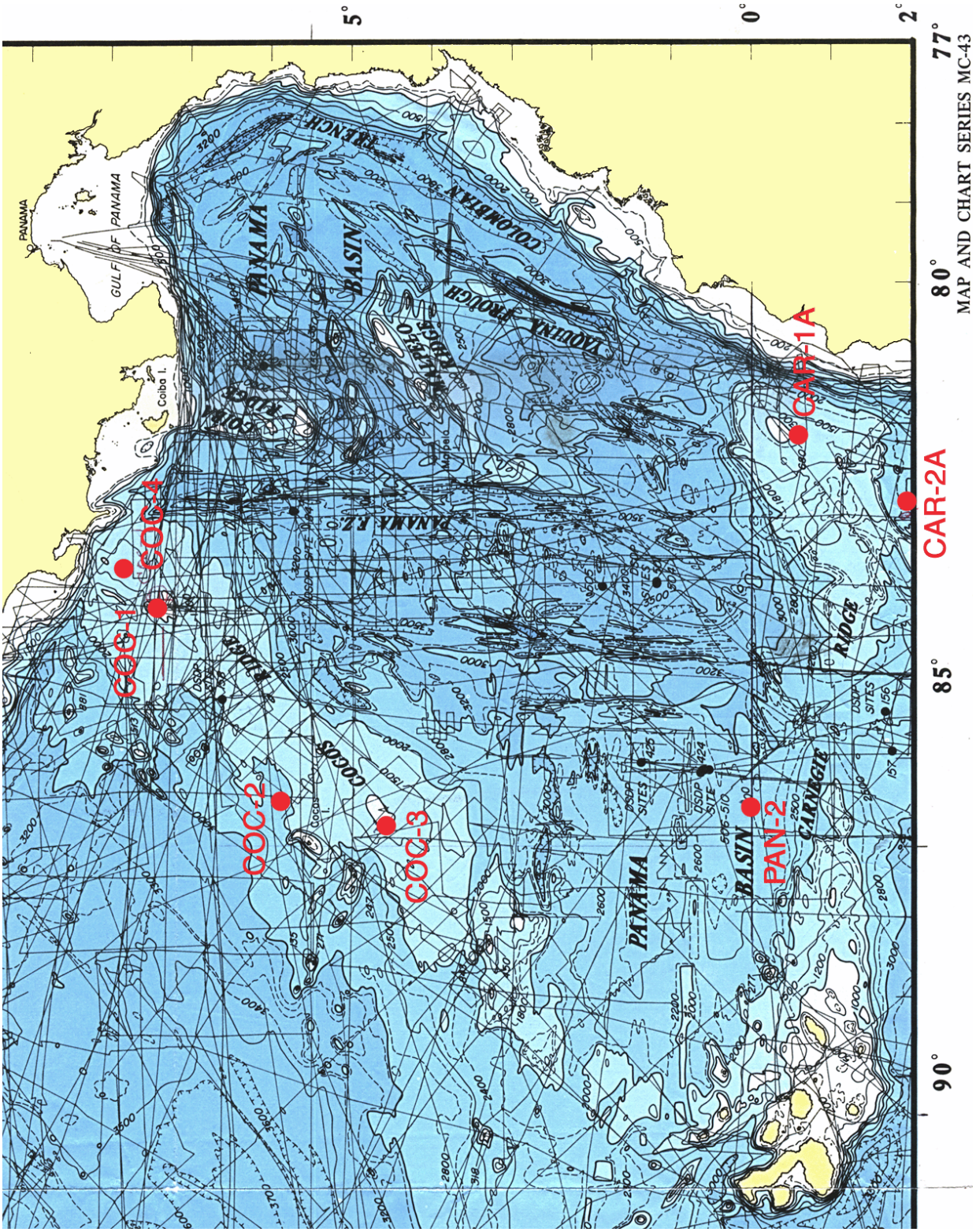
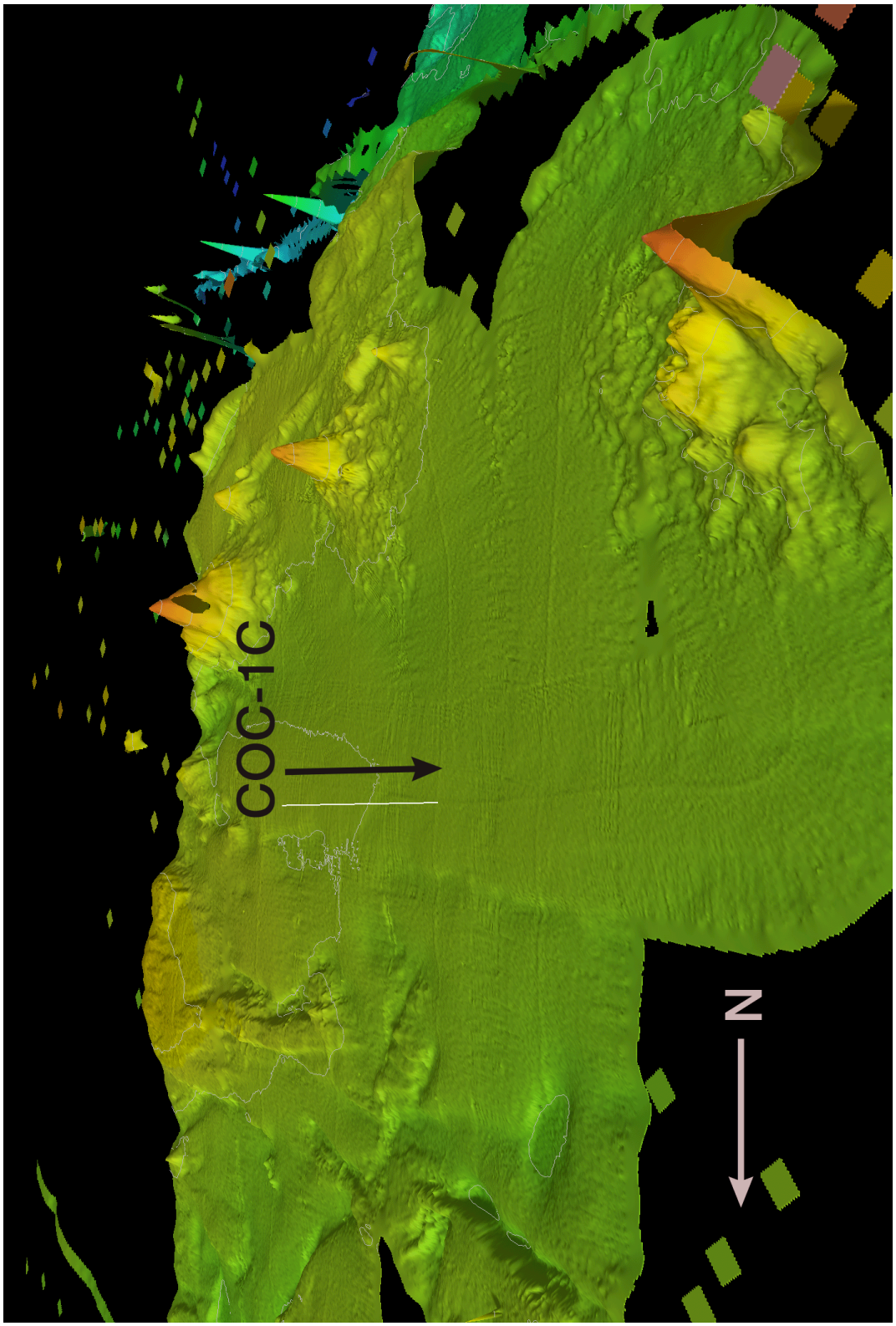
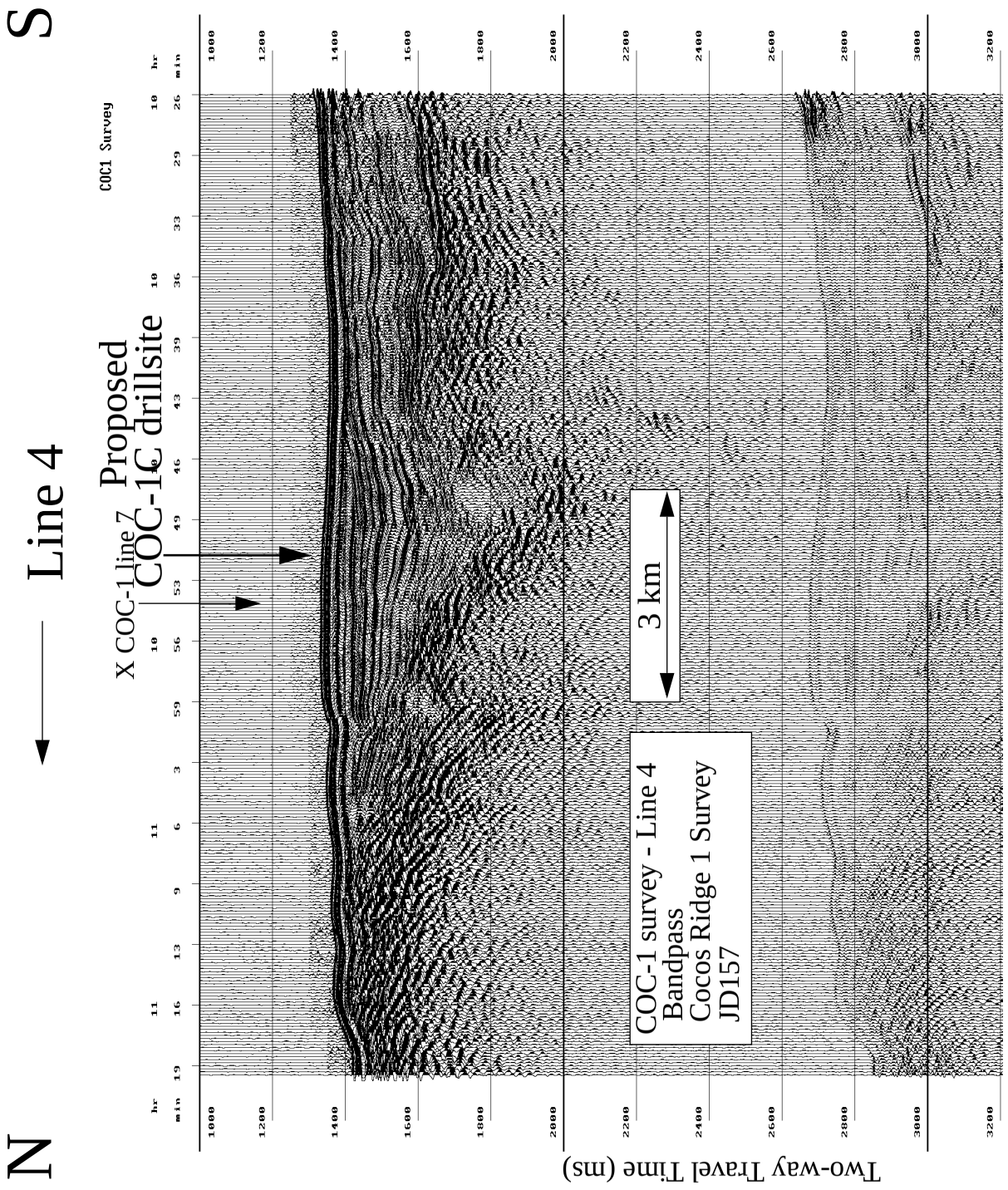


