2. SITE 506[1]

Shipboard Scientific Party[2]

HOLES 506, 506A

Date occupied: November 15, 1979

Date departed: November 16, 1979

Time on hole: 12 hr., 26 min.

Position (latitude; longitude): 0°36.59′N; 86°05.49′W (Hole 506); 0°36.5′N; 86°05.48′W (Hole 506A)

Water depth (sea level; corrected m, echo-sounding): 2710

Water depth (rig floor; corrected m, echo-sounding): 2720

Bottom felt (m, drill pipe): 2713.7

Penetration (m): 36.7

Number of cores: 9

Total length of cored section (m): 36.7

Total core recovered (m): 22.57

Core recovery (%): 61.49

Oldest sediment cored:
Depth sub-bottom (m): 36.7
Nature: Foraminifer nannofossil ooze
Age: 270–440 × 10^3 y.
Measured seismic velocity (km/s): 1.45–1.65

Basement:
Depth sub-bottom (m): 36.7
Nature: Basalt
Seismic velocity range (km/s): 5.45

Principal results: Seven holes were drilled or cored (Holes 506, B, C, D, G, H, I) and three heat-flow measurements attempted at Site 506, located 19.5 km south of the Galapagos Spreading Center. Both hydrothermal mounds (Holes 506, 506C) and off-mounds sediments (Holes 506B, 506D) were cored using the hydraulic piston corer. Three holes (506G, 506H, 506I) were drilled into basement.

The sediments are classified as (1) foraminifer nannofossil oozes with varying amounts of siliceous microfossils and (2) hydrothermal sediments, which include manganese-oxide crusts and granular to semi-coherent nontronitic clay. Hydrothermal sediments are confined to the mounds sites and are intermixed and interbedded with foraminifer nannofossil oozes. Pore-water chemistry and heat-flow data from the mounds sites suggest upward convecting solutions. Off-mounds sites are composed of siliceous foraminifer nannofossil oozes.

Basement samples retrieved are fresh, finely crystalline, plagioclase sparsely phyric to aphyric basalts.

Heat-flow measurements and pore-water sampling were conducted at Hole 506A.

HOLE 506B

Date occupied: November 16, 1979

Date departed: November 16, 1979

Time on hole: 5 hr., 38 min.

Position (latitude; longitude): 0°36.61′N; 86°05.48′W

Water depth (sea level; corrected m, echo-sounding): 2711.6

Water depth (rig floor; corrected m, echo-sounding): 2721.6

Penetration (m): 20.7

Number of cores: 6

Total length of cored section (m): 20.7

Total core recovered (m): 20.49

Core recovery (%): 99

Oldest sediment cored:
Depth sub-bottom (m): 20.7
Nature: Foraminifer nannofossil ooze
Age: 270–440 × 10^3 y.
Measured seismic velocity (km/s): 1.45–1.65

Basement:
Depth sub-bottom (m): 20.7
Nature: Basalt
Seismic velocity range (km/s): 5.45

Principal results: Hole 506B is located off a mounds site. The sediments recovered are predominantly pelagic: siliceous foraminifer nannofossil and foraminifer nannofossil ooze.

HOLE 506C

Date occupied: November 16, 1979

Date departed: November 16, 1979

Time on hole: 7 hr., 53 min.

Position (latitude; longitude): 0°36.46′N; 86°05.48′W

Water depth (sea level; corrected m, echo-sounding): 2709.8

Water depth (rig floor; corrected m, echo-sounding): 2719.8

Bottom felt (m, drill pipe): 2716.9

Penetration (m): 31.3

Number of cores: 8

Total length of cored section (m): 31.3

Total core recovered (m): 29.75

Core recovery (%): 95

[1] Honnorez, J., Von Herzen, R. P., et al., *Init. Repts. DSDP*, 70: Washington (U.S. Govt. Printing Office).

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Oldest sediment cored:
Depth sub-bottom (m): 31.3
Nature: Foraminifer nannofossil ooze
Age: 270–240 × 10^3 y.
Measured seismic velocity (km/s): 1.45–1.65

Basement:
Depth sub-bottom (m): 31.3
Nature: Basalt
Velocity range (km/s): 5.45

Principal results: Hole 506C was drilled on a hydrothermal mound. Sediments recovered are foraminifer nannofossil oozes with varying amounts of siliceous components and hydrothermal sediments. (See also Principal Results for Holes 506, 506A.)

HOLE 506D

Date occupied: November 16, 1979

Date departed: November 17, 1979

Time on hole: 11 hr., 20 min.

Position (latitude; longitude): 0°36.42′N; 86°05.48′W

Water depth (sea level; corrected m, echo-sounding): 2706.9

Water depth (rig floor; corrected m, echo-sounding): 2716.9

Bottom felt (m, drill pipe): 2716.9

Penetration (m): 31.9

Number of cores: 9

Total length of cored section (m): 31.9

Total core recovered (m): 29.25

Core recovery (%): 92

Oldest sediment cored:
Depth sub-bottom (m): 31.9
Nature: Foraminifer nannofossil ooze
Age: 270–240 × 10^3 y.
Measured velocity (km/s): 1.45–1.65

Basement:
Depth sub-bottom (m): 31.9
Nature: Basalt
Velocity range (km/s): 5.45

Principal results: The sediments recovered from this hole are foraminifer nannofossil oozes with varying amounts of siliceous microfossils (See Principal Results for Holes 506, 506A.)

HOLES 506E, 507F

Date occupied: November 17, 1979

Date departed: November 17, 1979

Position (latitude; longitude): 0°36.59′N; 86°05.48′W

Water depth (sea level; corrected m, echo-sounding):
2703 (Hole 506E); 2712 (Hole 507F)

Water depth (rig floor; corrected m, echo-sounding):
2713.7 (Hole 506E); 2721.6 (Hole 506F)

Principal results: Heat-flow measurements and pore-water sampling were conducted at Holes 506E and 506F.

HOLE 506G

Date occupied: November 18, 1979

Date departed: November 18, 1979

Time on hole: 4 hr., 31 min.

Position (latitude; longitude): 0°36.59′N; 86°05.48′W

Water depth (sea level; corrected m, echo-sounding): 2703.5

Water depth (rig floor; corrected m, echo-sounding): 2703.5

Bottom felt (m, drill pipe): 2713.5

Penetration (m): 5

Number of cores: 2

Total length of cored section (m): 5

Total core recovered (m): 1.05

Core recovery (%): 21

Oldest sediment cored:
Depth sub-bottom (m): 27.5
Nature: No samples (washed to basement)

Basement:
Depth sub-bottom (m): 32.5
Nature: Basalt
Seismic velocity range (km/s): 5.45

Principal results: Basement drilling.

HOLE 506H

Date occupied: November 18, 1979

Date departed: November 19, 1979

Time on hole: 5 hr., 22 min.

Position (latitude; longitude): 0°36.42′N; 86°05.48′W

Water depth (sea level; corrected m, echo-sounding): 2706

Water depth (rig floor; corrected m, echo-sounding): 2716

Bottom felt (m, drill pipe): 2716.9

Penetration (m): 8

Number of cores: 1

Total length of cored section (m): 8

Total core recovered (m): 0.17

Core recovery (%): 2

Oldest sediment cored:
Depth sub-bottom (m): 26.1
Nature: No samples

Basement:
Depth sub-bottom (m): 34.1
Nature: Basalt
Seismic velocity range (km/s): 5.45

Principal results: Basement drilling.

HOLE 506I

Date occupied: November 19, 1979

Date departed: November 19, 1979

Time on hole: 8 hr. (approx.)

Position (latitude; longitude): 0°36.46′N; 86°05.48′W

Water depth (sea level; corrected m, echo-sounding): 2707

Water depth (rig floor; corrected m, echo-sounding): 2717

Bottom felt (m, drill pipe): 2716.9

Penetration (m): 3.5

Number of cores: 1

Total length of cored section (m): 3.5

Total core recovered (m): 0.20

Core recovery (%): 6

Oldest sediment cored:
Depth sub-bottom (m): 26.1
Nature: No samples

Basement:
Depth sub-bottom (m): 29.6
Nature: Basalt
Seismic velocity range (km/s): 5.45

Principal results: Basement drilling.

BACKGROUND

Site 506 is a region of large mounds and ridges (15-20 m high), visited by an *Alvin* dive (#721) in 1977 (Williams et al., 1979). Particularly high heat-flow values were measured over some of these mounds, indicating an active hydrothermal process. They are some of the northernmost, and hence perhaps the youngest, of the mounds identified by the deep-tow surveys (Lonsdale, 1977).

OBJECTIVES

The objectives at Deep Sea Drilling Project (DSDP) Site 506 were the following:

1) To recover undisturbed and continuous sediment sections with the hydraulic piston corer (HPC) from one or more mounds and from adjacent off-mounds areas.

2) To measure heat flow and collect water samples from both environments.

3) To drill as deep as possible into the basement under the mounds and under the pelagic sediment off the mounds.

OPERATIONS

The approach to Site 506, on the morning of November 14, 1979, required relatively good navigation in that we were attempting to locate the beacon within a previously mapped mounds field (Lonsdale, 1977) to an accuracy of better than 0.5 nautical miles. The speed of the vessel on its run from Panama was adjusted so that a satellite fix would be received just a few miles before coming across the site. We also utilized a bathymetric contour chart prepared from a U.S. Navy multibeam survey of the Galapagos region so that we would be able to follow recognizable topography under the track of the vessel as recorded aboard the ship (Fig. 1). This strategy enabled us to position the beacon within a few tenths of a nautical mile of the desired location.

After the ship was settled in over the beacon, the pipe was lowered with an HPC bit; we were most interested to use this new device in order to obtain undisturbed cores from which to determine mounds stratigraphy. The first operation was to make a survey of the bottom, with a new 12-kHz pinger (essentially a modified positioning beacon) attached to the drill pipe 102 meters above the bit. The re-entry scanning source, successfully used to locate mounds on Leg 54, could not be deployed initially because it is physically incompatible with the HPC bit. The size of the survey was limited to a maximum of 3000 ft. displacement from the beacon by the programming of the ship's computer. With the pinger about 140 meters above the bottom, we were able to locate mounds quite successfully. They most commonly appeared as elevated (by 5-10 m) diffuse echoes from the seafloor several hundred feet wide, with the disappearance of internal reflectors beneath them (Fig. 2). Two mounds ridges were located (Fig. 3), slightly displaced (to the south) from, but corresponding to, those mapped by Lonsdale. The first hole (506) was selected over the more northerly of these, with offset coordinates of 1350 ft. N, 1000 ft. W of the beacon after about three hours of survey.

After completion of coring at Hole 506, the vessel was displaced 50 ft. east (1350′N, 950′W) for downhole temperature measurements and a pore-water sampling at Hole 506A. Subsequently we moved north 150 ft. (1500′N, 950′W) to another coring location (506B) on the northern edge of the mounds ridge.

On the morning of November 16, 1979, the vessel was moved south to the more southerly mounds ridge for coring Hole 506C (550′N, 950′W). Coring was completed to basement by the evening, and the vessel was then moved 250 ft. further south (300′N, 950′W) so as to be located adjacent to, but south of, this mounds ridge for coring another hole (506D). Coring at this location was completed on the morning of November 17, at which time the drill string was pulled to change bits for basement drilling. When the drill string was retrieved, a short (1 hr.) survey of this mounds region was attempted with the vessel towing a 10 in.^{3} air-gun source, but the thin sediments (approximately 30 m) precluded useful results. The 3.5-kHz echo-sounding system was the most useful surface seismic tool throughout the mounds region, with basement and internal sediment reflectors easily visible almost everywhere.

After again lowering the drill string with the new bit, a survey (N-S profile) of this mounds ridge region was made with the sonar scanning tool (Fig. 4). This gave a broader view of the mounds ridges than had the 12-kHz drill-string pinger, confirming the disposition of mounds ridges mapped by deep tow (Lonsdale, 1977) and showing the individual mounds peaks comprising the ridges (Figs. 4, 5). Following this survey, two downhole temperature and pore-water samples were made (1350 ft. N, 950 ft. W, Hole 506E, same as 506A; Hole 506F, 1600 ft. N, 950 ft. W).

Basement drilling was attempted at three locations (506G, same as 506A; 506H, same as 506D; and 506I, same as 506E) over a period of about 18 hr., with only minimal success at sample recovery. Drilling conditions in the basement were poor, with torquing and jamming during rotation, probably as a result of the fractured nature of the rocks. The drill string was recovered and work at the site completed about noon, November 19, 1979.

The HPC was used quite successfully at all holes where it was deployed. Recovery was high (Table 1), and quite undisturbed cores showing detailed stratigraphy were usually recovered. The top 0.5 to 1.0 meters of some cores occasionally appeared disturbed and/or contaminated, probably as a result of washing to this depth beneath the bit or of material from above falling to the bottom of the hole. A useful by-product of the deployment of the 12-kHz drill-string pinger is the ability to place the drill bit within 1 to 2 meters of the seafloor before the first coring attempt, ensuring recovery of the first "mudline" core without risk of lowering too much

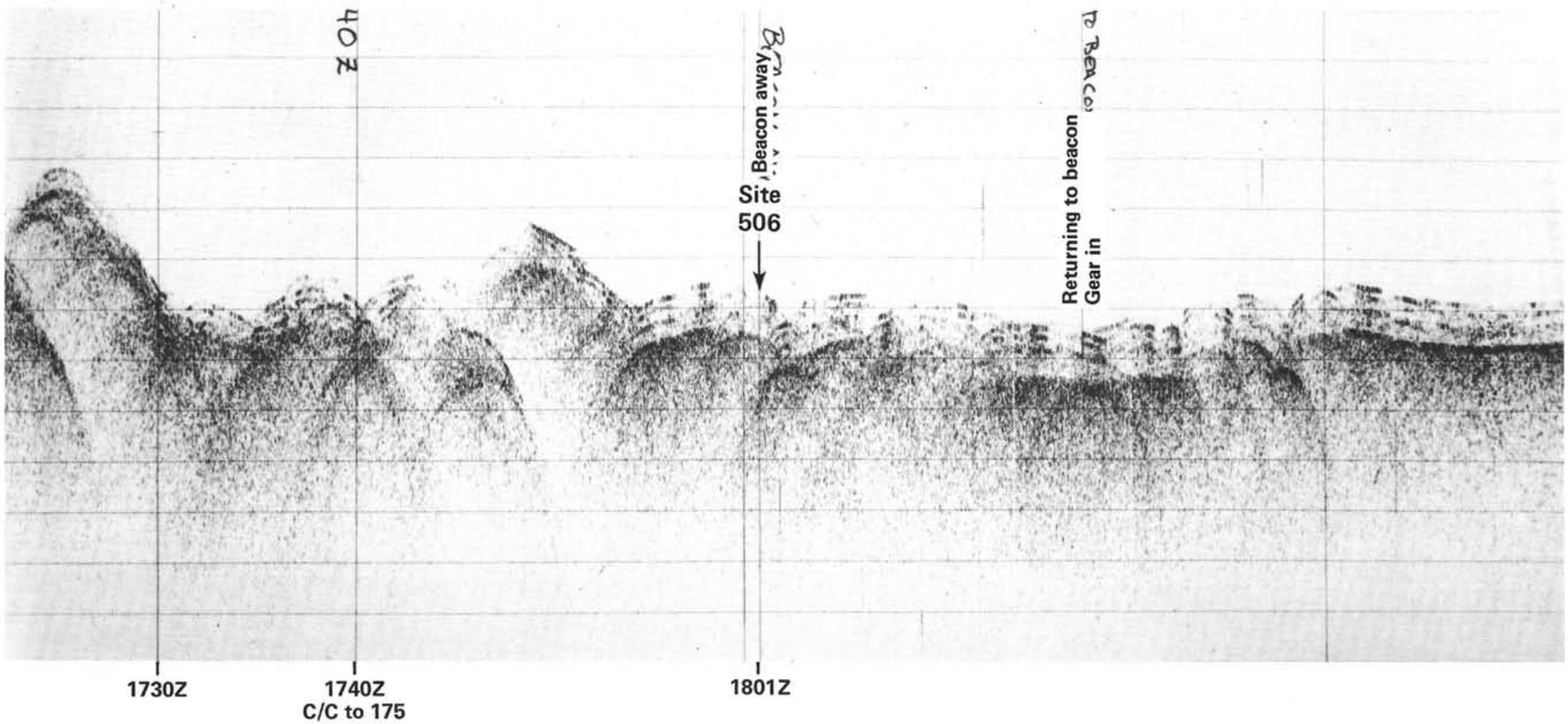


Figure 1. Approach to Site 506, as recorded on a 3.5-kHz echo-sounding system.