Figure COC1-2: Swathmap bathymetry for the COC-1 survey on the NEMO-3 cruise. COC-1C is marked.



FigureCOC1-3 Bandpass-filtered seismic reflection profile showing a segment of COC1 line 4, through the proposed COC-1C drillsite. Proposed drillsite location is just south of the cross between Line 4 and Line 7..



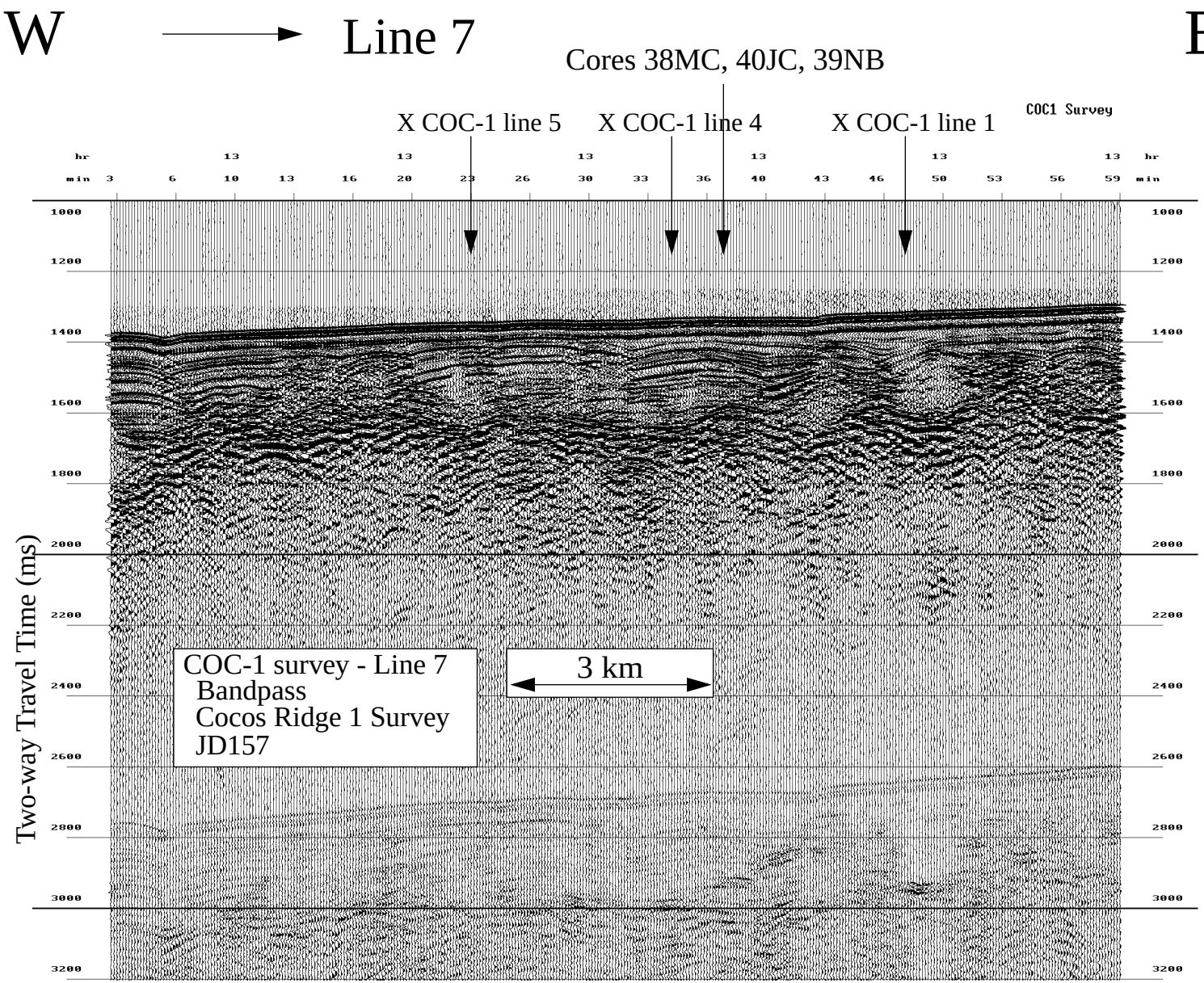


Figure COC1-4: Seismic crossline COC1 Line 7 across proposed drillsite.

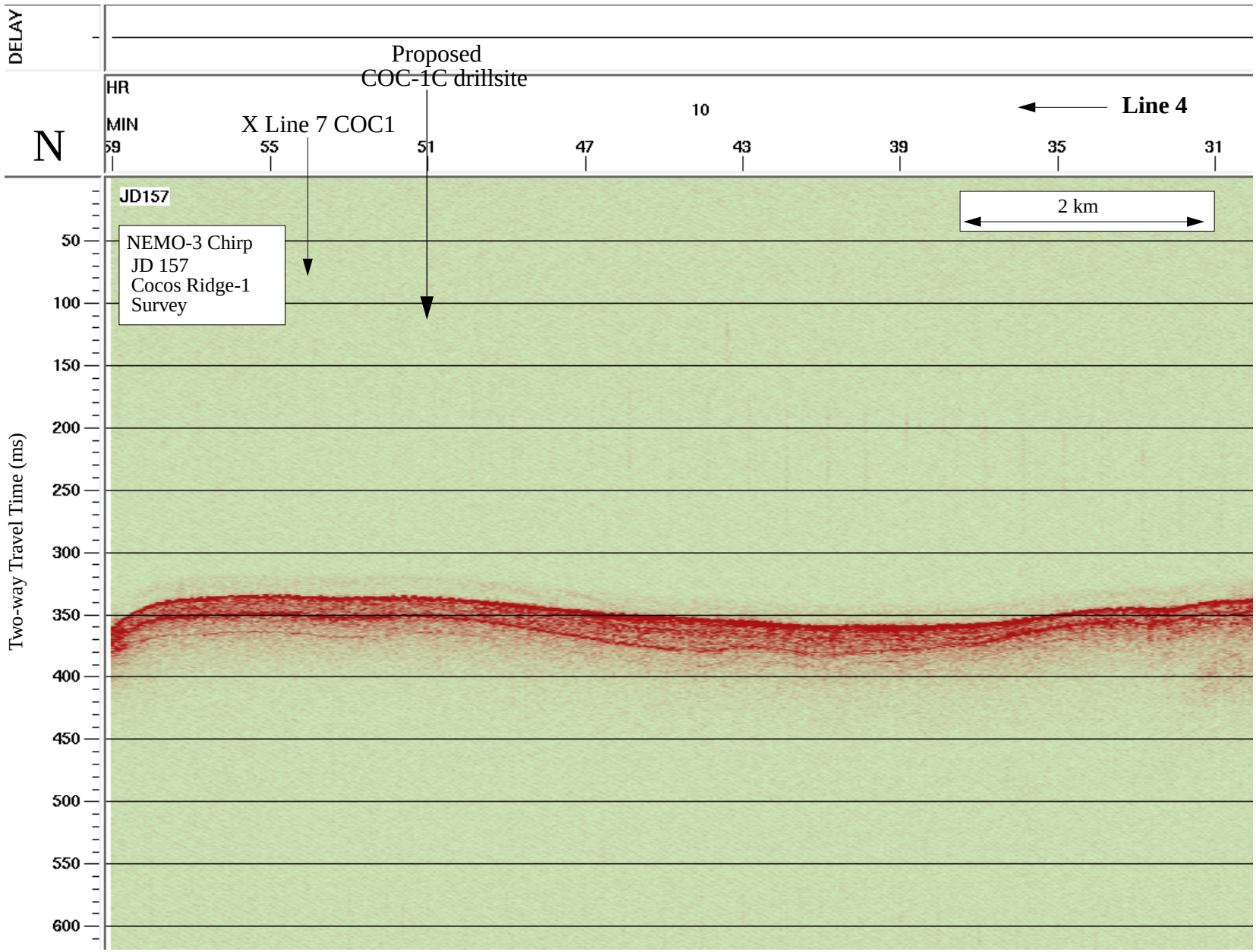


Figure COC1-5 Chirp seismic taken along COC1 Line 4 across the proposed drillsite.

SITE COC-4 (Intersection of Crest of Cocos Ridge with Costa Rica Margin)

7° 51.352'N 83° 36.402' W, water depth–1370 m

SITE OBJECTIVES

COC-4 will monitor the composition of basal intermediate waters and upper deep waters at the northern edge of the Panama Basin, and will be used to monitor the Costa Rica Current and the movement of the intertropical convergence zone. It will also be used to monitor upwelling along the Costa Rica Margin.

Because of the shallow depth of COC-4, 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.

The unconformity at the base of the sediment section provides an opportunity examine a middle Miocene shallow pelagic section from the Galapagos region and will provide an opportunity to date the onset of hemipelagic sedimentation.

GENERAL DESCRIPTION

COC-4 is situated in a shallow (~1400 m deep) basin within the structurally complex intersection between the Cocos Ridge and the Mesoamerican Trench (Figure COC4-1 and COC4-2; von Huene et al, 2000). The site lies in a graben on the crest of the Cocos Rift, which is in turn crosscut by younger normal faulting striking roughly ENE (Figure COC4-3).

Tectonic activity has had a striking effect on sedimentation. The COC-4 drillsite not only occupies a shallow bathymetric basin, but seismic reflection data shows the basin to be a shallow listric fault which is apparently still active (Figures COC4-4 and COC4-6). The crossline, COC4 Line 7 (Figure COC4-5) shows the 3-D nature of the deformation approximately along strike to the surface expression of the basin. The more recent sediments lie unconformably on top of the older sediment pile (presumably middle to early Miocene carbonates) which seems to be folded perhaps by the subduction process. Some older sediments outcrop along major anticlines, as can be observed at the southern end of COC4 Line 5 (Figures COC4-4 and COC4-7) forming 'badlands'.

Because the primary objectives of Leg 201 involve high resolution studies of the late Pliocene to Recent section, we chose a thick section within the most recent grabens as the COC-4 drillsite.

NEMO-3 SURVEY

COC-4 was surveyed 6 June 2000 on the R/V Melville NEMO-3 cruise. We surveyed the proposed drillsite with the Melville Seabeam 2000 swathmapping system for bathymetry, a digitally-recorded Knudsen 320B echosounder for high-resolution subbottom profiles, and the OSU multicore and jumbo piston coring system for surface sediment sampling. We used two 150 c.i. GI guns and the Scripps 4-channel hydrophone streamer to digitally acquire seismic reflection profiles. The seismic reflection profile and crossline over COC-4 are shown in Figures COC4-4 and COC4-5, and the echosounder profile is shown in Figures COC4-6 and COC4-7. COC-4 is located on COC4 Line 5 at the cross with COC4 Line 7. The upper sediments were cored to 15.08 m depth in the jumbo piston core ME0005A-43JC.

LITHOLOGIC DESCRIPTION

Nearest sediment core: ME0005-43JC, taken on NEMO-3; 7° 51.35' N, 83° 36.50'W, 1368 m water depth, 15.08 m sediment recovered

This core was not opened on the cruise, but from section breaks we noted dark olive gray clay with forams.

SEISMIC INTERPRETATION

Primary Site (COC-4): COC4 line 5, JD158 09:09:05Z (SP3295)

Crossline: COC4 line 7,
Location: 7° 51.349'N, 83° 36.488' W
Site water depth: 1368 m (center beam depth; 1.735 sec TWTT)
Sediment thickness: 0.559 sec (461 m at 1650 m/sec velocity)
Proposed Drilling Depth: 465 m

COC-4 is located in a graben on the crest of the Cocos Ridge, within the region of strong hemipelagic sedimentation from Costa Rica. Because the highest priority objectives involve sampling a high resolution Pleistocene section we picked a graben with thick hemipelagic infill. It is uncertain how fast these sediments have filled the graben, although the basement age should be middle to late early Miocene based upon other DSDP and ODP drillsites. 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/million years (the graben sediments are about 300 m thick)

GEOLOGIC HAZARDS

There are no geological hazards. The section to be drilled is a pelagic foraminiferal ooze over basalt on an aseismic ocean ridge.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/00

Seismic lines, chirp subbottom profiles, and maps for COC-3 are all included in V.2 of this submission. We also include CD-ROMs of images and SEG-Y files of the seismic reflection data for electronic filing

FIGURES

Fig COC4-1: Regional location map for COC-4 from Mammerickx and Smith (1981). Proposed drill site is marked.
Fig COC4-2: Regional swathmap bathymetry from von Huene et al. (2000) along the Costa Rica margin. The COC-4 survey area is outlined by the box in the SE corner of the map.

Fig COC4-3: Swathmap bathymetry for the COC-4 region, from the Nemo-3 site survey. Proposed drill site is marked. The "badlands" region are the southern small basins in the center of the map.

Fig COC4-4: Bandpass-filtered seismic reflection profile COC4 Line 5 across COC-4, from NEMO-3. Proposed drill site is marked.

Fig COC4-5: Crossline profile COC4 line 7, from NEMO-3. Crossing with Line 5 is marked.

Figure COC4-6: 2-7 kHz chirp seismic taken along COC4 Line 5 across the proposed drillsite. Note the much higher sedimentation rate within the basin.

Figure COC4-7: 2-7 kHz chirp seismic taken at the end of COC4 Line 5 in the badlands section.

REFERENCES

Hey, R., Tectonic evolution of the Cocos-Nazca spreading center, *Geological Society of America Bulletin, 88*, 1404-1420, 1977.

Mammerickx, J. and Smith, S.M., 1981, Bathymetry of the southeast pacific. *Geological Society of America, Map and Chart Series*, MC-43.

von Huene, R., C.R. Ranero, and W. Weinrebe, Quaternary convergent margin tectonics of Costa Rica, segmentation of the Cocos Plate, and Central American volcanism, *Tectonics, 19 (2)*, 314-334, 2000.

Figure COC3-1: Site map showing the position of COC-1 on the Cocos Ridge and bathymetry of the northern Nazca Plate. The base map is Mammerickx and Smith (1978).