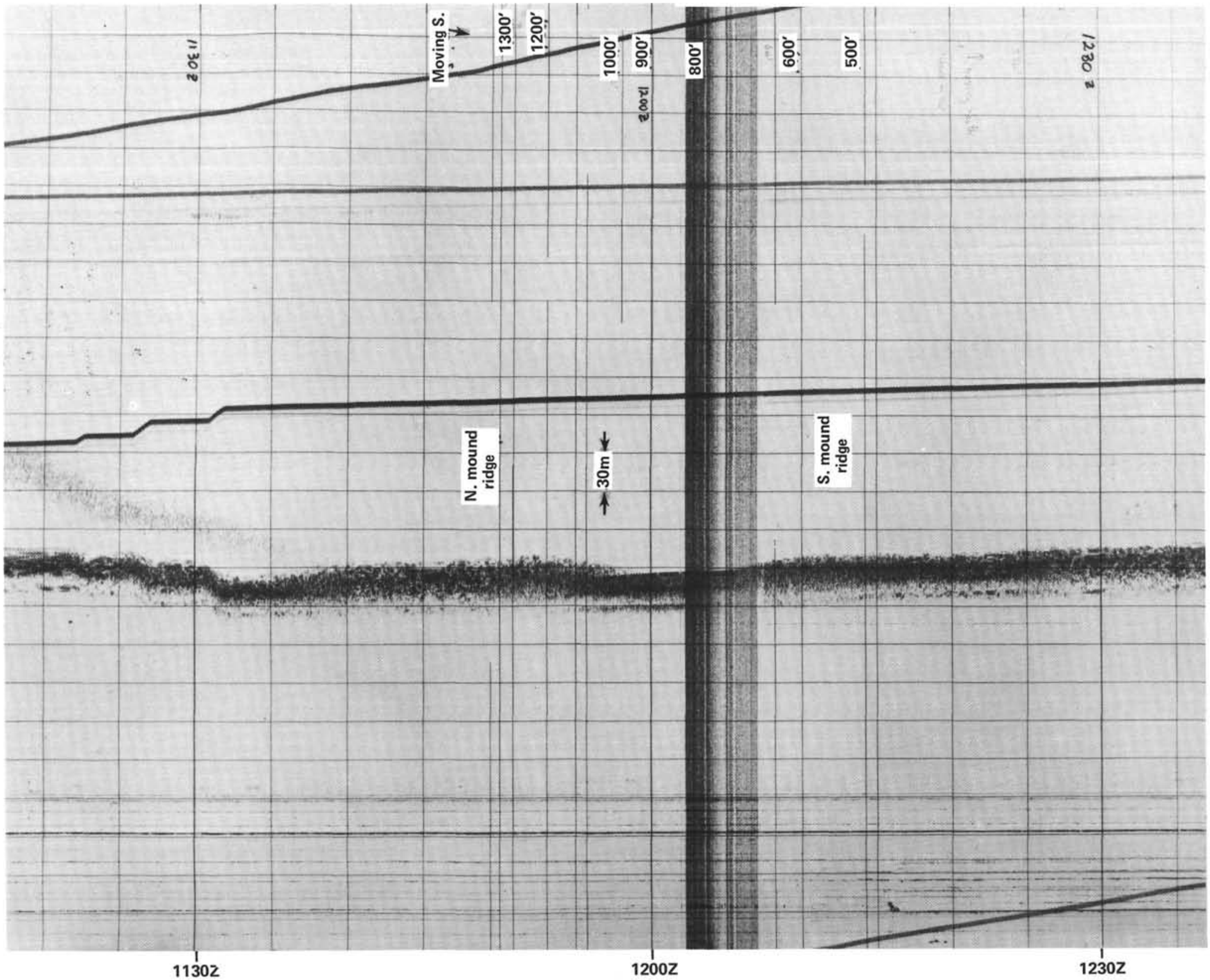


Figure 2. Record of portion of 12-kHz pinger survey, Site 506. (Thin dark band is outgoing pulse, broader band is reflected from bottom. Note decreased distance between these when passing over mounds ridge and lack of internal reflectors beneath them.)

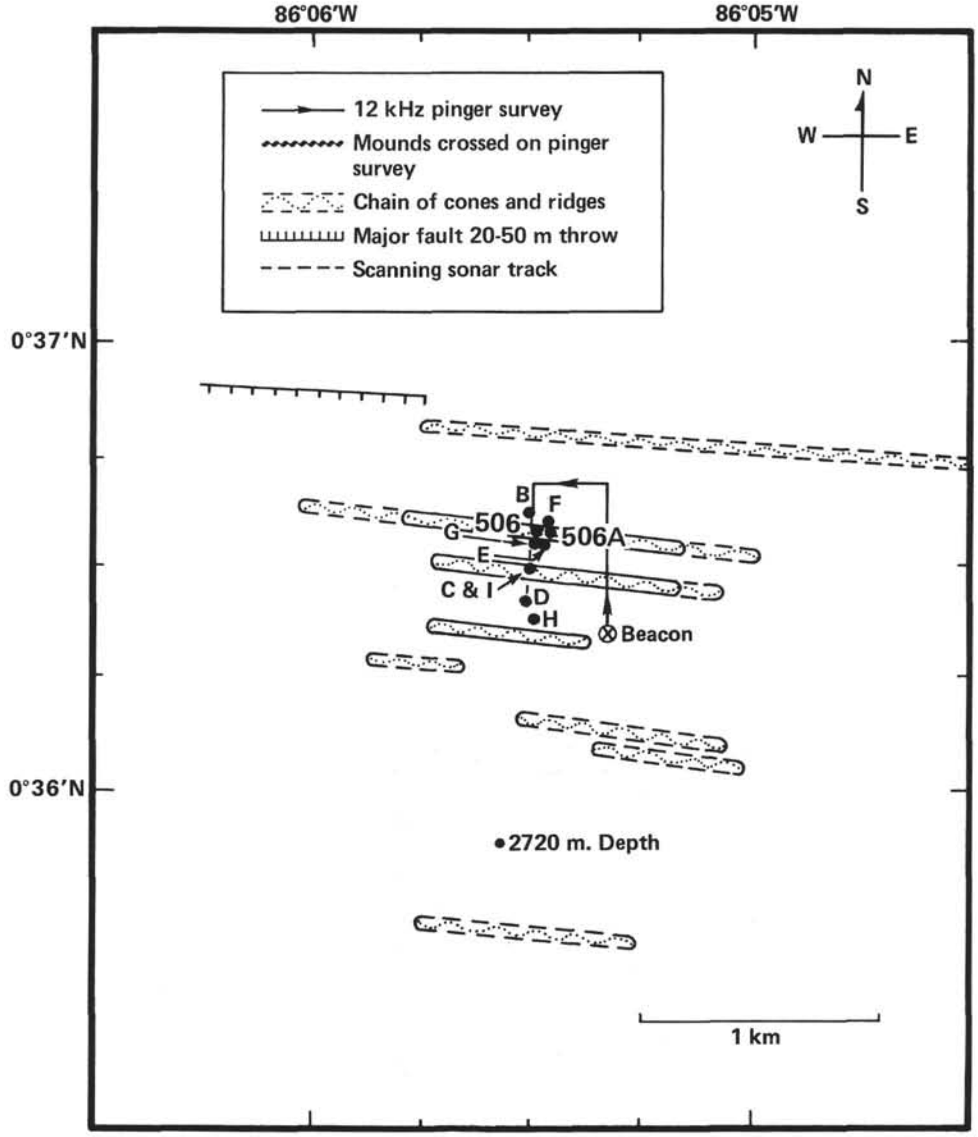


Figure 3. Detailed mound site survey, Site 506.

pipe and thereby missing the "mudline." Interestingly, the passage of the core barrel through the drill pipe below the pinger during coring, as well as the "pressuring-up" of seawater inside the drill string to fire the shear pin of the HPC, could also be seen on the precision depth recorder (PDR) (Fig. 6).

SEDIMENT LITHOLOGY AND STRATIGRAPHY

Sediments were recovered from four holes at Site 506. They are classified into two major lithologic types, which are interbedded within the sediment column and not confined to any particular depth interval. The major lithotypes are hydrothermal sediments and pelagic ooze.

Hydrothermal Sediments

The hydrothermal sediments are themselves divided into two types: (1) Mn-oxide fragments and (2) green clay.

The Mn-oxide fragments are angular and commonly elongate, 1 mm to 2 cm in diameter, and predominantly grayish black (N2) in color. This material occurs near the top in Holes 506 and 506C (Fig. 7). In these holes the material is very disturbed, and contacts with beds above and below are poorly defined.

Green clay, predominantly dark greenish gray (5G 4/1), occurs mainly in Holes 506 and 506C (Fig. 8), but a small amount (80 cm) is present in Hole 506D. The green clay generally occurs as loose granules up to 1 cm in diameter which can be crushed between the fingers, but locally it is a finer-grained, more compact sediment. This latter material commonly grades into pelagic ooze, but sharp contacts are also present. Although deposits classified as "green clay" contain at least 50% smectite, most occurrences of green clay are at least 90% smectite. Nonsmectite components include foraminifers, calcareous nannofossils, radiolarians, and diatoms. Foraminifers and radiolarians often show infillings and/or coatings of green clay or opaque material. A small amount of volcanic glass and "normal" pelagic brown clay may also be present.

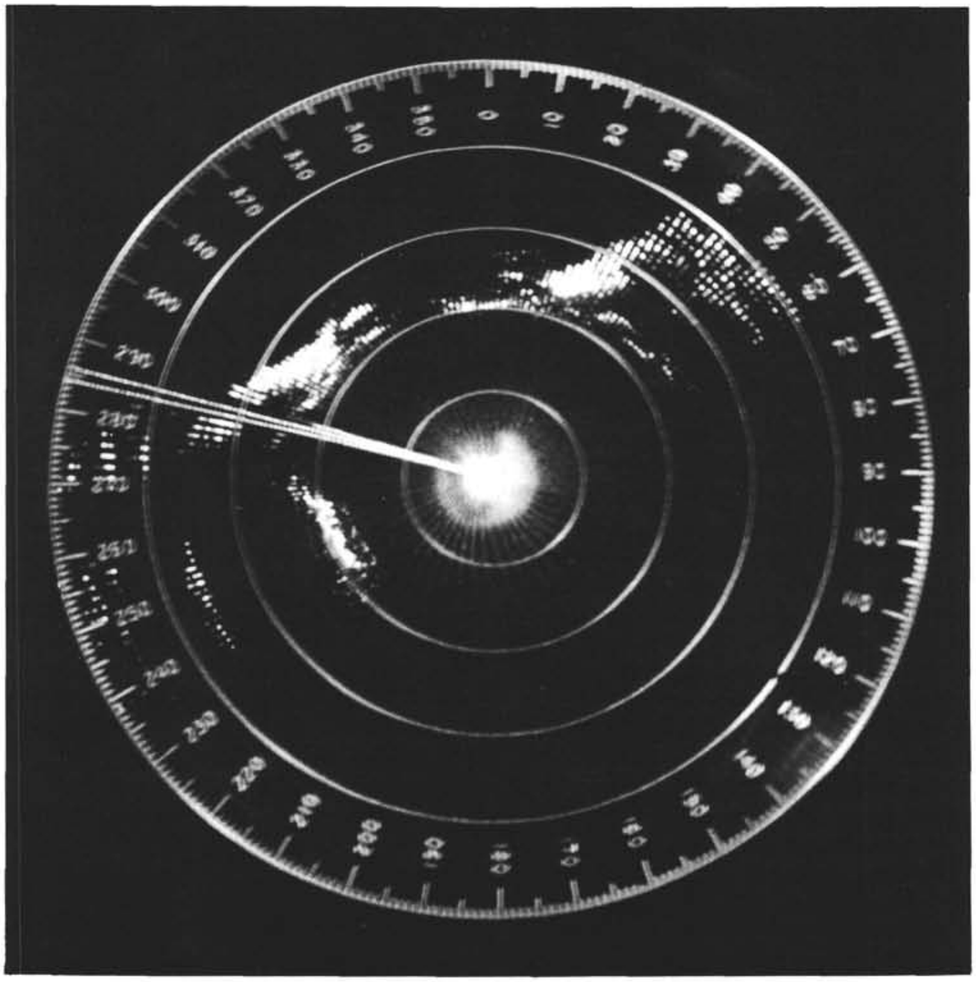


Figure 4. Scanning sonar view of mound ridges at Site 506. (Vessel located at 650 ft. N, 950 ft. W of beacon. View shows two parallel ridges separated by approximately 100 ft., with the lineated reflectors nearest 0° relative orientation being the southernmost. Scale 250 ft. from center to periphery of circle.)

Pelagic Ooze

This sediment is represented primarily by three types: (1) foraminifer nannofossil ooze, (2) siliceous foraminifer nannofossil ooze, and (3) brown pelagic ooze.

The foraminifer nannofossil ooze and the siliceous foraminifer nannofossil ooze occur in all holes from which sediment was recovered. Its dominant colors are light olive gray (5YG/1) and light greenish gray (5GY 8/1). The constituents of these oozes are, respectively: nannofossils 60–85%, foraminifers 5–25%, clays ~5%, diatoms 0–5%, radiolarians 0–5%; and nannofossils 40–70%, foraminifers 5–20%, clays ~5%, diatoms 10–20%, radiolarians 1–10%.

These pelagic units display mottling throughout all holes. This mottling may locally result from drilling disturbance, but the majority of mottles appear to be the result of burrowing in-fauna. Many Planolite-type burrows (e.g., Section 506B-1-1) and Zoophycus burrows (Fig. 9) are clearly visible.

The brown pelagic ooze forms the uppermost sediment in every hole, with a maximum thickness of 35 cm. Compositionally, it is a siliceous foraminifer nannofossil ooze. It is grayish brown (5YR 3/2), moderate brown (5YR 3/4), and/or brownish gray (5YR 4/1). It is soupy and disturbed by drilling. The brown color results from dispersed fine-grained particles of Mn and Fe oxides.

Hole 506

Hole 506 (Fig. 10) was drilled on a mound. In this hole, the brown pelagic ooze occurs twice; once at the top of Core 1 and again at the top of Core 2. Core 2 therefore appears to have resampled the uppermost sediment. This may be the result of the drill string's having left the hole after the first mudline core was taken and moved laterally. Therefore, the true stratigraphic sequence probably begins with Core 2. If so, then the uppermost sediments consist of 1.7 meters of siliceous foraminifer nannofossil ooze lying above 70 cm of Mn-oxide material. The contact is gradational between the siliceous foraminifer nannofossil ooze and Mn-oxide material. Beneath this layer, about 12.7 meters of interbedded green clays and foraminifer nannofossil oozes were recovered (this figure does not include Core 5, which had 0% recovery). Within this interbedded interval the total thickness of green clay is about 9.5 meters.

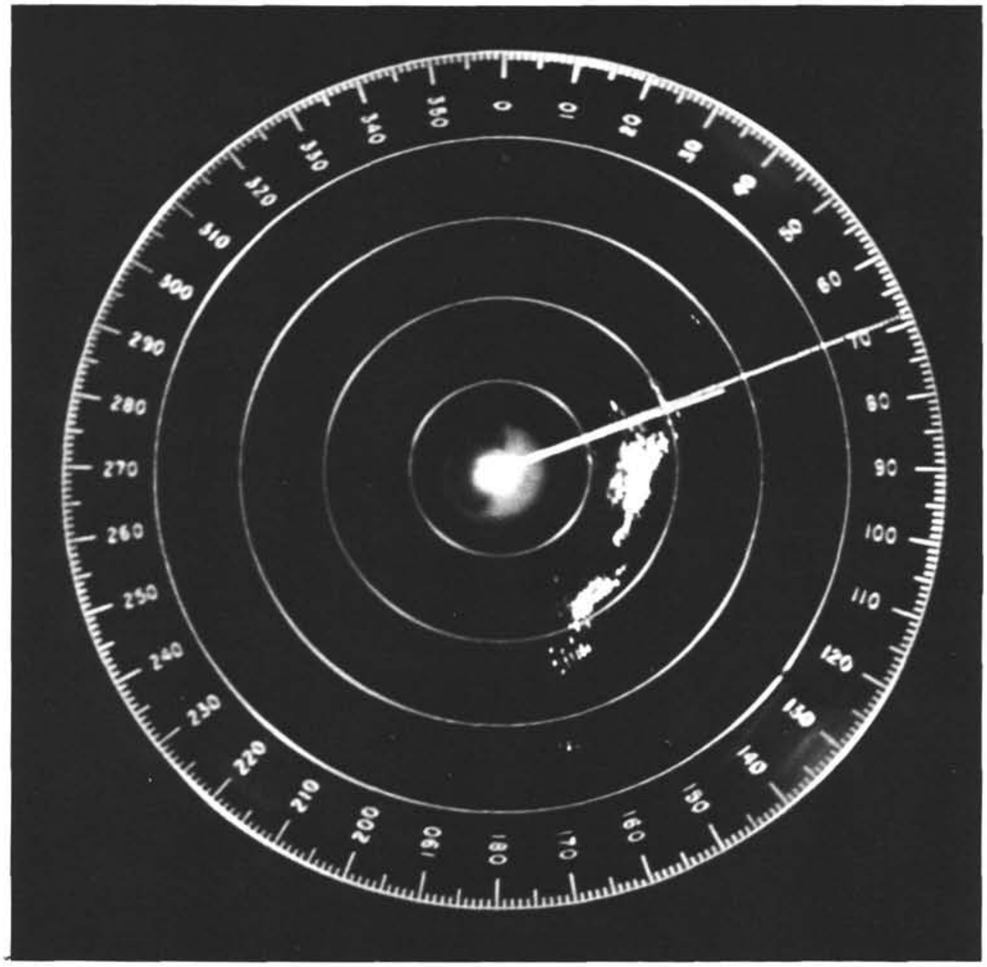


Figure 5. Scanning sonar view of mound ridge, Site 506. (Vessel located 1500 ft. N, 950 ft. W. Visible echoes represent lineated mounds ridge about 150 ft. south of scanner, toward 100° relative orientation. Scale 500 ft. from center to periphery of circle.)