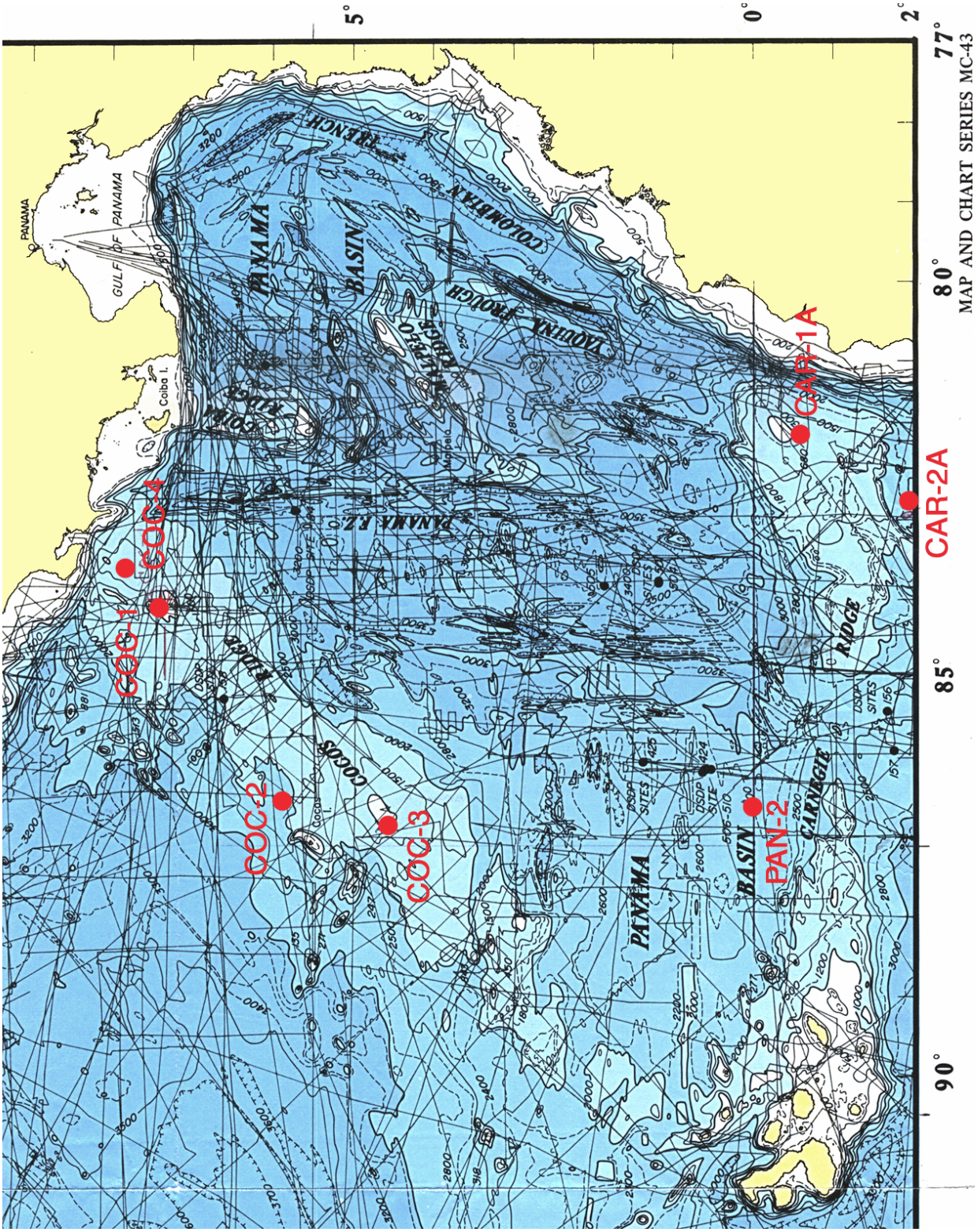
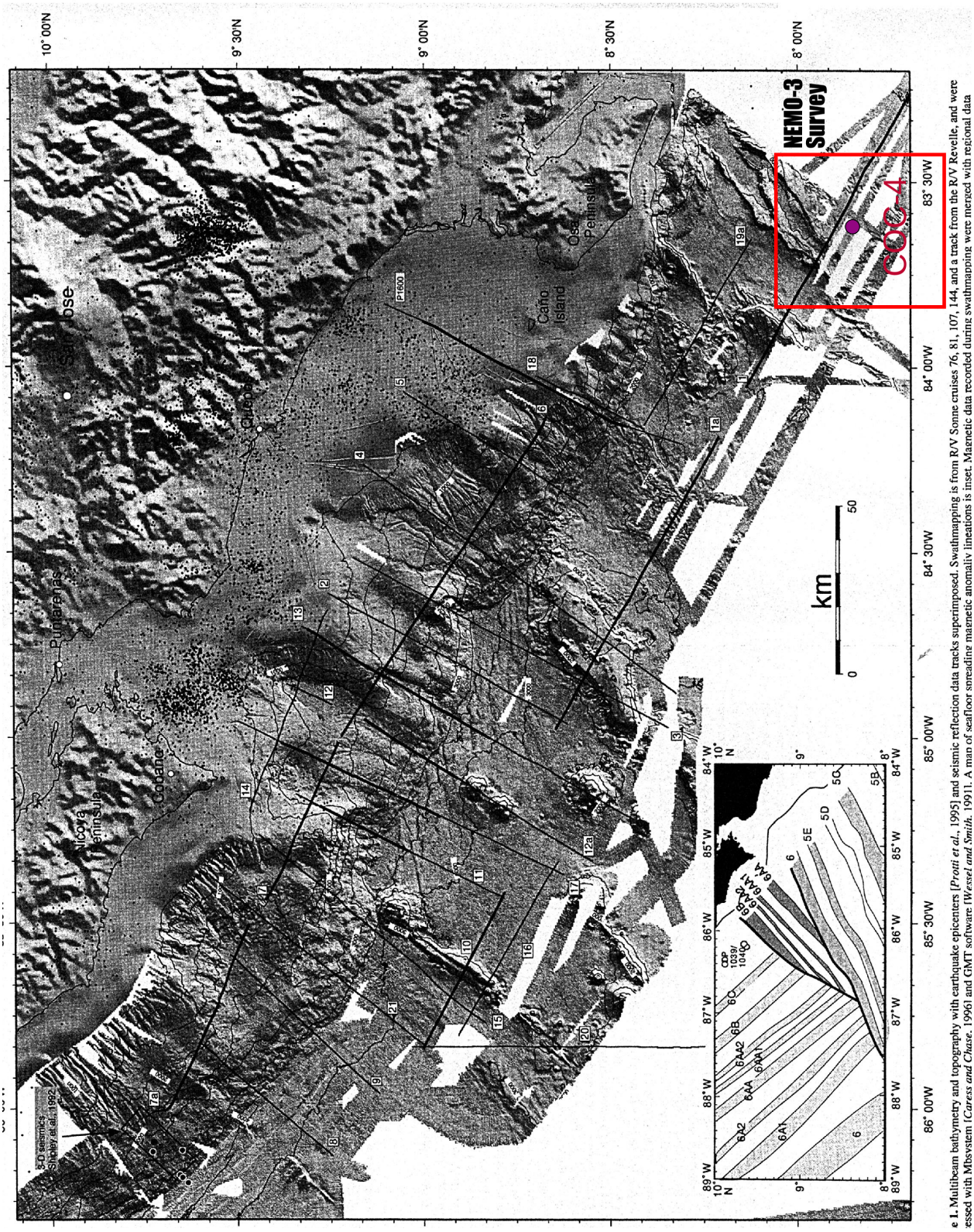
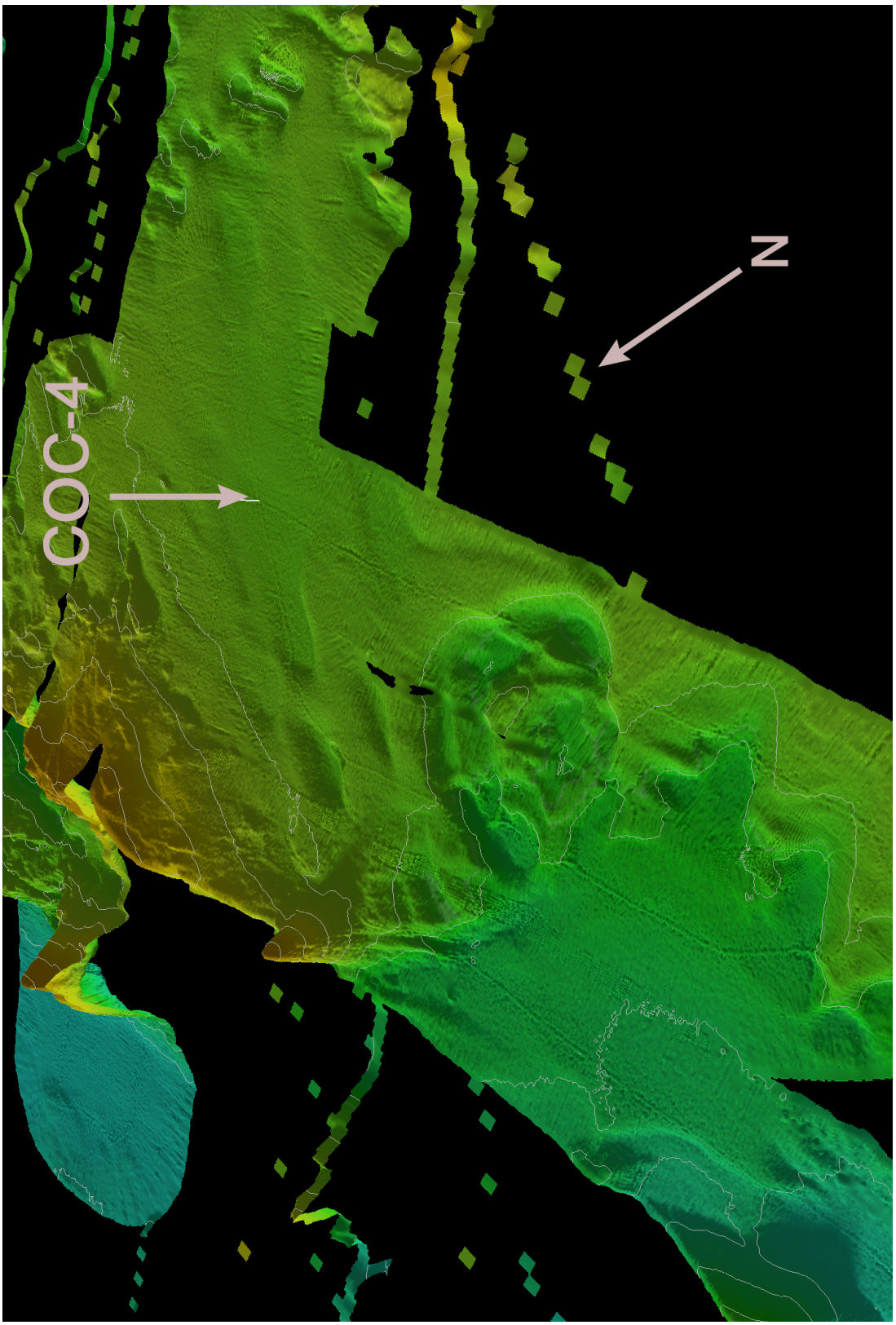


Figure COC4-2: Regional swathmap bathymetry from von Huene et al.(2000). The proposed COC-4 drillsite is marked.



e 1. Multibeam bathymetry and topography with earthquake epicenters [*Protti et al.*, 1995] and seismic reflection data tracks superimposed. Swathmapping is from R/V Sonne cruises 76, 81, 107, 144, and a track from the R/V Revelle, and were essed with Mbsystem [*Caress and Chase*, 1996] and GMT software [*Wessel and Smith*, 1991]. A map of seafloor spreading magnetic anomaliy lineations is inset. Magnetic data recorded during swathmapping were merged with regional data

Figure COC4-3 Swathmap bathymetry for the COC-4 survey on the NEMO-3 cruise. COC-4 is marked.



FigureCOC4-4 Bandpass-filtered seismic reflection profile showing a segment of COC line 5, through the proposed COC-4 drillsite. Proposed drillsite location is at the cross between Line 5 and Line 7..

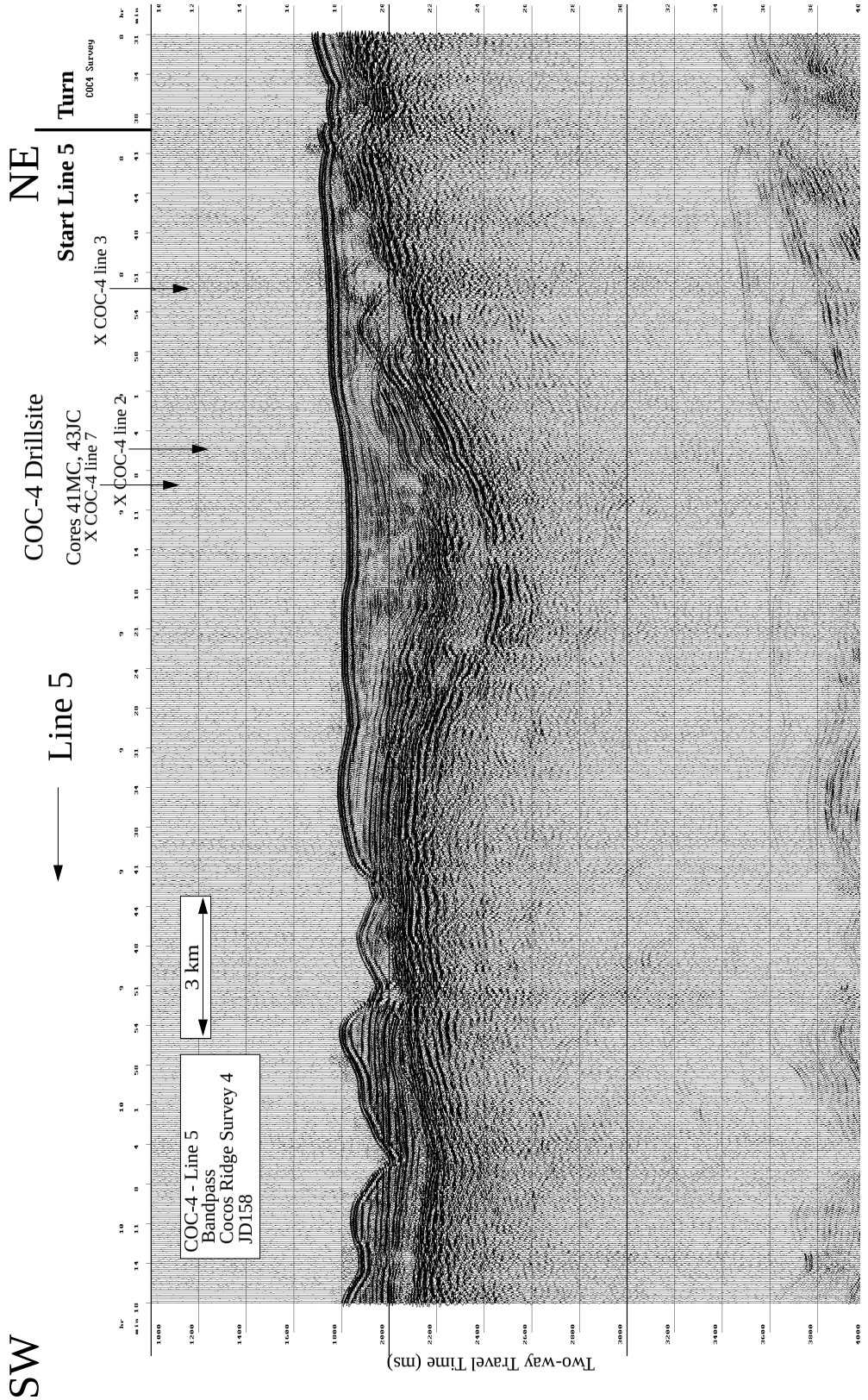
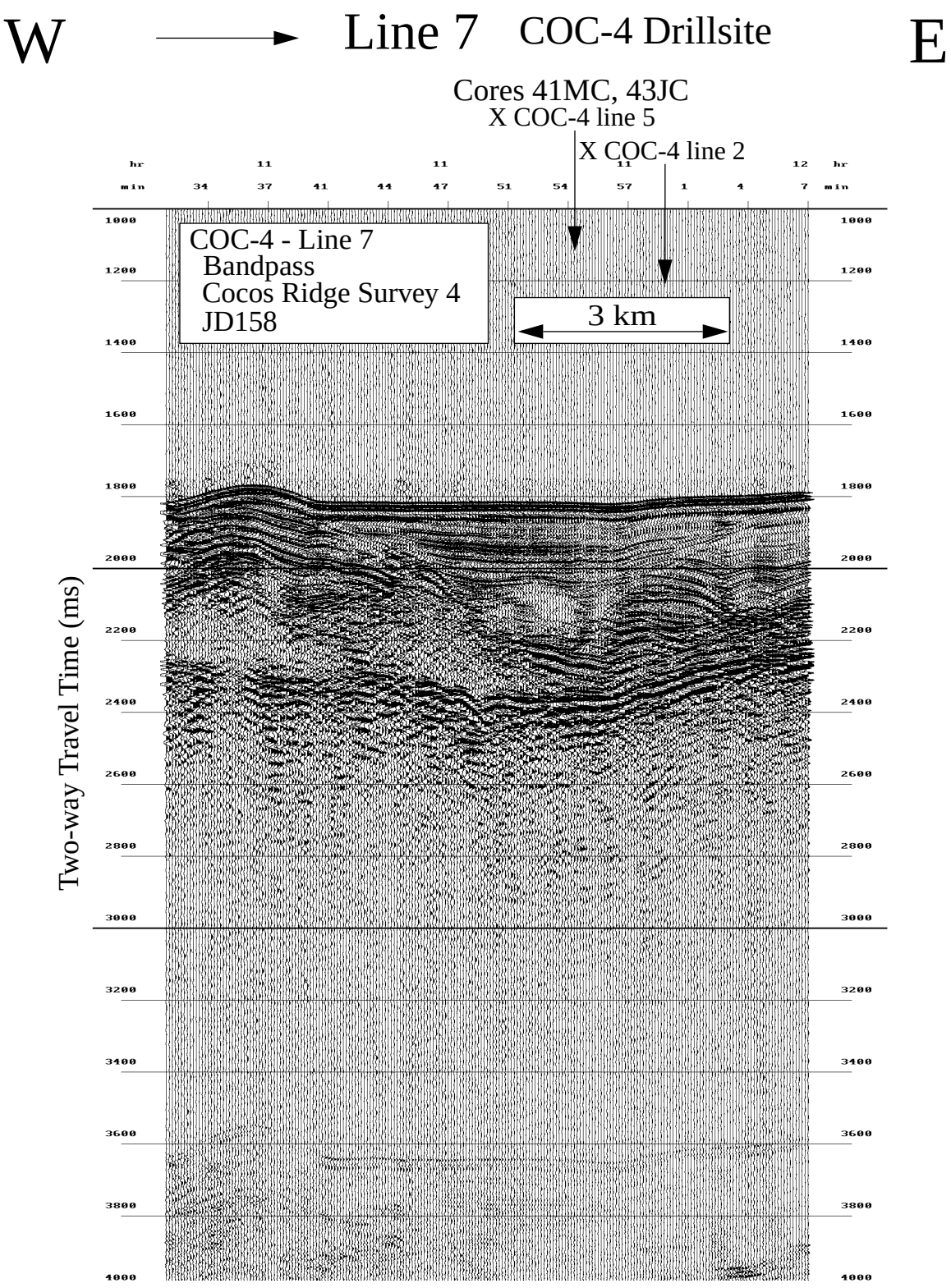


Figure COC4-5 Seismic crossline COC4 Line 7 near proposed drillsite.