The lowest green clay bed is underlain by about 8 meters of foraminifer nannofossil ooze.

In cores which contain granular green clay, the possibility cannot be excluded that the uppermost material was washed in from higher up in the hole. In some cases, slumped-in material at core tops can be clearly recognized because pelagic sediment lies above and below. For example, see the tops of Cores 7 and 8 (Fig. 10).

Hole 506B

Hole 506B (Fig. 10) was drilled off a mound. The sedimentary sequence in this hole consists of an upper section, about 11 meters thick, of siliceous foraminifer nannofossil ooze, and a lower section, approximately 9 meters thick, of foraminifer nannofossil ooze. There are no layers of hydrothermal material in this hole. Some areas of biogenic mottling occur within the sedimentary sequence. The mottles are similar in color to transitional material found between green clay and pelagic ooze, which contain variable amounts of green clay. A few small lumps (less than 2 cm in diameter) of Mn oxide occur in the middle parts of Cores 3 and 4.

Hole 506C

This hole was drilled on a mound. The upper 4 meters of sediment is a siliceous foraminifer nannofossil ooze. Below this is a 30-cm-thick moderately disturbed layer of brownish gray (5YR 4/1) to greenish gray (5GY 6/1) clay with variable amounts of intermixed pelagic ooze. This layer is transitional to the hydrothermal sediments below. The hydrothermal sediments consist of an uppermost layer of Mn-oxide fragments approximately 30-cm thick. Beneath this exists 12.5 meters of green clay with thin interbeds of foraminifer nannofossil ooze. The contacts between these interbeds are mostly gradational. The total thickness of the green clay is approximately 9 meters. Beneath the lowest layer of green clay is foraminifer nannofossil ooze which is continuous to the base of the hole. Basalt glass shards occur in the lower part of Core 7 and in the core catcher. Although the top half of Core 8, Section 1 is probably material washed in from higher in the hole, the lower 70 cm appear to be *in situ* sediment with a high component of granular green clay. The remainder of Core 8 consists of soupy foraminifer nannofossil ooze.

Table 1. Coring summary, Site 506.

Core	Date	Time	Depth from Drill Floor (m) Top Bottom	Depth below Seafloor (m) Top Bottom	Length Cored (m)	Length Recovered (m)	Recovered (%)
Hole 506							
1	11/15/79	0621	2713.7-2715.2	0.0-1.5	1.50	1.34	89
2	11/15/79	0729	2715.2-2719.6	1.5-5.9	4.40	2.95	67
3	11/15/79	0830	2719.6-2724.0	5.9-10.3	4.40	4.38	99
4	11/15/79	0922	2724.0-2728.4	10.3-14.7	4.40	4.28	97
5	11/15/79	1018	2728.4-2732.8	14.7-19.1	4.4	TR	0
6	11/15/79	1121	2732.8-2737.2	19.1-23.5	4.4	3.81	87
7	11/15/79	1417	2737.2-2741.6	23.5-27.9	4.4	4.31	98
8	11/15/79	1521	2741.6-2746.0	27.9-32.3	4.4	1.5	34
9	11/15/79	1847	2746.0-2750.4	32.3-36.7	4.4	TR	0
Total:					36.7	22.57	
Hole 506B							
1	11/16/79	0020	2721.6-2723.1	0.0-1.5	1.5	1.45	97
2	11/16/79	0131	2723.1-2727.5	1.5-5.9	4.4	4.63	100
3	11/16/79	0233	2727.5-2731.9	5.9-10.3	4.4	4.53	100
4	11/16/79	0338	2731.9-2736.3	10.3-14.7	4.4	4.49	100
5	11/16/79	0448	2736.3-2739.8	14.7-18.2	3.5	3.12	89
6	11/16/79	0558	2739.8-2742.3	18.2-20.7	2.5	2.27	91
Total:					20.7	20.49	
Hole 506C							
1	11/16/79	1045	2716.9-2720.4	0.0-3.5	3.50	3.51	100
2	11/16/79	1243	2720.4-2724.8	3.5-7.9	4.4	3.80	86
3	11/16/79	1339	2724.8-2729.2	7.9-12.3	4.4	4.34	99
4	11/16/79	1446	2729.2-2733.6	12.3-16.7	4.4	3.77	86
5	11/16/79	1541	2733.6-2738.0	16.7-21.1	4.4	4.53	100
6	11/16/79	1642	2738.0-2742.4	21.1-25.5	4.4	4.48	100
7	11/16/79	1740	2742.4-2744.9	25.5-28.0	2.5	2.02	81
8	11/16/79	1838	2744.9-2748.2	28.0-31.3	3.3	3.3	100
Total:					31.3	29.75	
Hole 506D							
1	11/16/79	2111	2716.9-2719.4	0.0-2.5	2.50	2.22	89
2	11/16/79	2207	2719.4-2723.8	2.5-6.9	4.4	4.52	100
3	11/16/79	2302	2723.8-2728.2	6.9-11.3	4.4	3.24	74
4	11/16/79	2359	2728.2-2732.6	11.3-15.7	4.4	4.52	100
5	11/17/69	0048	2732.6-2737.0	15.7-20.1	4.4	4.26	97
6	11/17/69	0155	2737.0-2741.4	20.1-24.5	4.4	4.46	100
7	11/17/69	0311	2741.4-2745.8	24.5-28.9	4.4	3.59	82
8	11/17/69	0527	2745.8-2747.8	28.9-30.9	2.0	1.67	84
9	11/17/69	0831	2747.8-2748.8	30.9-31.9	1.0	0.77	77
Total:					31.9	29.25	
Hole 506G							
1	11/18/79	1415	2741.0-2743.0	27.5-29.5	2.0	0.30	15
2	11/18/79	1846	2743.0-2746.0	29.5-32.5	3.0	0.75	25
					5.0	1.05	
Hole 506H							
1	11/19/79	0008	2743.0-2751.0	26.1-34.4	8.3	0.17	2.05
Hole 506I							
1	11/19/79	0700	2743.0-2746.5	26.1-29.6	3.50	0.20	5.71

Hole 506D

Hole 506D was drilled off a mound. The sedimentary sequence consists entirely of pelagic ooze, with the exception of an 85-cm thick layer of green clay located about 6 meters below the mudline. The uppermost 12 meters consist of siliceous foraminifer nannofossil ooze, the sediment below being a foraminifer nannofossil ooze.

Discussion

Holes 506 and 506C were drilled specifically on hydrothermal mounds as identified by the character of the 12-kHz pinger records. Holes 506B and 506D were drilled a short distance from the mounds. The presence of a cap of approximately 1.5 meters and 4.0 meters of biogenic ooze overlying hydrothermal sediments in Holes 506 and 506C, respectively, may indicate that hydrothermal sedimentary processes are inactive, at least on the surface. Alternatively, it is very possible that we did not drill directly on the center of the mounds, where hydrothermal activity is present.

No direct correlation of individual hydrothermal layers can be made between the two mounds holes. However, the total thickness of hydrothermal sediments is very similar at both mounds, and the base of the interbedded and mixed hydrothermal sediments and pelagic oozes lies at similar distances above the basement in both holes (~10 and 14 m respectively).

In the holes drilled immediately adjacent to mounds very little or no hydrothermal sediments are present. This indicates that the lateral continuity of the hydrothermal material is restricted to the mounds and does not blanket a large area as has been previously suggested (Natland et al., 1979).

The presence of pelagic oozes interbedded with hydrothermal sediments indicates that hydrothermal activity is episodic and/or that the formation of hydrothermal sediments takes place within the mounds. Poorly preserved fossils, many of which have nontronitic overgrowths and others that are partially dissolved and/or replaced, along with gradational contacts and transitional zones in which fossils are depleted or absent, support the latter idea.

The volume of pelagic oozes on and off the mounds offers an interesting problem. The total thickness of pelagic oozes on the mounds is significantly less than in the off-mounds areas. Assuming that pelagic sedimentation rates are the same on the mounds and on off-mounds areas, then either (1) hydrothermal activity is dissolving and/or replacing pelagic ooze, or (2) the pelagic oozes which accumulate on the tops of the mounds are slumping off onto the flanks of the mounds or in the areas between mounds.

BIOSTRATIGRAPHY

Calcareous nannofossils and planktonic foraminifers were examined from 26 samples recovered from pelagic sediments at Site 506. Planktonic foraminifers and calcareous nannofossils are the most abundant taxa and therefore will be used as the primary means of age determination at this site, as well as succeeding sites. The biostratigraphic zonation of planktonic foraminifers follows the scheme of Kaneps (1973). The calcareous nannofossil biostratigraphy follows Gartner's (1977) zonation. Only the calcareous nannofossils could be utilized for establishing the late Pleistocene age (*Gephyrocapsa oceanica* Zone, 0.44 to 0.27 million years) of the pelagic oozes in contact with underlying basalts. It is difficult to positively identify the calcareous nannofossils which serve as zonal markers because of their small size. All age assignments should be considered tentative until a more detailed examination of the nannofossils can be conducted using an electron microscope. Data from planktonic foraminifers support the Pleistocene age of the sediments, but no zones defined by this microfossil group could be recognized.

Radiolarians and diatoms are the principal siliceous biogenic components of the pelagic oozes. Silicoflagellates are rare in all samples.

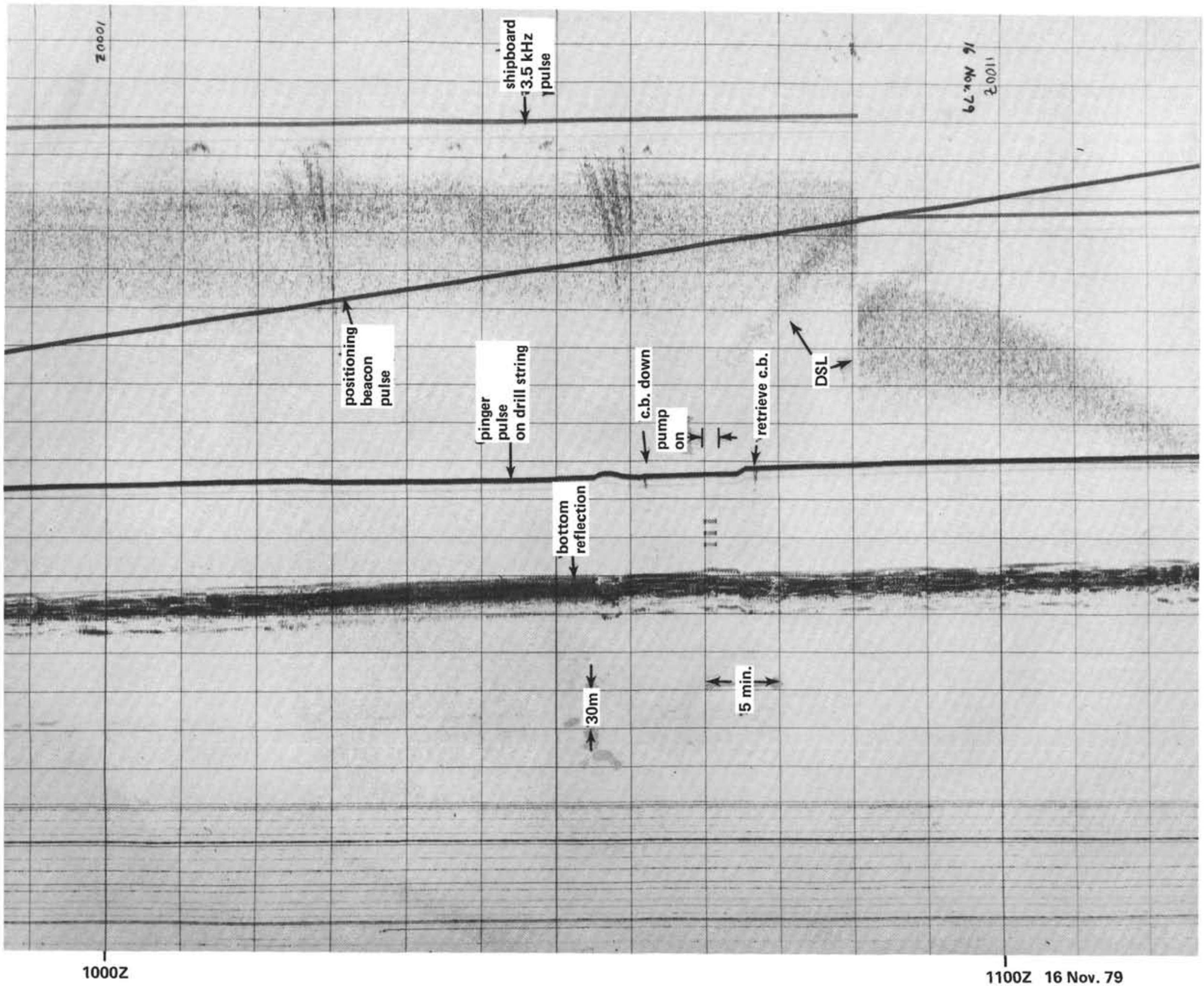


Figure 6. 12-kHz drill-string pinger record during lowering of hydraulic piston coring barrel.

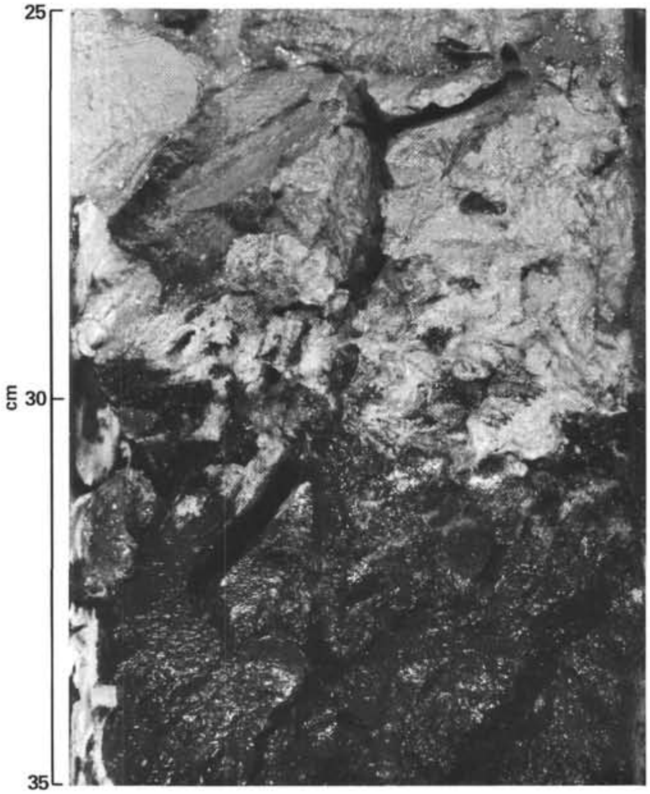


Figure 7. Mn-oxide fragments, Sample 506C-2-1, 25–35 cm.

Calcareous Nannofossils

Nannofossils are moderately to well preserved. The most frequently occurring species are *Gephyrocapsa oceanica*, small *G.* spp., *Helicopontosphaera kamptneri*, and *Cyclococcolithina leptopora*. These four species make up at least 75% of the nannofossil assemblage. Rarely occurring species include *Ceratolithus cristatus* and various reworked discoasters.

Planktonic Foraminifers

Planktonic foraminifers are common to abundant in all samples examined. Tests are moderately to well preserved, but a few show evidence of overgrowth. *Globoquadrina dutertrei* and *Globigerina bulloides* dominate the foraminiferal assemblages. *Globigerinoides sacculifer, G. ruber, Orbulina universa, Globorotalia menardii, G. scitula, G. tumida*, and *Pulleniatina obliquiloculata* are generally common. Rarely occurring species include *Globigerinella aequilateralis* and *Sphaeroidinella dehiscens. Globorotalia truncatulinoides* was not found in any of the samples.

X-RAY DIFFRACTION ANALYSIS

Shipboard X-ray diffraction analysis was carried out on the D/V *Glomar Challenger* for the first time during Leg 70. The X-ray diffraction unit is a Rigaku machine with a Cu tube which produces CuKα radiation at 30 kV, 10 mA.