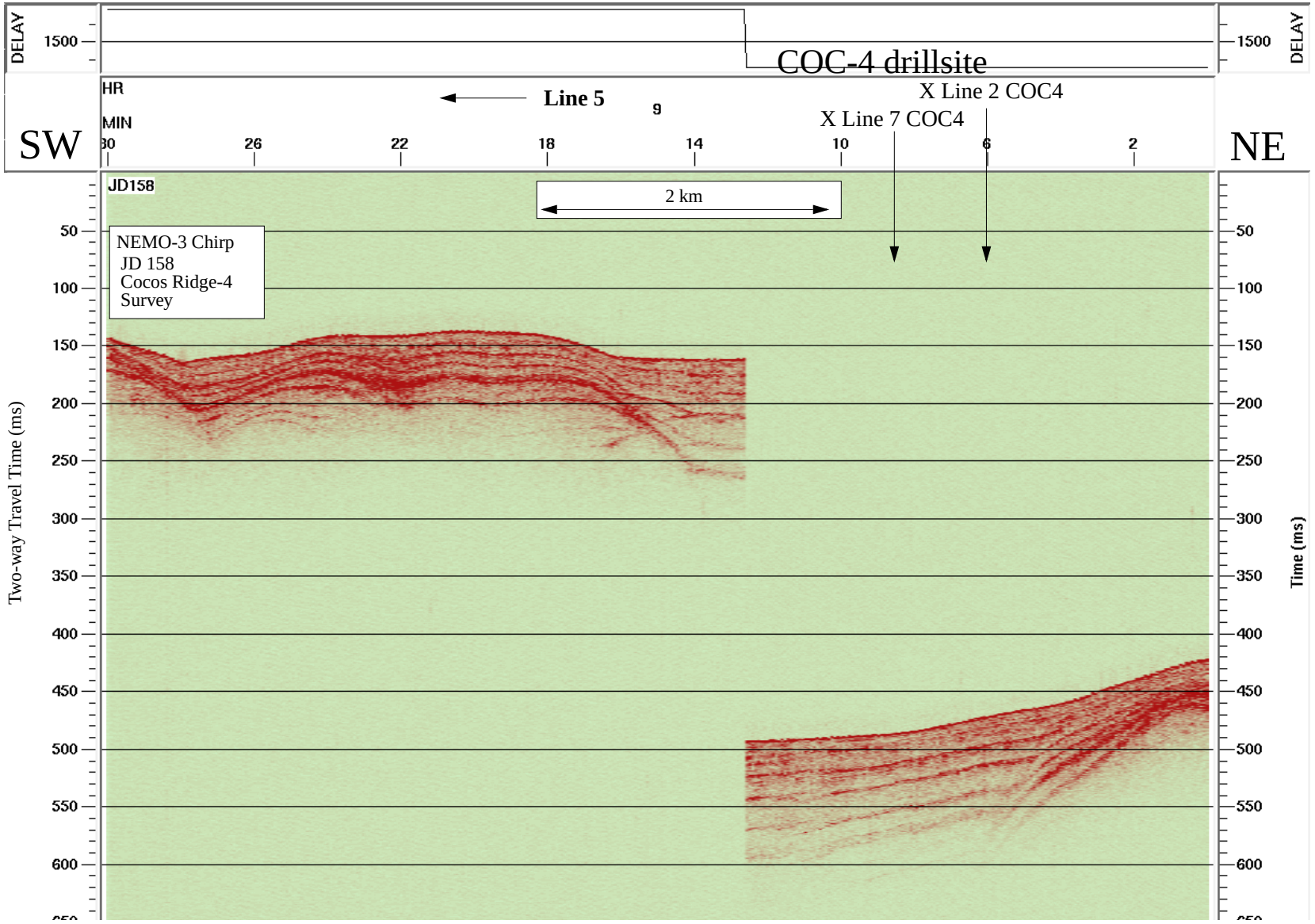


Figure COC4-5 Chirp Seismic taken during COC4 Line 5 across the proposed drillsite.

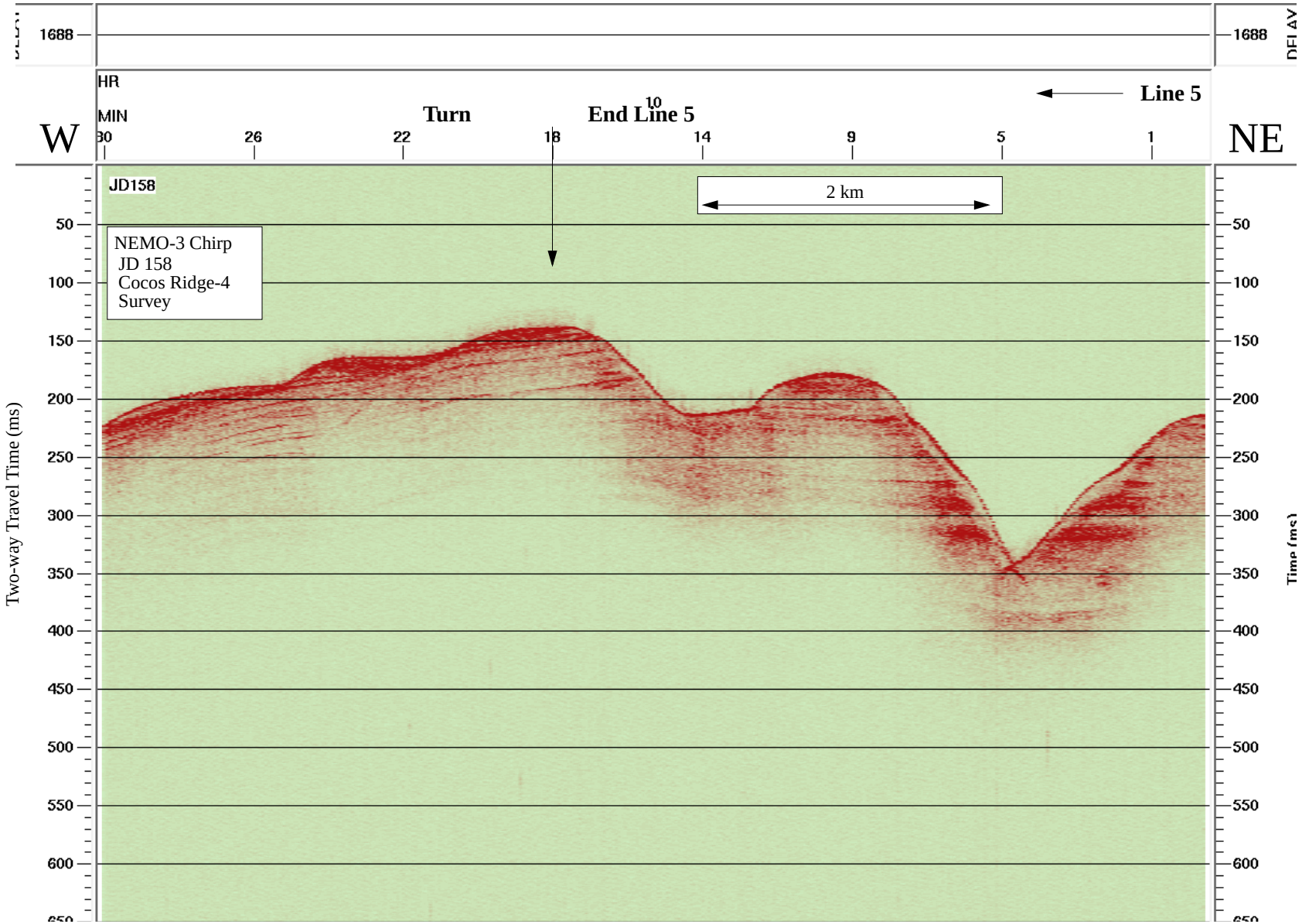


Figure COC4-6: Eroded "badlands" of outcropping older sediment at the end of COC4 line 5.

SITE TEH-1 (Gulf of Tehuantepec margin, Mexico)

15° 36.08'N 95° 21.40' W, water depth–802 uncorr. m

SITE OBJECTIVES

TEH-1 will be useful for studies of the Tehuantepec margin of Mexico (figure TEH1-1). The Tehuantepec margin is in the region of the strongest oxygen minimum in the eastern Pacific. The importance in drilling the site will be to understand the fate of the oxygen minimum over the Pleistocene. Because this region is a possible source of low oxygen waters transported to the north, it will also define how variations in source strength affect California margin intermediate waters. It will also be important to study changes in coastal upwelling through time, especially associated with the development of winter high pressure in the Caribbean and strong winds (Tehuantepecanos) blowing through the mountain gap in Mexico.

The Holocene sediments at this site are laminated, with intermittent bioturbated zones. TEH-1 will also provide an ultra-high resolution record of oceanographic change in the eastern Pacific for comparison with other sections in the Gulf of California and the Santa Barbara Basin. There may also be a record of paleoseismicity along the Polochic-Motogua fault zone from nearby slumps.

GENERAL DESCRIPTION

TEH-1 is situated on the Tehuantepec continental slope in the only place we are confident that has a continuous sediment section in the upper 300-400 m of the sediment column. It is located on the TEH-1B survey line 1 on a hill on the southern flank of a possible transform fault cutting the margin from northeast to southwest (Figure TEH1-2).

The survey discovered a large number of complexities on the upper slope and shelf break of the Tehuantepec margin that made it difficult to locate an adequate drillsite. In the northwestern and western part of the survey area we see evidence of a massive slump buried under about 25 m of hemipelagic sediment. Part of the slump can be seen in the northwestern part of TEH1B-line 1, shown in Figure TEH1-3. The central part of the survey area is marked by a large canyon running southwestward between 95° 15'W and 95° 20'W. To the east of the canyon are incised slopes and recent slumps. It appears that the ridge just to the east of the canyon along 95°15'W is one or more detached blocks which have slid some ways downslope. The shelf between 95° 10 and 95°05'W is a hard ground of some sort, reflecting most of the seismic energy back. There is layering within the block suggesting that the hard ground consists of lithified sedimentary material.

NEMO-3 SURVEY

TEH-1 was surveyed between May 18 and May 20 2000 on the R/V Melville NEMO-3 cruise. We surveyed the proposed drillsite with the Melville Seabeam 2000 swathmapping system for bathymetry, a digitally-recorded Knudsen 320B echosounder for high-resolution subbottom profiles, and the OSU multicore and jumbo piston coring system for surface sediment sampling. We used two 150 c.i. GI guns and the Scripps 4-channel hydrophone streamer to digitally acquire seismic reflection profiles. The seismic reflection profile over TEH-1 is shown in Figure TEH1-3, and the echosounder profile is shown in Figure TEH1-4.

LITHOLOGIC DESCRIPTION

Nearest sediment core: ME0005-003PC, taken on NEMO-3; 15° 39.04' N, 95° 16.83'W, 740 m water depth, 13.42 m sediment recovered

The piston core is laminated through much of its length, although significant intervals are extensively burrowed or have distinct burrows through laminations. The basal sediments of the core are extensively burrowed. The core had a strong H_2S odor over its entire length, indicating strongly reducing conditions from the surface of the sediments. Occasional ~0.5 cm light-colored layers of ash and/or overbank turbidite deposits can be found through the core. Thick laminations can also be found in some intervals.

SEISMIC INTERPRETATION

Primary Site (TEH-1): TEH1B survey line 1, 04:17:08 Z(SP 114)

Location: 15° 36.08' N 95° 21.40' W
Site water depth: 802 m (uncorr. m)
Sediment thickness: >0.93 sec (> 800 m)
Proposed Drilling Depth: 250 m

TEH-1 is sited on a sedimentary ridge between two canyons, one to the west mostly filled with a slump deposit. It is the only location we surveyed that appears to have a continuous sediment section without sediment units slumped away and missing from the section or major slump deposits within the section.

GEOLOGIC HAZARDS

We did not see any obvious bottom simulating reflectors (BSRs) indicating gas hydrates. There are some seismic bright spots but none at the proposed drill site.

OTHER HAZARDS

There are no manmade hazards in the vicinity.

SUBMITTED DATA, 7/00

Seismic lines, chirp subbottom profiles, and maps for TEH-1 are all included in V.2 of this submission. We also include CD-ROMs of images and SEG-Y files of the seismic reflection data for electronic filing

FIGURES

Fig TEH1-1: Location map for TEH-1. Proposed drill site is marked.

Fig TEH1-2: Swathmap bathymetry for the TEH-1 region, from the NEMO-3 site survey. Proposed drill site is marked.

Fig TEH1-3: Bandpass-filtered seismic reflection profile TEH1B line 1 across TEH-1, from NEMO-3. Proposed drill site is marked.

Fig TEH1-4: 2-7 kHz Chirp subbottom profile along TEH1B Line 1 across TEH-1, from the NEMO-3 survey. Proposed drill site is marked

Figure TEH1-1: Site map showing the position of TEH-1 in the Gulf of Tehuantepec. Basemap is Carta Batimetrica CB-008 (Golfo de Tehuantepec), Direccion General de Geografia de los Estados Unidos de Mexico.

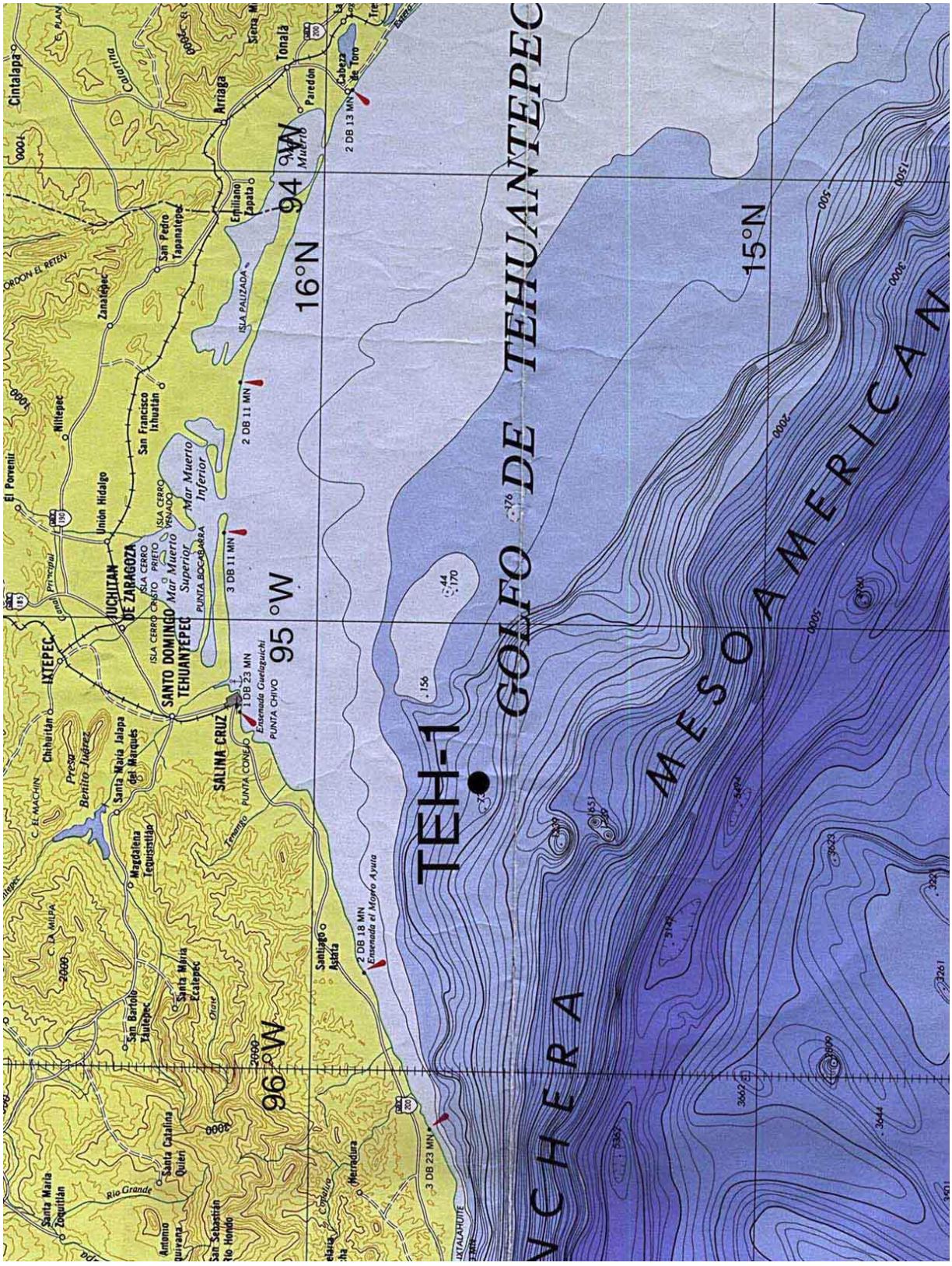
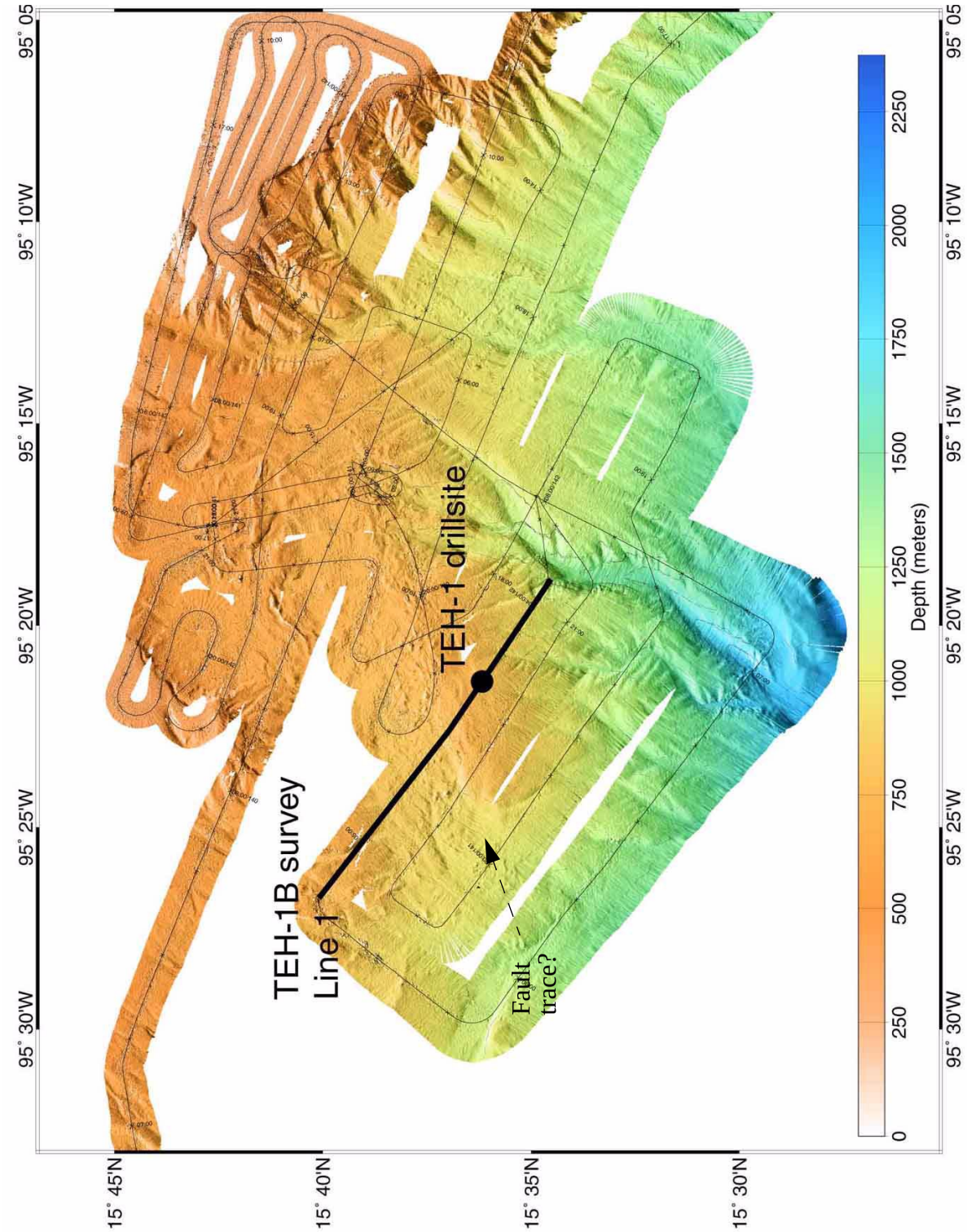
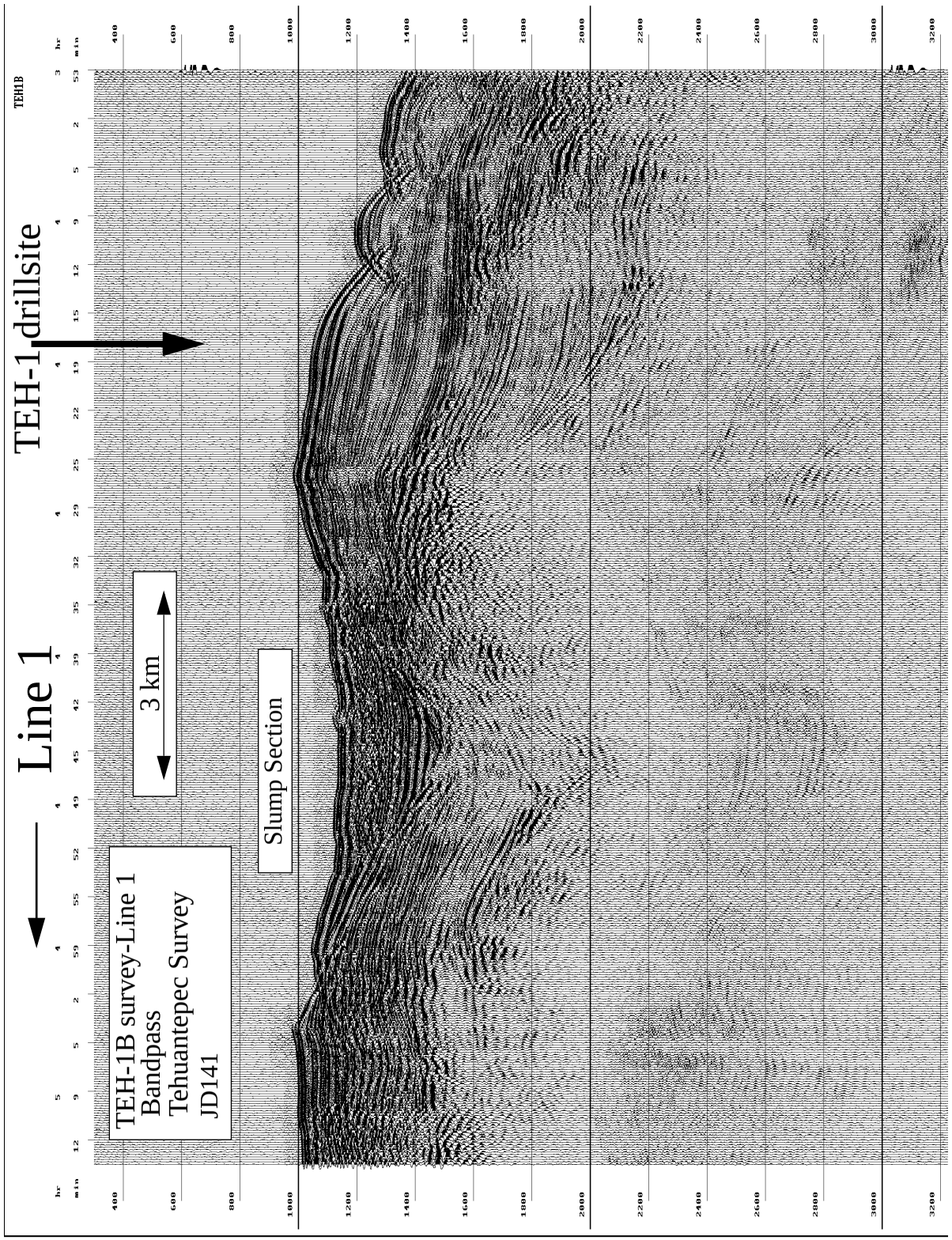