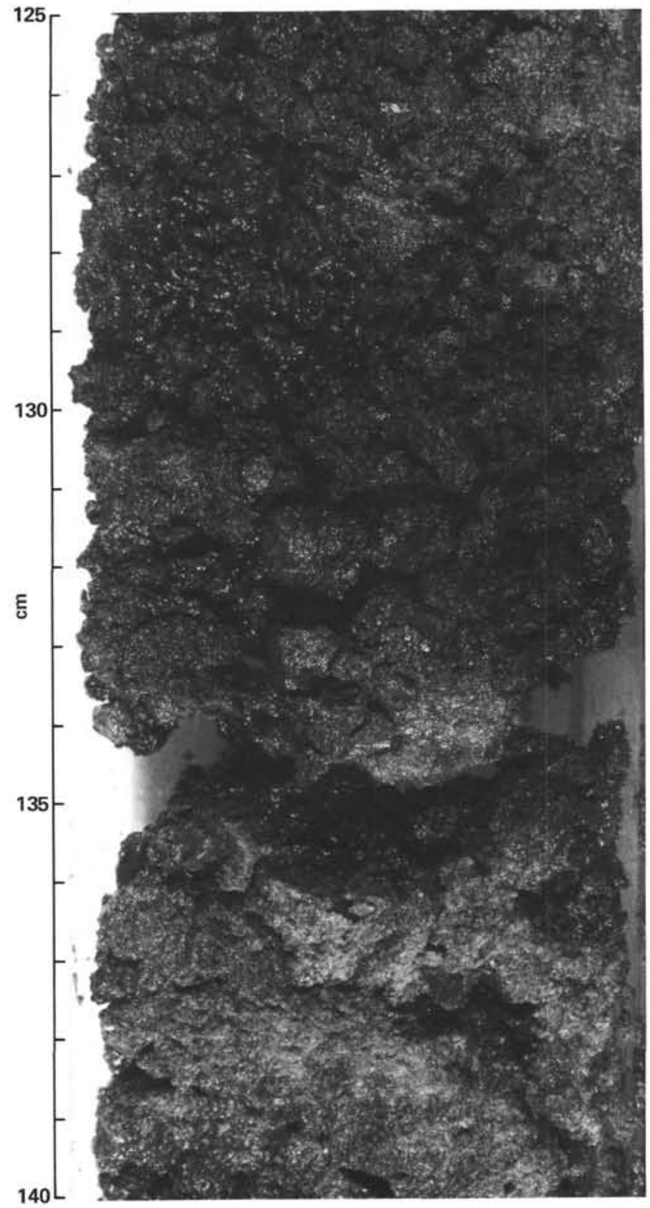


Figure 8. Granular green clay, Sample 506C-2-2, 125–140 cm.

ANALYTICAL METHODS

The best and most consistent results were obtained by using smear-mounted samples containing a small amount of KCl as an internal standard. The smear mounts were prepared by making a suspension of the material in acetone or distilled H_2O and applying the sample to the slide. The slides were then air dried. A correction factor to calculate 2θ degree angles was determined by comparing accepted peak values for the internal standard to those peaks observed in the smear mounts.

Results

The results presented in Table 2, at least those pertaining to the clay minerals, are only tentative because ethylene glycol was not available, and we did not have time to try Mg saturation techniques on the samples. We were able to run a nontronite standard (locality unknown), which was used as a comparison to our sam-

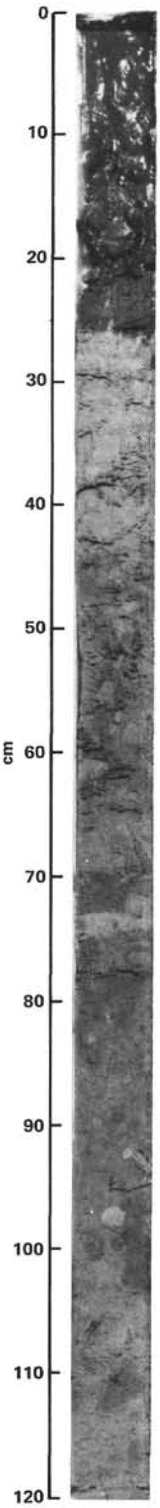


Figure 9. Many Planolite-type burrows and Zoophycus burrows are clearly visible (Section 506B-1-1).

ples. We also had access to the unpublished data of several Leg 54 participants and co-workers (Hoffert et al., 1980; Rateev et al., 1980; Schrader et al., 1980), dealing with the mineralogy of the mounds sediments. Identification was also based on the reference data given by Carroll (1970), Chen (1977), and Burns and Burns (1977).

One sample of Mn-oxide crust and seven samples of the green clay were run. By comparing these diffractograms with that for the nontronite standard and with the literature, we tentatively identified nontronite as being the major mineral present in all the clay samples. It was also present in the Mn-oxide sample. The main mineral in the Mn-oxide sample is todorokite. The sample from Section 506-3-1 displayed a peak at 10.2–9.8 Å, which could correspond to either todorokite or a mica, such as glauconite or celadonite. Treatment of the sample with a 25% solution of hydroxylamine hydrochloride, however, resulted in the disappearance of this peak. Fecal pellets were found in the green clay, and it is therefore possible that some glauconite may occur in these clays even though none was positively identified in the samples we analyzed. It was therefore tentatively identified as resulting from the presence of todorokite. One sample of pelagic ooze mixed with green clay was analyzed: Sample 506C-5-1, 34–35 cm. All four major calcite peaks were identified together with a low intensity peak at 11.3 Å assigned to nontronite.

SEDIMENTATION RATES

Table 3 summarizes estimates of sedimentation and accumulation rates for the holes cored at Site 506. The off-mounds sites show fairly uniform sedimentation and accumulation rates and are in general agreement with the region's sedimentation rates.

The sedimentation (cm/10^3 y.) and accumulation rates (g/cm^2/10^3 y.) for the mounds holes are slightly higher than those of off-mounds holes. It should be emphasized that the sedimentation and accumulation rates may be valid only for the off-mounds holes because of dissolution related to hydrothermal activity.

It is possible that during the formation of hydrothermal sediments, pelagic sediments are replaced and eventually dissolved. For example, Hole 506, on a mound, had approximately 11 meters of recovered pelagic ooze. Its neighbor, Hole 506B, an off-mounds site drilled on a relatively flat seafloor, has 20.5 meters of recovered pelagic ooze. Hence, as much as 9.5 meters of pelagic sediment may be missing from the mounds site.

SEISMIC STRATIGRAPHY

The seismic evidence bearing on a stratigraphy at this site is of several types. Because of thin sediment thickness (approximately 30 m) only relatively high-frequency seismic signals (3.5 and 12 kHz) were useful in delineating the structural details in the sediments columns. While at the site, 5-in.^{3} air-gun reflection profiles were attempted over a portion of the region, but the resolution was insufficient to provide useful detail.

One of the most useful shipboard survey techniques at this site was the 3.5-kHz echo-sounding system. During the approach to and on the site, several reflectors

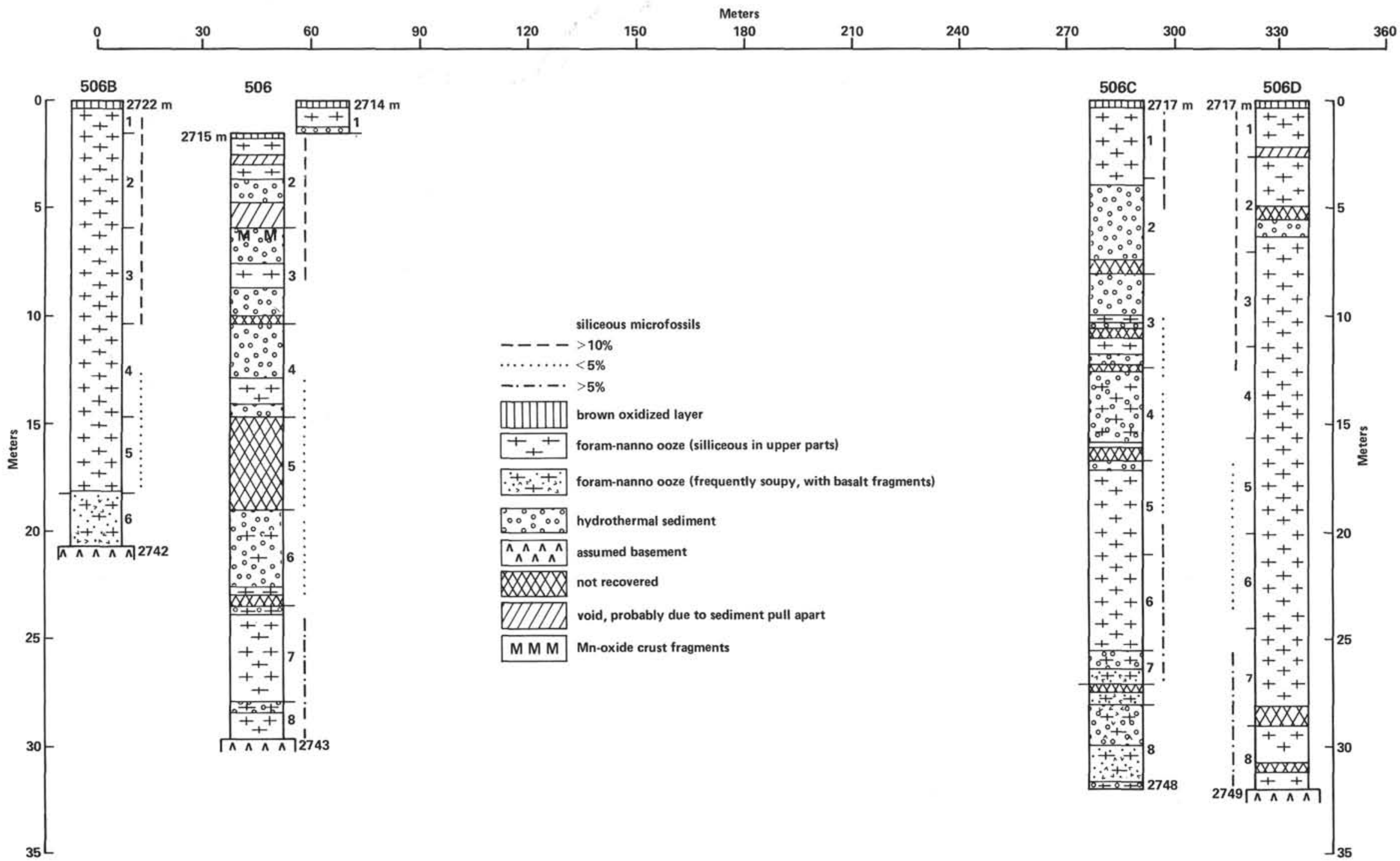


Figure 10. Lithostratigraphy, Site 506.

Table 2. X-ray diffraction analysis, Site 506.

Sample (interval in cm)	Mineral	Major Peak (uncorr.)		Major Peak (corr.)	
		2θ	d(Å)	2θ	d(Å)
Smear Slides					
Mn-oxides					
506-1-1, 145–147	Nontronite	7.8	11.3	8.1	10.915
	Todorokite	8.8	10.0	9.1	9.72
506-1-1, 145–147	Nontronite	7.8	11.3	8.1	10.9
	Todorokite	8.75	10.1	9.05	9.77
	Todorokite	7.9	4.95	18.2	4.87
506-1-1, 145–147	Nontronite	7.7	11.48	8.0	10.05
	Todorokite	8.75	10.105	9.05	9.77
	Todorokite	18.15	4.89	18.45	4.80
	Todorokite	37.0	2.43	37.3	2.41
Green Clay					
506-2-2, 73–74	Nontronite	7.70	11.48	7.73	11.436
		5.25	16.8	5.55	15.9
506-2,CC (10–11)	Nontronite	7.80	11.33	7.83	11.29
	Nontronite	19.4	4.575	19.7	4.506
	Nontronite	34.5	2.60	34.8	2.58
506-3-1, 24–25	Nontronite	7.6	11.6	7.9	11.20
(dark)	Nontronite	7.9	11.2	8.2	10.8
	Glauconite or Todorokite and/or Celadonite	8.7	10.2	9.0	9.8
506-3-1, 24–25 (light)	Nontronite	7.7	11.48	8.0	11.1
506-6-1, 96–97	Nontronite	7.55	11.708	7.85	11.26
		6.35	13.9	6.55	13.6
506-6-2, 60–61	Nontronite	7.8	11.3	8.1	10.9
		6.3	14.0	6.6	13.4
		4.4	20.1	4.7	18.8
506C-2-2, 14	Nontronite	7.65	11.56	7.95	11.12
	Nontronite	7.9	11.12	8.2	10.78
		25.25	3.53	25.55	3.49
Pelagic Ooze					
506C-5-1, 34–35	Nontronite	7.6	11.6	7.9	11.20
	Calcite	23.35	3.80	23.65	3.76
Cavity Runs					
506-1-1, 145–145	Nontronite	7.8	11.3	8.0	11.1
	Todorokite	8.85	10.0	9.05	9.77
	Todorokite	18.2	4.87	18.4	4.82
	Todorokite	37.3	2.41	37.5	2.40
506-2,CC (10–11)	Nontronite?	6.5	13.6		
	Nontronite?	7.8	11.3		
		19.4	4.58		
Pelagic Ooze					
506C-5-1, 34–35	Nontronite?	7.8	11.3		
	Calcite	22.9	3.88		
	Calcite	29.3	3.05		
		31.6	2.83		
	Calcite	35.8	2.51		
	Calcite	39.3	2.29		
Standards					
Nontronite Std. (smear)		5.4	16.4	5.7	15.5
		7.6	11.6	7.9	11.2
		7.85	11.3	8.05	11.05
		5.3	16.7	5.6	15.8
		5.6	15.8	5.9	15.0
		7.5	11.8	7.8	11.3
		19.2	4.62	19.5	4.15
Nontronite Cavity					
		6.2	14.3	6.5	13.6
Std.		6.7	13.2	7.0	12.6
		7.8	11.3	8.1	10.9

Note: Correction factor = 0.3; based on KCl internal standard.

Table 3. Sedimentation rates, Site 506.

Hole	S^a	Sedimentation Rate (cm/10^3 y.)		P^b (%)	Sediment Accumulation Rate (cm/10^3 y.)		Average Grain Density (g/cm^3)	Accumulation Rate (g/cm^2/10^3 y.)	
		A	B		A	B		A	B
506	37	8.4	6.85	0.80	1.68	1.37	2.67	4.49	3.66
(mound)		13.7			2.74			7.32	
506B	22	5.0	4.07	0.81	0.95	0.774	2.65	2.51	2.06
(off-mound)		8.15			1.54			4.08	
506C	28	6.36	5.18	0.80	1.27	1.04	2.77	3.37	2.76
(mound)		6.13			2.00			5.3	
506D	32	7.27	5.93	0.85	1.09	0.89	2.65	2.89	2.35
(off-mound)		11.85			1.77			4.69	

Note: Sedimentation accumulation rate = $[(1 - P) \times$ sediment thickness$/t]$, where t = time. Accumulation rate = sedimentation accumulation rates × average grain density. Columns lettered "A" show minimum and maximum values based on paleontological evidence. Paleontological evidence estimates the age at the bottom of each hole to be 270–440 × 10^3 y. Columns lettered "B" are values based on spreading rates taken from Klitgord and Mudie (1974). Spreading rate estimates assign an age of approximately 540 × 10^3 y. for the ocean crust in the area.
[a] S = Sediment thickness (recorded drilling thickness).
[b] P = Porosity (fractional void space) = (void space)/(total volume); values are averages taken from the Physical Properties section.

were easily seen within the sediment and as the strong reverberant reflection from the top of the basalt (Fig. 1). Two prominent reflectors are usually seen within the sediment column over most of the region, presumably corresponding to those identified by Lonsdale (1977) from a deeply towed instrument. Based on mean sedimentation rates of about 5 cm/10^3 y., the upper reflector was tentatively given an age of about 140 thousand years and the lower about 300 thousand years by Lonsdale. It was suggested that these uniformly draping layers may result from ash falls and therefore represent time horizons.

In the 3.5-kHz records of the surface ship, it is seen that the reflecting layers in the sediments are less coherent and less continuous than in deep-tow records. Most likely this is principally the result of irregular topography on a small scale, as seen from a surface ship, causing alternating reinforcement and cancellation of acoustic reflected energy over short distances. This effect can be seen even while the *Glomar Challenger* is on site (Fig. 11), caused by the small oscillations of the dynamically positioned vessel over the desired location; in this case, even the strongly reflecting basement surface appears incoherent.

Another possible source of reflector incoherence is the mounds themselves. Lonsdale (1977) has already noted that the reflecting layers of the sediment are frequently attenuated or obliterated beneath the mounds. A particularly useful device for locating mounds at this site was a pinger attached to the drill pipe about 100 meters above the bit. The 2 millisecond pulse at 12 kHz, as reflected from the seafloor sediments and recorded on the ship's echo sounder, showed this detailed disposition of internal sediment reflectors and the characteristic change of signal character across a mound (Fig. 2). In addition to the shoaling of water depth in most cases, the internal reflectors are observed to disappear on crossing a mound, and the surface reflection becomes significantly less distinct. The latter probably occurs because the irregular surfaces of mounds scatter reflection.

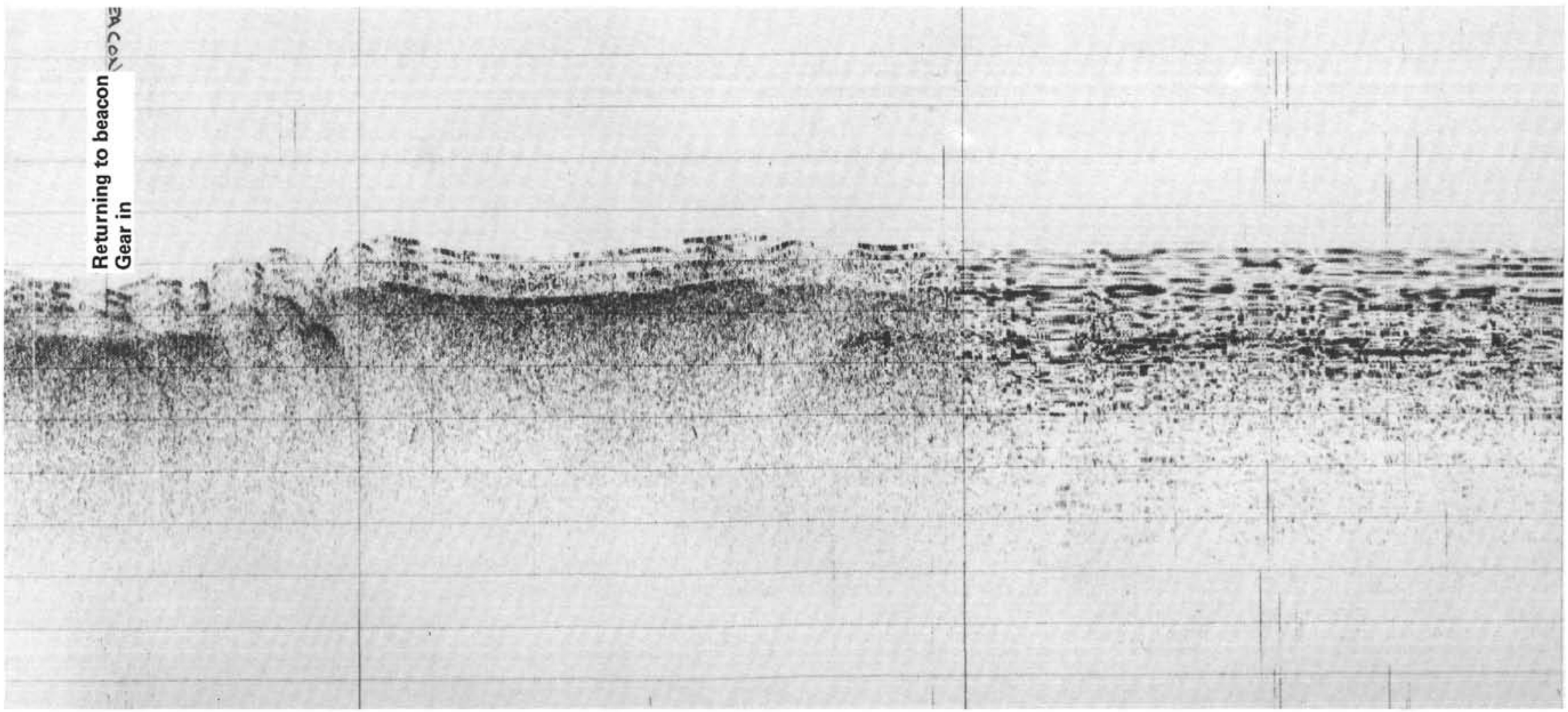


Figure 11. Seismic profile of irregular topography on a small scale causing alternating reinforcement and cancellation of acoustic reflected energy over short distances.

The source of the acoustic impedance contrasts which must be responsible for the reflecting layers in the sediments is uncertain. Indeed, the pelagic sections cored on Holes 506B and 506D appear to show relatively uniform physical properties with depth, and no ash layers were identified. The possibility that at least one reflector results from an impedance contrast between pelagic and hydrothermal sediments, as suggested by Natland et al. (1979) based on Leg 54 results, seems remote, since significant sections of hydrothermal sediments were not found at the pelagic sites. Furthermore, the contrast in impedance between pelagic and hydrothermal clays is not particularly large (see Physical Properties section), as had been suggested by Natland et al. as the cause of reflections. Therefore, we lack a reasonable explanation for the observed sediment reflectors.

PORE-WATER GEOCHEMISTRY

A new procedure was used for sampling sediment pore water on Leg 70: 10- to 11-cm whole core sections were cut and stored at 7°C or 22°C for estimated *in situ* temperatures less than or greater than 12°C, respectively. Within 1 to 24 hours (generally about 6 hours), the samples were subcored and extruded into 150 cm^3 centrifuge tubes after 1-cm slices had been cut from the top and bottom of the core sections. To slow down the rate of oxidation, N_2 was blown into the volume between the sediment and the top of the centrifuge tube, and the samples, in groups of four, were sealed in N_2-filled plastic bags. These bags were placed in water-filled Tupperware containers thermostated at the estimated *in situ* temperature to $\pm 2°C$ by periodically adding ice. The samples were equilibrated for about two hours. They were then centrifuged at 8500 rpm for 10 minutes in a Sorvall RC5B refrigerated superspeed centrifuge. The centrifuging temperature was kept 3°C below the estimated *in situ* temperature to compensate for frictional heating. Water samples were drawn from the centrifuge tubes into Plastipak syringes and filtered through 25-mm, 0.4-μm acid washed Nuclepore filters into various glass and plastic bottles.

Some core sections were sampled differently to separate pore waters for noble gas analysis. Core samples were subcored in the usual way except that the subcore was taken adjacent to the core liner. A Cu tube was then pushed through the sediment adjacent to the subcore; before the tube was inserted it was filled part way with deionized water to prevent inclusion of air in the sample. There was always 1 cm of sediment between the area where the Cu tube was pushed in and the core liner (this space serves to insulate the gas sample against diffusive exchange of He between pore waters and the atmosphere). After sampling, the tube was clamped to seal off a volume of sediment.

Pore-water samples were analyzed for Ca, Mg, chlorinity, and salinity using the normal shipboard techniques. NH_3 and SiO_2 were measured using standard colorimetric methods and a Beckman DU-2 spectrophotometer.

The results (Tables 4–6) are plotted in Figure 12. There are a number of intriguing features which turn out to be

Table 4. Pore-water data, Holes 506, 506B, 506C, 506D.

Core-Section	ISPW No.	Sub-bottom Depth (m)	SiO_2 (μM)	NH_3 (μM)	S^{2-} (μM)	Ca^{2+} (mM)	Mg^{2+} (mM)	Cl (‰)
Hole 506								
1-1	1	0.70–0.80	450	5	n.d.			
2-1	2	2.59–2.69	560	16	n.d.	10.30	53.37	18.83
3-2	3	8.30–8.40	410	5	n.d.	11.72	51.94	18.93
4-2	4	13.20–13.30	370	7	n.d.			
4-3	5	14.00–14.10	380	5	n.d.	11.56	51.70	18.51
6-1	6	20.25–20.35	350		n.d.	11.14	48.50	17.90
7-1	7	24.90–25.00	460		n.d.			
7-2	8	26.40–26.50	440		n.d.	11.14	51.48	18.12
7-3	9	27.74–27.84	450		n.d.	10.51	51.76	18.44
Hole 506B								
1-1	10	1.19–1.29	600	45	n.d.	11.49		18.28
2-1	11	2.90–3.00	540	22	n.d.			
2-2	12	4.40–4.50	510	20	n.d.	11.64	50.45	18.25
2-3	13	5.90–6.00	400		n.d.	11.26	51.12	18.00
3-1	14	7.30–7.40	440	15	n.d.			
3-2	19	8.80–8.90	470		n.d.	11.18	51.79	18.19
3-3	15	10.19–10.29	400	11	n.d.			
4-1	16	11.70–11.80	410		n.d.			
4-2	20	13.20–13.30	390		n.d.			
4-3	21	14.57–14.67	390	6	n.d.	11.58		
5-1	22	15.80–15.90	390		n.d.			
5-2	23	17.60–17.70	420	16	n.d.	11.47	51.61	17.48
Hole 506C								
1-1	24	1.40–1.50	570		n.d.	10.55		18.93
1-2	25	2.90–3.00	540		n.d.	10.95	51.43	18.89
3-1	26	9.30–9.40			n.d.			
3-2	27	10.80–10.90	230		n.d.	10.95	53.24	18.54
3-3	28	12.03–12.13	93		n.d.	11.58		
4-1	29	13.70–13.80	97		n.d.	11.83		
4-2	30	15.20–15.30			n.d.			
4-3	31	15.67–15.77	210		n.d.	12.29	51.14	18.61
5-1	32	18.10–18.20	530		n.d.	11.32		
5-2	33	19.60–19.70	540		n.d.	11.37	51.60	18.25
5-3	34	20.99–21.09	520		n.d.			
6-1	35	22.50–22.60	520		n.d.	11.41	51.91	18.67
6-2	36	24.00–24.10	530		n.d.			
6-3	37	25.32–25.42	490		n.d.	11.49	51.47	18.28
Hole 506D								
1-1	38	1.40–1.50	600		n.d.	10.55	52.88	19.02
2-2	39	4.95–5.05	490		n.d.	11.85	51.82	19.21
2-3	40	6.82–6.92	215		n.d.	11.37		
3-1	41	8.30–8.40	610		n.d.	11.64		
3-2	42	9.80–9.90	560		n.d.			
3-3	43	10.94–11.04	540		n.d.	11.58	51.45	18.64
4-1	44	12.70–12.80	500		n.d.			
4-2	45	14.20–14.30	480		n.d.	11.51	52.27	18.67
4-3	46	15.62–15.72	410		n.d.	11.52		
5-1	47	17.10–17.20	460		n.d.			
5-2	48	18.60–18.70	520		n.d.	11.45	50.93	18.70
5-3	49	19.77–19.87	480		n.d.			
6-3	50	24.36–24.46	510		n.d.	11.32	51.81	18.67
7-3	51	27.89–27.99	500		n.d.	11.26	51.00	18.70

Note: n.d. = not determined.

Table 5. Shipboard pore-water data for *in situ* samples, Site 506.

Hole	SiO_2 (μm)	Ca^{2+} (mM)	Mg^{2+} (mM)	Cl (‰)
Hole 506A 1W17 ISPW #1	23	10.09	51.65	17.93
Hole 506E 1W52 ISPW #2	113	10.47	51.04	17.39
Hole 506F 1W53 ISPW #3	540	12.22	51.38	18.12

Table 6. Results of basalt coring activities, Site 506.

Hole	Sediment Thickness above Basalt (m)	Penetration into Basalt (m)	Recovery (%)
506B	20.70	*	*
506D	31.90	*	*
506G	29.50	3.00	75
506H	26.10	8.00	17
506I	26.10	3.50	20

Note: * = fragments of basalt retrieved in core catcher of hydraulic piston corer.

characteristic of all our mounds area sites (i.e., all holes at Sites 506, 507, and 509). First, virtually every sample is enriched in Ca by 0.5–2.0 mM and depleted in Mg by 1–3 mM relative to bottom water. This result is believed to reflect seawater-basalt reaction prior to the flow of water up through the mounds (Holes 506 and 506C) and surrounding sediment (Holes 506B and 506D). Second, silica concentrations generally scatter around 400–600 μm, typical for sediments underlying the equatorial high productivity zone. Mounds sediments, however, generally have silica concentrations lower than those of adjacent pelagic sediments (compare mounds Holes 506 and 506C with flank Holes 506B and 506D). Low silica may in part be a sampling artifact resulting from Si removal along with Fe^{2+} oxidation during pore-water separation. However, the low Si concentrations of the mounds are believed to be primary features reflecting input of low Si-formation water and limited Si dissolution during rapid transit up through the sediments (some evidence will be offered in the Site 509 pore water summary). The third feature is that ammonia concentrations are low and decrease with depth. Furthermore, ammonia concentrations in mounds cores are lower than in adjacent pelagic cores (compare 506 and 506B). These results probably reflect upward advection and rapid flushing of metabolites.

Two *in situ* pore water (ISPW) samples were taken at Site 506 using the DSDP Barnes pore-water/heat-flow probe. The composition of ISPW 2 was identical to that of surface seawater and undoubtedly sampled surface water pumped down the hole. ISPW 3, at the location of Hole 506E, appears to be a good sample. The Mg concentration of ISPW 3 agrees well with the interpolated value of the centrifuge samples. The Si concentration is 35% higher than that of the centrifuge samples. This difference reflects in part the fact that samples were centrifuged at a temperature that was 3°C lower than the *in situ* value. However, it must mainly reflect a sampling artifact or local variability in pore-water silica concentrations.

The Ca value of ISPW 3 is 5% higher than that of the closest centrifuge sample. This anomaly, whose origin is not understood, is common to most other areas, and it restricts our ability to interpret Ca data.

The results are discussed further, along with those of other Galapagos Spreading Center holes, at the end of the Site 509 summary.

PHYSICAL PROPERTIES

Several kinds of physical properties including density, porosity, sonic velocity, thermal conductivity, and shear strength were measured. The relevant data and their interpretations are presented in the chapter on physical properties by Karato and Becker (this volume).

Measurements of density and porosity were made by gravimetric method and by GRAPE. The wet-bulk density of pelagic sediments ranges from 1.15 to 1.59 g/cm^3 and that of granular green clays from 1.22 to 1.67 g/cm^3. The porosity of the pelagic sediments ranges from 66.4 to 92.7% and that of granular green clays from 61.8 to 88.7%.

Sonic velocity measurements were made using the Hamilton Frame velocimeter, yielding values from 1.45 to 1.63 km/s for pelagic sediments and 1.45 to 1.65 km/s for granular green clays.

Measurements of shear strength were made by the vane shear strength equipment and gave values from 22

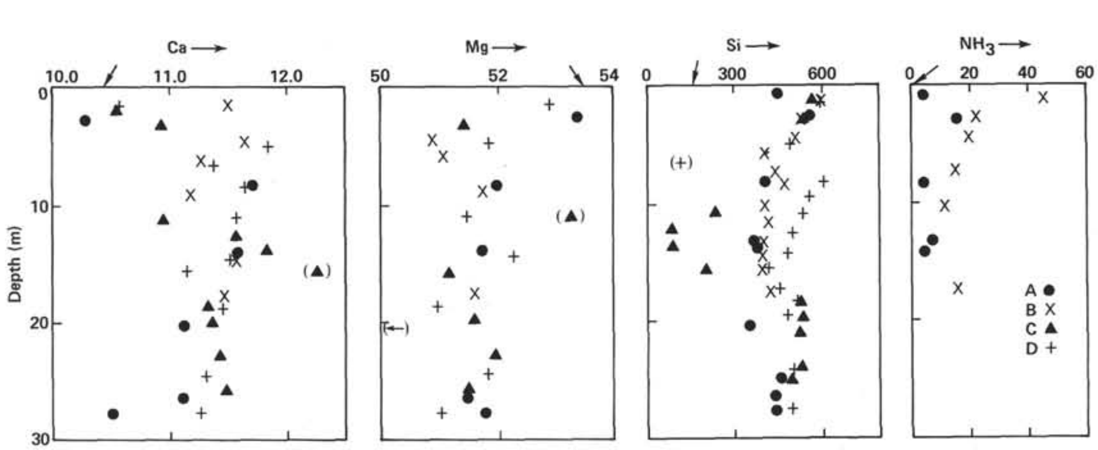


Figure 12. Pore-water chemistry, Site 506. (Ca and Mg concentrations in mM/l; Si and NH_3 concentrations in μM/l. Arrows indicate bottom water concentrations.)

to 315 g/cm^2 for pelagic sediments and 45 to 215 g/cm^2 for granular green clays.

Thermal conductivity was measured by the needle probe method. The thermal conductivity of pelagic sediments ranges from 0.77 to 1.08 W/m•K and that of granular green clays from 0.69 to 0.92 W/m•K.

Wet-bulk density, thermal conductivity, and shear strength tend to increase with increasing depth except for very shallow depths (2–4 m).