Figure TEH1-2: Swathmap bathymetry for the TEH-1 survey on the NEMO-3 cruise. TEH-1 is located on the southern flank of a possible transform fault cutting from NE to SW.



FigureTEH1-3: Bandpass-filtered seismic reflection profile TEH1B-seisline 1 across TEH-1, from the NEMO-3 survey



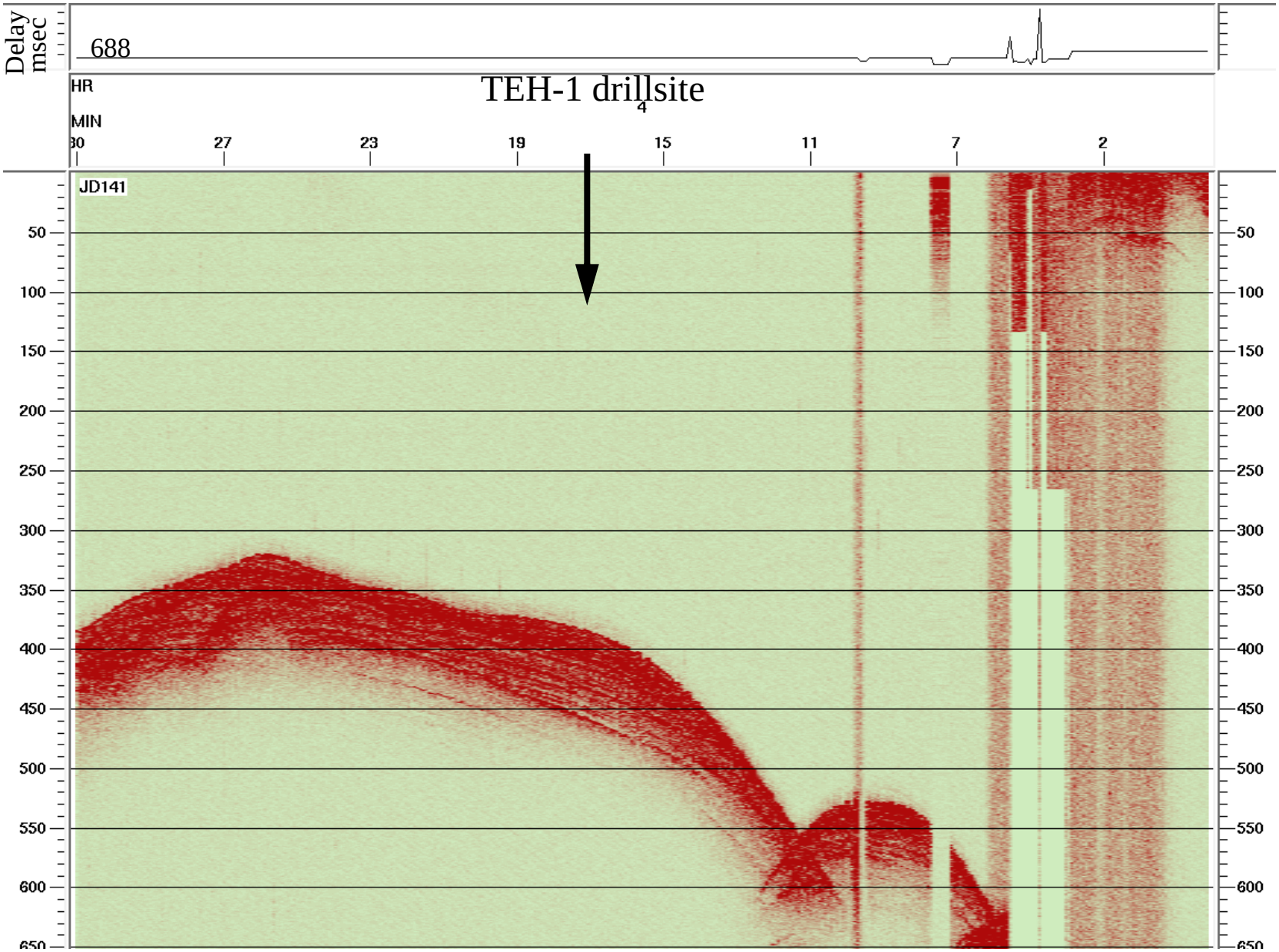


Figure TEH1-4: 3.5 kHz profile TEH1B-35line1 across TEH-1, from the NEMO-3 survey