HEAT FLOW

Two successful lowerings of the DSDP downhole temperature probe were made into undisturbed sediments at Site 506, in Holes 506E and 506F. Hole 506E was located as close as possible to Hole 506, where a mound was cored, and 506F was located about 30 meters north of Hole 506B, close to mounds, but where only pelagic sediments were cored. Detailed thermal conductivity studies on cores from 506 and 506F (Karato and Becker, this volume) revealed a strong increase of conductivity with depth. Several sources of error limited the precision of gradient determination to about 0.05 to 0.1°/cm (see Becker et al., this volume). Despite this relative imprecision, plots of temperature vs. depth and integrated thermal resistance, suggest that the measurements at the two sites sampled two distinct thermal regimes. The gradient at 506E, in a mound, decreases significantly with depth, suggesting the upward migration of pore waters. Becker et al., (this volume) model the steady-state flow rate at about 50 cm/y., with a surface heat flow of about 30.5 HFU. On the other hand the gradient at Hole 506F was quite linear, suggesting a conductive heat transfer of 14.6 HFU.

These values are consistent with heat-flow measurements made from *Alvin* across the same mounds (Williams et al., 1979) and indicate active localized hydrothermal discharge at the mounds investigated. Detailed discussion of these heat flow results is in Becker et al., (this volume).

SEDIMENT PALEOMAGNETISM

The sediments at Site 506 were cored by the HPC, first used on Leg 64, and reconnaissance paleomagnetic measurements were obtained for these sediments using the on-board, vertical, long spinner magnetometer, which measures the horizontal remanence of whole (unsplit) sections of core, up to 150 cm long. Using a vertically stationary calibration sample, about one-tenth of the signal was measured at a distance of 5.5 cm by the vertically adjusted sensor. Thus, at a particular sensor position, the sediment signal represents an average over about 10 cm, centered at the sensor. Measurements were usually obtained at 10-cm intervals. Some of the preliminary observations are summarized below.

The remanence of the upper portions of cores was usually disturbed. The disturbed zone extended from 50 to sometimes more than 150 cm. The disturbance was manifested by large scatter of the declinations and intensities, resulting (1) from physical disturbance of the sediment, especially when poorly consolidated, and (2) from rust flakes from the drilling pipe, which became embedded along the sediment column. The rust flakes frequently caused wild intensity fluctuations of upper portions of cores (often the first section) sometimes exceeding three orders of magnitude (e.g., from 1 to 1500 $\times 10^{-6}$ gauss). Pieces of rust have actually been picked out of sediment cores after they were split. Both modes of disturbance diminish rapidly with depth in the cores, as evidenced by much lower scatter of the declinations and intensities. Thus, useful reconnaissance paleomagnetic measurements can often be obtained from the lower 3 to 4 meters of HPC-obtained sediments.

No reversals were observed in any of the holes of Site 506. This is not particularly surprising, because the basement age is about 0.54×10^6 y. The only reversal we might have expected to detect is the Blake event at about 0.11×10^6 y. (Smith and Foster, 1969; Denham, 1976). However, sedimentation rates of only about 5 cm/10^3 y., possible hiatuses in sedimentation, incomplete recovery, and the fact that only "uncleaned" remanence was measured combine to readily explain why no reversals were observed at Site 506.

The most interesting and surprising of the preliminary paleomagnetic observations was that there was no magnetic distinction between lithologies, particularly between the green-black clays of presumed hydrothermal origin and the pelagic foraminifer nannofossil ooze. This is true for both intensities and directions of the remanence, in particular Holes 506 and 506C. However, even if the green-black (hydrothermal) clays and the pelagic oozes were distinct episodes of sedimentation, it would be difficult to discern between their mean declination values, even when these boundaries occur within cores, because the entire sedimentary section is of normal polarity. On the other hand, if the green-black clays were produced by chemical transformation of originally "normal" pelagic sediments, preliminary paleomagnetic measurements might suggest that the remanence and hence the magnetic oxides were not mobilized or significantly affected by hydrothermal chemical reactions.

IGNEOUS PETROLOGY AND LITHOSTRATIGRAPHY

Basalt was recovered from five holes at Site 506. At Holes 506B and 506D, several rounded-to-subangular fragments of basalt were recovered in the core catcher and lower portion of the final core above basement, indicating that the corer impacted with the basement. Hard rock drilling was attempted at Holes 506G, 506H, and 506I. Both penetration and recovery were poor (see Operations, Site 506).

The recovered basalt is fragmental and obviously not a stratigraphic representation of successive flows or pillow sequences. These samples may represent pieces from a rubble layer overlying the basement. Evidences supportive of this thesis are as follows:

1) The difficulty in drilling immediately upon contacting basalt with the bit.

2) The subangular morphology of basalt fragments not completely shaped by drill bit abrasion.

3) The alteration rinds paralleling existing surfaces, suggesting that these surfaces were the actual bound-

aries (either surfaces or cracks and fractures) of the pieces on the seafloor.

4) Similarities in drilling environment and problems to Leg 54, during which the local presence of a rubble cap was established.

At Hole 506G, the basalts appeared to be very fine to fine grained, mostly aphyric to very sparsely plagioclase, and generally fresh. Orientable, nearly cylindrical pieces were used to tentatively define (on the basis of grain size variation and degree of vesiculation) the presence of three cooling units:

1) Unit 1, 0–35 cm, ranges from medium-grained basalt in Piece 1 to a glassy rind in Piece 4; (see Visual Core Description for positions of numbered pieces);

2) Unit 2, 35–92 cm, ranges from fine-grained basalt in Piece 5 to medium-grained basalt in Piece 7 back to very fine-grained, vesicular basalt in Piece 8;

3) Unit 3, 92–127 cm (and downward), ranges from very fine-grained vesicular basalt in Piece 11 to medium-grained basalt in Piece 14; no base to this unit was seen in recovered samples.

The basalts from Holes 506D, 506H, and 506I are identical to the fine-grained aphyric basalts in 506G. No cooling units or glassy margins are present. All basalts are quite fresh with little evidence for alteration.

In thin sections, two textural types of basalt were delineated: variolitic-axiolitic and hyalopilitic. In the former textural type, the processes of devitrification and quenching of basaltic magma have given rise to a range of textures from incipient spherulites to advanced development of varioles. The microlite/variolitic minerals comprise clinopyroxene and plagioclase. Often, the varioles are centered around plagioclase laths of much larger dimensions (the surface of these feldspars having offered preferred nucleation sites for the microlites). All of the rocks falling into this variolitic-axiolitic group are sparsely plagioclase phyric—Samples 506D-9-1, 53 cm; 506D-9-1, 48 cm, and 506D-9,CC (17 cm). Two thin sections revealed hyalopilitic textures: Sample 506G-2-1 (Piece 2) and Sample 506G-2-1 (Piece 10). Both samples are aphyric basalts with about equal amounts of plagioclase and clinopyroxene in the groundmass. All of the thin sectioned samples are fresh and have essentially unaltered silicate mineralogies. Vesicles in Sample 506G-2-1 (Piece 10) were filled with gray green smectite near one edge.

Opaque minerals are present in amounts ranging from 2 to 10%. In all samples 90 to 95% of all opaques are titanomagnetite. The oxides are skeletal, single crystals, or skeletal stacks of twinned octahedra. Some magnetite crystals are rimmed by secondary Fe-oxides. Sulfides occur as primary spheres floating in mesostasis, replacing silicates and filling voids (vesicles, cracks, etc.) Thus, sulfides of primary (spheres) and secondary (veinlets) origins are noted.

The size of titanomagnetite crystals is proportional to the degree of undercooling in the quenched basalt. These oxides range in size from less than 1 μm to greater than 30 μm. Primary sulfide spheres (generated by liquation) are also smaller in the quenched, glassy basalts and larger in the more crystalline samples. Minor pyrite veining was recognized in Sample 506G-2-1 (Piece 10).

Basement Alteration

Macroscopically, a thin rind of blue-green or green minerals (clay) coating uncut surfaces can be seen on half of the fragments of basalts of Holes 506D, 506G, and 506I.

Vesicles, near the rims of quenched margins, are filled with or coated by clays or a brownish material. In the interior of the samples the vesicles are empty.

Microscopic examination reveals that most of these vesicles are empty. The infillings may have been plucked out during the thin sectioning process. However, some vesicles in a fragment from Hole 506D are partly filled with green smectite; smectite also fills some tiny irregularly shaped voids between silicates in the same sample.

Most of the samples from Site 506 are fresh basalts. The other samples are only slightly altered, as indicated by the presence of green smectite. It seems that this type of alteration is the result of the interaction of seawater with basalts at low temperature (see *Initial Reports*, Legs 37, 52, 53). No signs of hydrothermal alteration were observed.

Physical Properties (basement)

The density, porosity, sonic velocity, and thermal conductivity of Sample 506G-2-1, 86–88 cm were measured. The results are: 2.96 g/cm^3, 3.7%, 5.45 km/s, and 1.72 W/m•K, respectively.

BASEMENT PALEOMAGNETISM

Site 506 was drilled about 19 km south of the Galapagos Spreading Center (GSC) into basement whose age is about 0.54×10^6 y., using a 3.5 cm/y. half-spreading rate (Klitgord and Mudie, 1974). Because of poor basement penetration and recovery, only four independently oriented minicores were obtained for paleomagnetic measurements at Site 506. Shipboard paleomagnetic measurements included: J_{NRM}, or magnetization intensity of NRM (natural remanent magnetization); low field susceptibility (χ); and alternating field (AF) demagnetization of the NRM, to examine the remanence stability and to determine the stable inclinations. The uncertainties below, associated with the mean values of the magnetic parameters, represent one standard deviation.

$\bar{J}_{NRM} = 22 \pm 9 \times 10^{-3}$ gauss (G), a very high value relative to other DSDP drilled basement and consistent with the high amplitude magnetic anomalies associated with the Galapagos Spreading Center. In fact, the value of $\bar{J}_{NRM}$ at Site 506 is very similar to that used by Sclater and Klitgord (1973) to model the central anomaly, and it is about one-third to one-half that of samples from the rift valley of the GSC.

$\bar{\chi} = 1.51 \pm 0.51 \times 10^{-3}$ G/Oe, which is in the range of values for fine-grained submarine basalts.

Q is a derived quantity, $Q = J_{NRM}/\chi H$, where $H =$ 0.33 Oe is the present geomagnetic field intensity at the sampling site. Thus, Q is a measure of the relative importance of remanent versus induced magnetization. For Site 506, $\bar{Q} = 53 \pm 2$, clearly illustrating the dominance of remanent magnetization for these samples and consistent with the distinct magnetic anomalies observed in this area.

The relatively high stability of the remanence is demonstrated by the AF demagnetizations, where the peak alternating fields required to reduce the remanences to half their NRM values vary between 108 and 204 Oe. Moreover, the stable directions are hardly distinguishable from the NRM directions.

Because of its proximity to the equator, the time-averaged inclination at Site 506 should be very near zero. However, the present inclination at the Leg 70 sites is about +20°. The stable inclinations of the four independently oriented samples are −40°, −27°, −16°, and −1°. Because of the poor penetration and recovery, the rather high dispersion of the stable inclinations of the samples makes us suspect that orientation errors cannot be totally discounted, although the paleomagnetic samples were taken from the longest available pieces of rock, never less than 7 cm. Other possible causes for the dispersion of the inclinations are secular variation of the geomagnetic field and rigid rotations of oceanic crustal blocks. The data, however, are quite insufficient to distinguish between these alternatives.

PRINCIPAL RESULTS

Site 506

Seven holes were drilled or cored and three heat-flow measurements attempted at Site 506, located 19.5 km south of the Galapagos Spreading Center. Both hydrothermal mounds (506, 506C) and off-mounds sediments (506B, 506D) were cored using the hydraulic piston corer. Two holes (506G, 506I) were drilled into basement.

The sediments are classified as: (1) foraminifer nannofossil oozes with varying amounts of siliceous microfossils and (2) hydrothermal sediments, which include manganese-oxide crusts and granular to semi-coherent nontronitic clay. Hydrothermal sediments are confined to the mounds sites and are mixed and interbedded with foraminifer nannofossil oozes. Pore-water chemistry and heat-flow data from the mounds sites suggest upward convecting solutions. Off-mounds sites are composed of siliceous foraminifer nannofossil oozes.

The most notable observations about the sediment stratigraphy are the following:

1) The mudline was encountered at almost the same depth (within several meters) at all four sediment holes.

2) In the mounds, Mn-oxyhydroxides (mainly todorokite) form a layer up to 30 cm thick which rests on an alternating sequence of thin pelagic sediment layers and green smectite layers, the latter reaching thicknesses up to 50 meters. X-ray diffraction techniques were used for the first time on the *Glomar Challenger*, enabling us to identify todorokite and smectite. Both minerals are thought to be hydrothermal in origin based on their similarity with Leg 54 sediments and their restricted occurrence to the mounds. These hydrothermal units are separated from the basaltic basement at 506 and 506C by an ~10- to ~14-meter-thick basal unit consisting mainly of foraminifer nannofossil oozes. The hydrothermal sediments are also overlain by a 1.7- to 3.9-meter-thick unit of foraminifer siliceous nannofossil oozes. No direct stratigraphic correlation exists between the hydrothermal units of Holes 506 and 506C.

3) Off the mounds, the hydrothermal sediments are either completely missing (Hole 506B), or their presence is reduced to an 80-cm-thick layer of green smectite-rich sediments (506D). This indicates that, contrary to the conclusions of the Leg 54 scientific party, the lateral extension of the hydrothermal sediments is limited to the mounds themselves. In the off-mounds holes, Holes 506B and 506D, the sedimentary column is made up of siliceous foraminifer nannofossil oozes with stratigraphic thicknesses of 20.5 and 31 meters, respectively.

The reduced thickness of the pelagic sediments in the mounds themselves compared to those of the off-mounds holes indicates either that the hydrothermal deposits are, at least partly, a product of replacement and/or dissolution of pre-existing pelagic sediments or that the pelagic sediments have been removed from the mounds by slumpings into the off-mounds areas. No clear evidence for or against either of these hypotheses was found at this site.

Preliminary NRM measurements on the long spinner magnetometer show no apparent difference between the direction and intensity of the remanence of the off-mounds sediments and the hydrated Mn-oxide or green smectite-rich sediments from the mounds.

The significant density change in the sediments from Holes 506 and 506C corresponds to lithological changes from the pelagic oozes (= 1.3 g/cm³) to the hydrothermal sediments (= 1.3 to 1.7 g/cm³). All the physical properties measured in Holes 506B and 506D vary continuously with depth. The depth gradients of the physical properties in Holes 506, 506B, and 506C are significantly larger than those present at Sites 504 and 505 but are compatible to those of Site 424 (Leg 54). The only sample of basement basalt that was studied shows typical values of physical properties for Layer 2 rocks.

Two successful heat-flow measurements to depths of about 30 meters sub-bottom at Sites 506E and 506F gave about 24 and 14 HFU, located respectively on and off mounds. The nonlinear temperature gradient measured at the former suggests significant upward movement of pore waters.

Pore-water chemistry is complex, reflecting the influences of diagenesis, convection, and reactions of biogenic debris with the basement. The dominant features are: (1) the low concentrations of elements produced by biogenic degradation indicating that, both in and off the mounds, the sediments are flushed out by convecting waters; and (2) the 10–20% calcium enrichment believed to be the result of seawater–basalt reaction.

The basement samples retrieved in the various holes of Site 506 appear to be mostly fresh, finely crystalline, plagioclase sparsely phyric to aphyric basalts. Fresh glassy rinds are observed. No alteration minerals of unequivocally hydrothermal origin are present. These basalts appear similar to that observed in Leg 54 or *Alvin* dives.

The basalts display high magnetization intensities ($J_{NRM} = 22 \times 10^{-3}$ G); high ratios of remanence to induced magnetization ($Q = 53$), and shallow negative inclinations (I_{NRM} and I_{STABLE} less than $-20°$), consistent with the high-amplitude magnetic anomalies and equatorial location of the site.

REFERENCES

Burns, R. G., and Burns, V. M., 1977. *In* Glasby, G. P. (Ed.), *Marine Manganese Deposits:* New York (Elsevier), pp. 185–248.

Carroll, D., 1970. Clay minerals: A guide to their X-ray identification. *Geol. Soc. Am. Spec. Pap.*, 126.

Chen, P. Y., 1977. Table of key lines in X-ray powder diffraction patterns of minerals in clays and associated rocks. *Occasional Paper 21, Geological Survey* (Bloomington, Indiana).

Denham, C. R., 1976. Blake polarity episode in two cores from the Greater Antilles outer ridge. *Earth Planet. Sci. Lett.*, 29:422.

Gartner, S., 1977. Calcareous nannofossil biostratigraphy and revised zonation of the Pleistocene. *Marine Micropaleontol.*, 2:1–25.

Hoffert, M., Person, A., Courtois, C., Karpoff, A. M., and Trauth, D., 1980. Sedimentology, mineralogy, and geochemistry of hydrothermal and sedimentary deposits from Holes 424, 424A, 424B, 424C (Galapagos Spreading Center). *In* Hekinian, R., Rosendahl, B. R., et al., *Init. Repts. DSDP*, 54: Washington (U.S. Govt. Printing Office), 339–376.

Kaneps, A. G., 1973. Cenozoic planktonic Foraminifera from the eastern equatorial Pacific Ocean. *In* van Andel, Tj. H., Heath, G. R., et al., *Init. Repts. DSDP*, 16: Washington (U.S. Govt. Printing Office), 713–745.

Klitgord, K. D., and Mudie, J. D., 1974. The Galapagos Spreading Center: A near-bottom geophysical survey. *Geophys. J.R. Astron. Soc.*, 38:563–586.

Lonsdale, P., 1977. Deep tow observations at the mounds abyssal hydrothermal field. *Earth Planet. Sci. Lett.*, 46:92–110.

Natland, J., Rosendahl, B., Hekinian, R., Dmitriev, Y., Fodor, R., Goll, R., Hoffert, M., Humphris, S., Mattey, D., Petersen, N., Roggenthen, W., Schrader, E., Srivastava, R., and Warren, N., 1979. Galapagos hydrothermal mounds: Stratigraphy and chemistry revealed by Deep Sea Drilling. *Science*, 204:613–616.

Rateev, M. A., Timofeev, P. P., and Rengarten, N. V., 1980. Minerals of the clay fraction in Pliocene–Quaternary sediments of the east equatorial Pacific, Leg 54 *Glomar Challenger*. *In* Hekinian, R., Rosendahl, B. R., et al., *Init. Repts. DSDP*, 54: Washington (U.S. Govt. Printing Office), 307–318.

Schrader, E. I., and Furbish, W. J., 1980. Mineralogy and geochemistry of hydrothermal and pelagic sediments from the mounds hydrothermal field, Galapagos Spreading Center. *In* Hekinian, R., Rosendahl, B. R., et al., *Init. Repts. DSDP*, 54: Washington (U.S. Govt. Printing Office), 319–328.

Smith, J. D., and Foster, J. H., 1969. Geomagnetic reversal in the Brunhes normal polarity epoch. *Science*, 163:565.

Williams, D. L., Green, K. E., van Andel, Tj. H., Von Herzen, R. P., Dymond, S. R., Crane, K., 1979. The hydrothermal mounds of the Galapagos Spreading Center: Observations with DSRV *Alvin* and detailed heat flow studies. *J. Geophys. Res.*, 84:7467–7484.

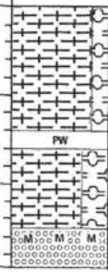
SITE 506 HOLE CORE (HPC) 1 CORED INTERVAL 0.0–1.5 m

TIME – ROCK UNIT: UPPER PLEISTOCENE/RECENT

BIOSTRATIGRAPHIC ZONE: *Emiliania huxleyi* (N)

FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS
C	A	R	C	R	1	0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES: CC

LITHOLOGIC DESCRIPTION

5YR 3/2
5YR 3/4
5Y 8/1–5GY 8/1
5GY 6/1
5Y 8/1
5GY 2/1

SILICEOUS NANNOFOSSIL OOZE
Variations: diatomaceous-foraminifer nannofossil ooze; foraminifer nannofossil ooze; and diatom nannofossil ooze.
0–30 cm: grayish brown to moderate brown oxidized zone.
30–54 cm: yellowish gray to light greenish gray.
54–102 cm: greenish gray, mottling present suggesting bioturbation.
103–123 cm: yellow gray ooze.

HYDROTHERMAL SEDIMENT
Greenish black to grayish black (N2) Fe-Mn crustal material, fragmental. At the upper contact with siliceous nannofossil ooze a 3 cm alteration zone of yellowish-brown (10YR 5/4) sediment occurs.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-45	1-65	1-90	1-115	1-125
Quartz	–	TR	–	–	–
Feldspar	–	TR	–	–	–
Mica	–	–	–	–	5
Clay minerals	20	15	15	10	10
Volcanic glass	–	TR	–	–	TR
Calc.-Dolo.-Arag.	15	5	10	10	–
Foraminifers	15	15	10	15	10
Calc. nannofossils	30	40	40	40	5
Diatoms	15	20	20	20	50
Radiolarians	5	5	5	5	15
Sponge spicules	TR	TR	TR	TR	TR
Silicoflagellates	–	TR	TR	–	TR
Fe-Mn micronodules	–	TR	–	–	3

CARBON-CARBONATE (%)

	1, 83–85
Organic Carbon	5.15
Total Carbonate	78.0

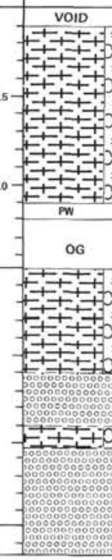
SITE 506 HOLE CORE (HPC) 2 CORED INTERVAL 1.5–5.9 m

TIME – ROCK UNIT: UPPER PLEISTOCENE

BIOSTRATIGRAPHIC ZONE: *Emiliania huxleyi* (N)

FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS
C	A	R	C	R	1	0.5, 1.0
F	A	R	C	R	2	
					CC	

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES: CC

LITHOLOGIC DESCRIPTION

5YR 3/2
5GY 4/1
5GY 2/1
5GY 6/1
5G 2/1
5GY 2/1
5G 6/1
5GY 2/1
5GY 2/1

FORAMINIFER SILICEOUS NANNOFOSSIL OOZE
10–25 cm: grayish brown, this represents oxidizing zone at top of core, and may be sediment water interface. It may be a repetition of Core 1, Section 1. Greenish gray to greenish black, siliceous foraminifer nannofossil ooze. Mottling due to bioturbation is noted. This unit grades into the underlying unit for approximately 50 cm. Fe-Mn granules are found throughout this transitional zone.

HYDROTHERMAL SEDIMENT
Greenish black to dark greenish gray Mn-oxide granules and granular green clay.

SMEAR SLIDE SUMMARY (%)

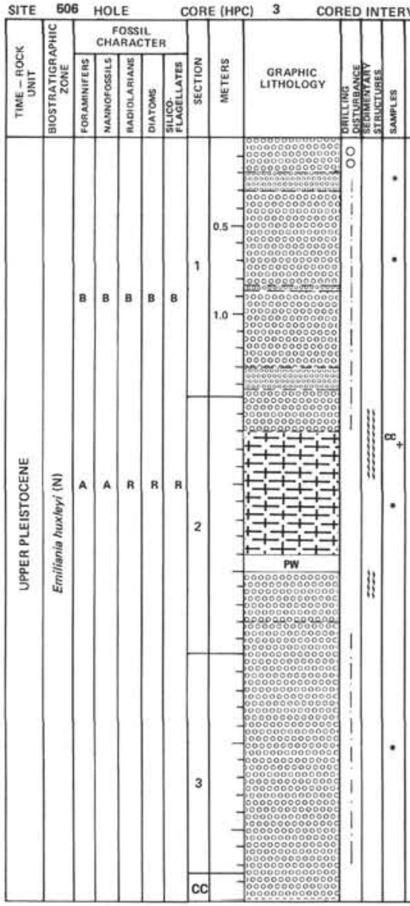
COMPOSITION:	1-22	1-72	2-10	2-51	2-95
Clay minerals	10	5	5	10	5
Volcanic glass	TR	–	TR	TR	TR
Zeolite	TR	TR	TR	–	–
Calc.-Dolo.-Arag.	5	10	–	10	5
Foraminifers	15	20	20	10	10
Calc. nannofossils	45	40	50	50	55
Diatoms	15	20	20	15	10
Radiolarians	10	5	5	5	10
Sponge spicules	–	–	–	TR	TR
Fe-Mn micronodules	2	–	–	–	–
Green clay	–	–	–	–	5

CARBON-CARBONATE (%)

	2, 3–5
Organic Carbon	2.36
Total Carbonate	70.0

Information on core description sheets, for ALL sites, represents field notes taken aboard ship under time pressure. Some of this information has been refined in accord with post-cruise findings, but production schedules prohibit definitive correlation of these sheets with subsequent findings. Thus the reader should be alerted to the occasional ambiguity or discrepancy.

SITE 506 HOLE CORE (HPC) 3 CORED INTERVAL 5.9–10.3 m



LITHOLOGIC DESCRIPTION

N2

5YR 3/4

5GY 2/1

5GY 6/1

5GY 2/1

5GY 2/1

HYDROTHERMAL SEDIMENT
Dark gray to greenish black hydrothermal granular material approximately 1–2 cm in size. Interlayered with green hydrothermal fragments are layers of green hydrothermal clay that are not granular in texture.

FORAMINIFER NANNOFOSSIL OOZE
Greenish gray foraminifer nannofossil ooze. Traces of parallel bedding are present. Bioturbation is moderate.

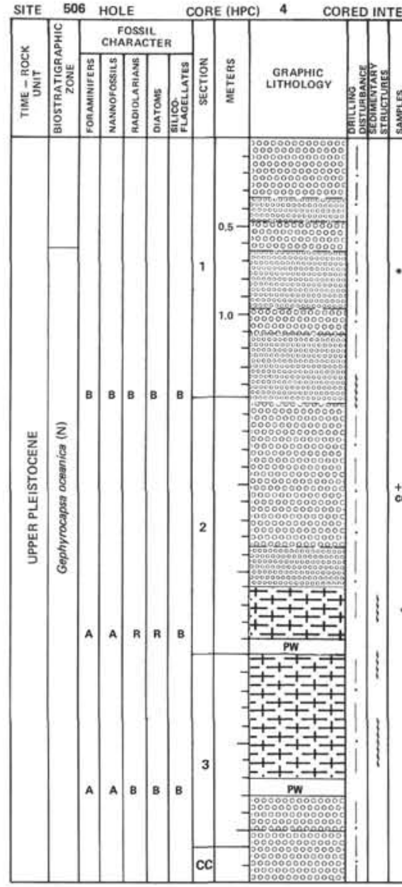
SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-23	1-71	2-68
Clay minerals	–	TR	15
Calc.-Dolo.-Arag.	–	15	5
Foraminifer	–	–	10
Calc. nannofossils	–	–	55
Diatoms	–	–	10
Radiolarians	–	–	5
Sponge spicules	–	–	TR
Fe-Mn Micronodules	–	–	TR
Green clay	100	85	TR

CARBON-CARBONATE (%)

	2, 27–29
Organic Carbon	0.66
Total Carbonate	2.0

SITE 506 HOLE CORE (HPC) 4 CORED INTERVAL 10.3–14.7 m



LITHOLOGIC DESCRIPTION

5GY 2/1

N7

5G 4/1

5GY 2/1

5G 4/1

5G 2/1

5G 8/1

5G 6/1

HYDROTHERMAL SEDIMENT
Greenish black granular to fine grained sediment alternating throughout the core.

FORAMINIFER NANNOFOSSIL OOZE
Light greenish gray foraminifer nannofossil ooze. Large foraminifer are visible. Bioturbation is present but not well enough preserved for ichnofossil identification.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-77	2-120
Clay minerals	–	20
Calc.-Dolo.-Arag.	–	5
Foraminifers	–	10
Calc. nannofossils	–	65
Diatoms	–	TR
Green clay	99	TR

CARBON-CARBONATE (%)

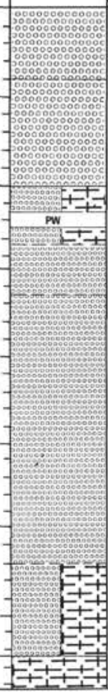
	2, 54–56
Organic Carbon	0.11
Total Carbonate	2.0

NOTE: SITE 506, CORE 5, 14.7–19.1 m: NO RECOVERY.

SITE 506 HOLE CORE (HPC) 6 CORED INTERVAL 19.1–23.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS
UPPER PLEISTOCENE	*Gephyrocapsa oceanica* (N)	A	A	B	B	B	1	0.5, 1.0
		F	A	B	B	B	2	
		A	A	B	B	B	3	
							CC	

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE · SEDIMENTARY STRUCTURES · SAMPLES

LITHOLOGIC DESCRIPTION

5GY 2/1

HYDROTHERMAL SEDIMENT
Greenish black granules and clay. Within the finer grained green deposits are coarser grained Mn-oxides granules.

5GY 2/1

FORAMINIFER NANNOFOSSIL OOZE
Greenish gray foraminifer nannofossil ooze, in some areas having evenly disseminated particles of green hydrothermal grains. In Section 1, 13–21 cm: concentric rings of different colored clays are observed. This resembles a halo burrow but may also be a zone of alteration.

5G 6/1

5GY 2/1

5GY 4/1

5GY 2/1

5GY 6/1

5GY 6/1

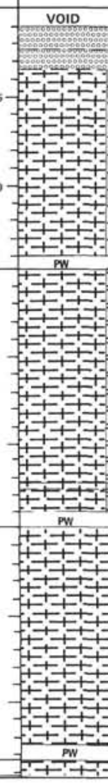
SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-112	1-145	2-96	3-32	3-73
Clay minerals	15	–	–	20	15
Calc.-Dolo.-Arag.	5	–	TR	–	–
Foraminifers	10	TR	TR	20	30
Calc. nannofossils	70	–	–	55	55
Diatoms	TR	–	–	TR	–
Radiolarians	TR	–	–	TR	–
Green clay	–	100	100	5	–
Fe-Mn micronodules	–	–	–	TR	–

SITE 506 HOLE CORE (HPC) 7 CORED INTERVAL 23.5–27.9 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS
UPPER PLEISTOCENE	*Gephyrocapsa oceanica* (N)	A	A	B	B	B	1	0.5, 1.0
		A	A	B	B	B	2	
		A	A	B	B	B	3	
							CC	

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE · SEDIMENTARY STRUCTURES · SAMPLES

LITHOLOGIC DESCRIPTION

5GY 2/1

FORAMINIFER NANNOFOSSIL OOZE
Mottled light greenish gray to dark greenish gray foraminifer nannofossil ooze. Mottling may be due to bioturbation.

HYDROTHERMAL SEDIMENT
Greenish black non-granular hydrothermal clay, highly disturbed.

5GY 8/1

5GY 8/1 to
5Y 8/1

5GY 8/1

5GY 8/1

5GY 6/1

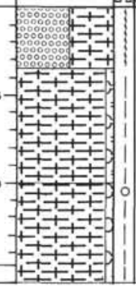
5GY 8/1

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-25	1-70	2-70	3-70
Clay minerals	–	10	15	20
Volcanic glass	–	–	–	2
Foraminifers	–	15	15	20
Calc. nannofossils	–	65	60	60
Diatoms	–	10	5	–
Radiolarians	–	–	5	–
Green clay	100	–	–	–

CARBONATE BOMB (%)
2, 42–43: 71
2, 75–77: 75

SITE 506 HOLE CORE (HPC) 8 CORED INTERVAL 27.9–32.3 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES		LITHOLOGIC DESCRIPTION
UPPER PLEISTOCENE	*Gephyrocapsa oceanica* (N)	C	A	B	B	B	1	0.5, 1.0				•, •, +, CC	5G 6/1; 5G 8/1	**FORAMINIFER NANNOFOSSIL OOZE** Light greenish gray foraminifer nannofossil ooze. In the top 36 cm the foraminifer nannofossil ooze is mixed with the granular greenish black hydrothermal sediment. Some large fragments of Fe-Mn oxide are present.
		F	A	B	B	B	CC						5G 8/1	

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-39	1-67
Clay minerals	10	10
Calc.-Dolo.-Arag.	–	5
Foraminifer	20	15
Calc. nannofossils	60	60
Diatoms	5	5
Radiolarians	5	5

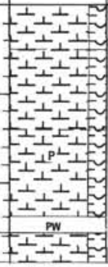
CARBONATE BOMB (%)
1, 73–74: 82

NOTE: SITE 506, CORE 9, 32.3–36.7 m: NO RECOVERY.

SITE 506 HOLE B CORE (HPC) 1 CORED INTERVAL 0.0–1.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS
UPPER PLEISTOCENE/RECENT	*Emiliania huxleyi* (N)	A	A	R	C	R	1	0.5, 1.0
							CC	

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE · SEDIMENTARY STRUCTURES · SAMPLES

LITHOLOGIC DESCRIPTION

10YR 2/2

10YR 7/4

5Y 6/1

5GY 4/1

5Y 5/1

DIATOMACEOUS NANNOFOSSIL OOZE

Dusky yellow, grayish orange, greenish gray variegated pelagic diatomaceous nannofossil ooze. The core is well preserved and is moderately bioturbated. Circular burrows of the planolites type are observed. Large vertical burrows are also present. Bedding contacts are determined by changes in color. Two small pteropods were found at 62 cm.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-22	1-53	1-108
Clay minerals	5	TR	10
Volcanic glass	5	–	–
Calc.-Dolo.-Arag.	10	5	10
Foraminifers	15	5	10
Calc. nannofossils	35	70	50
Diatoms	20	15	20
Radiolarians	1	1	TR
Sponge spicules	3	–	TR
Silicoflagellates	1	TR	TR
Fe-Mn micronodules	5	–	–

SITE 506 HOLE B CORE (HPC) 2 CORED INTERVAL 1.5–5.9 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS
UPPER PLEISTOCENE	*Emiliania huxleyi* (N)	A	A	R	C	R	1	0.5, 1.0
		F	A	R	C	R	2	
		C	A	R	R	R	3	
							CC	

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE · SEDIMENTARY STRUCTURES · SAMPLES

CC

LITHOLOGIC DESCRIPTION

5Y 6/1

10YR 6/3

5Y 6/1

5Y 7/1

5GY 6/1

FORAMINIFER DIATOM NANNOFOSSIL OOZE

Variegated color, greenish brown, pale brown, light gray to light olive gray foraminifer diatom nannofossil ooze. Faint bedding traces exist throughout the core. Larger foraminifer are visible with the naked eye. Horizontal zoophycus and circular planolites burrow are beautifully preserved.

SMEAR SLIDE SUMMARY (%)

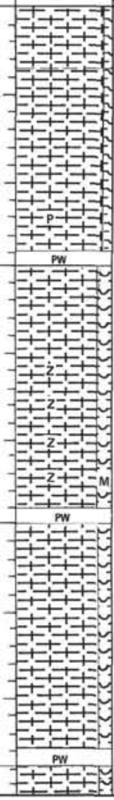
COMPOSITION:	1-11	1-115	2-100	3-26	3-105
Clay minerals	15	5	TR	30	2
Volcanic glass	TR	TR	–	TR	–
Calc.-Dolo.-Arag.	10	15	10	10	5
Foraminifers	10	3	3	5	3
Calc. nannofossils	35	55	60	50	75
Diatoms	10	20	20	3	15
Radiolarians	10	2	2	2	TR
Sponge spicules	3	TR	TR	TR	TR
Silicoflagellates	2	TR	TR	TR	TR
Fe-Mn micronodules	5	–	–	–	–
Green clay	TR	–	–	–	–

CARBON-CARBONATE (%)

	1, 62–64
Organic Carbon	2.35
Total Carbonate	58.0

SITE 506 HOLE B CORE (HPC) 3 CORED INTERVAL 5.9–10.3 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	
UPPER PLEISTOCENE	*Emiliania huxleyi* (N)	C	A	R	R	R	1	0.5, 1.0	P, PW			• •	5GY 6/1, 5G 6/1, 5G 4/1
		C	A	R	F	R	2		Z, Z, Z, Z, M, PW			•	5G 6/1
		C	A	R	R	R	3		PW			CC, •	5G 4/1
							CC						5G 6/1



LITHOLOGIC DESCRIPTION

DIATOM FORAMINIFER NANNOFOSSIL OOZE
Greenish gray to dark greenish gray diatomaceous foraminifer nannofossil ooze. Bioturbation is extensive with well preserved zoophycus and possibly some halo burrows and planolites also observed. Faint bedding noted by color changes are observed throughout the core. Larger foraminifer are observed and make up 90% of the coarse sand size fraction.

SMEAR SLIDE SUMMARY (%)

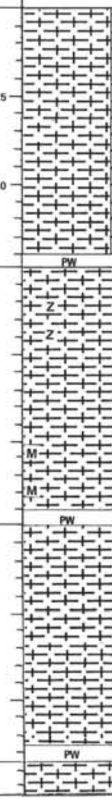
COMPOSITION:	1-17	1-120	2-58	3-77
Clay minerals	15	10	4	15
Volcanic glass	–	–	TR	–
Calc.-Dolo.-Arag.	5	–	2	3
Foraminifers	5	30	3	5
Calc. nannofossils	60	50	75	60
Diatoms	10	5	15	15
Radiolarians	5	5	1	2

CARBON-CARBONATE (%)

	2, 5–7
Organic Carbon	1.40
Total Carbonate	62.0

SITE 506 HOLE B CORE (HPC) 4 CORED INTERVAL 10.3–14.7 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	
UPPER PLEISTOCENE	*Emiliania huxleyi* (N)	F	A	B	R	B	1	0.5, 1.0	PW			•	5GY 6/1, 5G 6/1, 5Y 6/3
		C	A	B	R	B	2		Z, Z, M, M, PW			CC, • •	5G 4/1, 5G 6/1
		C	A	R	R	B	3		PW			• •	5GY 6/1, 5G 6/1, 5G 6/1
							CC						5GY 6/1



LITHOLOGIC DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE
Greenish gray and dark greenish gray to pale olive variegated foraminifer nannofossil ooze. Highly bioturbated with zoophycus observed. A few large Mn-oxide pebbles are present. In addition some grayish black (N2) areas are observed. They contain a mixture of pelagic nannofossil ooze and green nontronitic clay.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-32	2-76	2-76	3-11	3-114
Pyrite	–	–	TR?	TR?	–
Clay minerals	10	15	TR	–	10
Calc.-Dolo.-Arag.	10	5	–	–	5
Foraminifers	10	15	20	20	10
Calc. nannofossils	50	60	50	40	75
Diatoms	10	TR	TR	TR	–
Radiolarians	3	TR	–	–	–
Sponge spicules	1	TR	–	–	–
Silicoglagellates	1	–	–	–	–
Fe-Mn micronodules	1	–	1	TR	–
Green clay	–	–	30	40	–

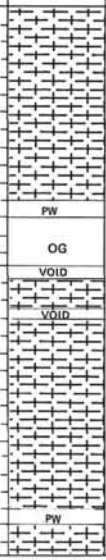
CARBON-CARBONATE (%)

	2, 37–39
Organic Carbon	2.89
Total Carbonate	76.0

SITE 506 HOLE B CORE (HPC) 5 CORED INTERVAL 14.7–18.2 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS		SECTION	METERS
UPPER PLEISTOCENE	*Gephyrocapsa oceanica* (N)	F	A	B	B	B	1	0.5, 1.0
		C	A	B	B	B	2	
		C	A	B	B	B	CC	

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

5GY 6/1

5GY 6/1

5G 8/1

5G 8/1

LITHOLOGIC DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE
Greenish gray to light greenish gray foraminifer nannofossil ooze. Some mottling with dark greenish gray clay smectite is present. Core-Catcher is a mixture of ooze with several basalt fragments.

SMEAR SLIDE SUMMARY (%)

	1-54	2-68	2-107
COMPOSITION:			
Pyrite or Fe-Mn oxide nodules	–	–	5
Clay minerals	15	10	10
Volcanic glass	10	TR	5
Calc.-Dolo.-Arag.	5	10	–
Foraminifers	10	20	40
Calc. nannofossils	60	60	45
Radiolarians	TR	TR	TR

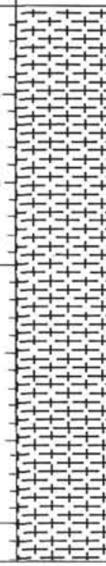
CARBON-CARBONATE (%)

	2, 78–80
Organic Carbon	1.50
Total Carbonate	86.0

SITE 506 HOLE B CORE (HPC) 6 CORED INTERVAL 18.2–20.7 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS
							1	0.5, 1.0
							2	
							CC	

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

5Y 6/2

5GY 6/1

5Y 6/2

5Y 6/2

LITHOLOGIC DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE
Light olive gray to greenish gray foraminifer nannofossil ooze mixed with fragments of volcanic glass and green clay smectite. This core is entirely mixed with water and therefore is not very reliable in terms of stratigraphy.

SMEAR SLIDE SUMMARY (%)

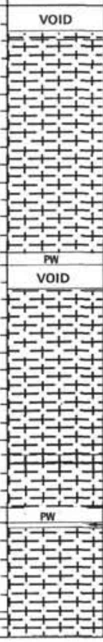
	1-10 (M)	2-95
Clay minerals	–	5
Volcanic glass	90	–
Calc.-Dolo.-Arag.	–	5
Foraminifera	–	20
Calc. nannofossils	5	50
Radiolarians	TR	–
Green clay	5	20

SITE 506 HOLE C CORE (HPC) 1 CORED INTERVAL 0.0–3.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION
UPPER PLEISTOCENE/RECENT	*Emiliania huxleyi* (N)	A	A	R	F	R	1
		F	A	R	F	R	2
		C	A	R	F	R	3
							CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE · SEDIMENTARY STRUCTURES · SAMPLES

LITHOLOGIC DESCRIPTION

5YR 4/1
5GY 6/1
5GY 6/1
VOID
5G 6/1
5G 6/1

DIATOM FORAMINIFER NANNOFOSSIL OOZE
Brownish gray to greenish gray mottled diatom foraminifer nannofossil ooze. Nodules of dark greenish gray clay are found between 77–85 cm of Section 1. Irregular contact 15–22 cm of Section 1. Brownish gray to greenish gray nannofossil ooze may be disturbed due to drilling.

SMEAR SLIDE SUMMARY (%)

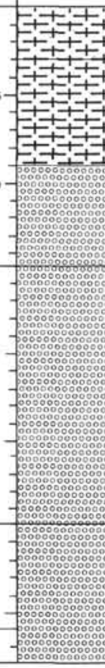
COMPOSITION:	1-19	1-81	2-80
Clay minerals	15	5	3
Volcanic glass	TR	TR	2
Calc.-Dolo.-Arag.	5	5	5
Foraminifers	10	20	15
Calc. nannofossils	50	50	45
Diatoms	10	15	15
Radiolarians	5	5	15
Sponge spicules	TR	–	TR
Fe-Mn micronodules	5	–	–
Green clay	TR	TR	–

SITE 506 HOLE C CORE (HPC) 2 CORED INTERVAL 3.5–7.9 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION
UPPER PLEISTOCENE	*Emiliania huxleyi* (N)	C	A	R	F	R	1
		B	R	B	B	B	2
							3
							CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE · SEDIMENTARY STRUCTURES · SAMPLES

LITHOLOGIC DESCRIPTION

5GY 6/1
N2
5YR 4/1
5GY 6/1
5GY 2/1
5YR 2/1
5YR 2/1
5GY 2/1
5G 4/1
5GY 2/1
5G 4/1
5GY 2/1

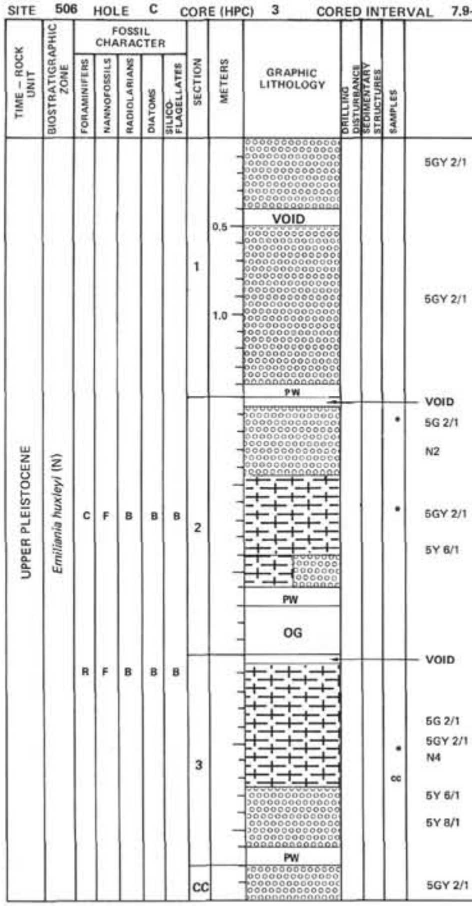
FORAMINIFER NANNOFOSSIL OOZE
Greenish gray foraminifer nannofossil ooze. Mottling may be due to drilling or by borrowing in fauna.

HYDROTHERMAL SEDIMENT
Greenish black to brownish black granular hydrothermal clay. Within this unit the granules dominate but in some small laminae and beds finer grained greenish black clay is observed.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-25	1-39	1-128	2-14	2-138
Clay minerals	5	5	–	–	TR
Volcanic glass	TR	–	–	–	–
Calc.-Dolo.-Arag.	5	–	–	TR	25
Foraminifers	15	–	–	5	–
Calc. nannofossils	50	–	15	TR	–
Diatoms	10	10	5	5	–
Radiolarians	15	5	5	–	–
Sponge spicules	TR	–	–	–	–
Fe-Mn micronodules	–	80	10	–	–
Green clay	–	–	65	90	75

SITE 506 HOLE C CORE (HPC) 3 CORED INTERVAL 7.9–12.3 m



LITHOLOGIC DESCRIPTION

HYDROTHERMAL SEDIMENT
Granular greenish black to grayish black sediment. Very coarse grained and fragmented, probably due to drilling. Sedimentary structures are impossible to identify.

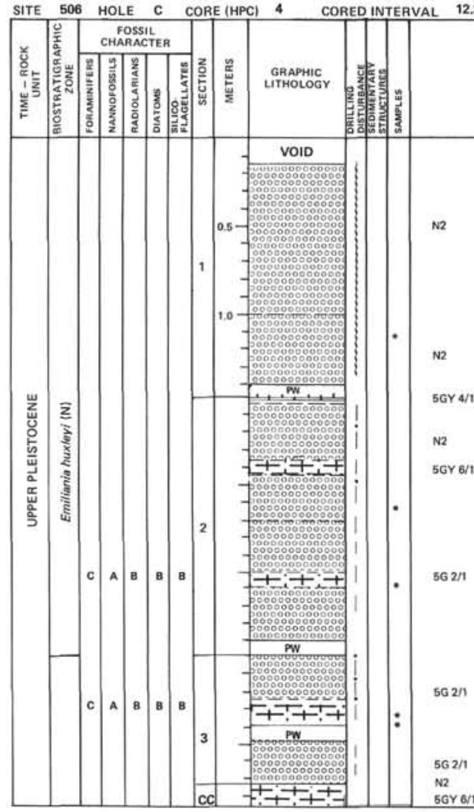
FORAMINIFER NANNOFOSSIL OOZE
Variegated and mottled light greenish gray to greenish black foraminifer nannofossil ooze, mixed with granular green hydrothermal clay.

SMEAR SLIDE SUMMARY (%)

	2-12	2-64	3-52
COMPOSITION:			
Clay minerals	–	20	20
Volcanic glass	TR	TR	–
Calc.-Dolo.-Arag.	–	3	2
Foraminifers	10	2	15
Calc. nannofossils	TR	15	13
Diatoms	–	TR	–
Radiolarians	TR	TR	–
Green clay	90	60	50

CARBONATE BOMB (%)
3, 50–52: 41

SITE 506 HOLE C CORE (HPC) 4 CORED INTERVAL 12.3–16.7 m



LITHOLOGIC DESCRIPTION

HYDROTHERMAL SEDIMENT
Granular dark green to medium green clays. Zones of finer grained sediment are noted and are unevenly distributed throughout the core.

FORAMINIFER NANNOFOSSIL OOZE
Variegated light green to greenish black foraminifer nannofossil ooze.

SMEAR SLIDE SUMMARY (%)

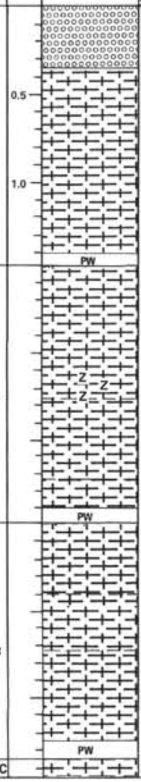
	1-111	2-63	2-108	3-35	3-40
COMPOSITION:					
Clay minerals	–	20	20	10	–
Volcanic glass	–	–	–	15	1
Calc.-Dolo.-Arag.	–	–	–	10	–
Foraminifers	–	10	10	10	–
Calc. nannofossils	–	70	70	55	1
Diatoms	–	TR	–	–	–
Radiolarians	–	–	TR	–	–
Green clay	100	–	–	–	98

SITE 506 HOLE C CORE (HPC) 5 CORED INTERVAL 16.7–21.1 m

TIME – ROCK UNIT: UPPER PLEISTOCENE

BIOSTRATIGRAPHIC ZONE: *Gephyrocapsa oceanica* (N)

FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION
R	A	B	B	B	1
C	A	B	B	B	2
A	A	B	B	B	3
					CC



LITHOLOGIC DESCRIPTION

5G 2/1
N2
5GY 6/1
5GY 6/1
5Y 6/1
5GY 6/1
5GY 6/1
5Y 6/1
5GY 6/1
5GY 6/1

FORAMINIFER NANNOFOSSIL OOZE
Light green to light olive green variegated foraminifer nannofossil ooze. Mottling is present with zoophycus burrows preserved.

HYDROTHERMAL SEDIMENT
Granular dark green sediment. Fragments are angular in shape and could have been washed into the core. The unit only occurs at the top of the core.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-33	2-39	2-116	3-20	3-57
Clay minerals	–	10	10	5	5
Volcanic glass	–	–	–	1	–
Calc.-Dolo.-Arag.	–	–	–	5	–
Foraminifers	5	10	12	15	15
Calc. nannofossils	60	80	75	60	70
Diatoms	–	–	2	7	5
Radiolarians	–	TR	1	7	5
Sponge spicules	–	–	–	TR	–
Green clay	40	–	–	–	–

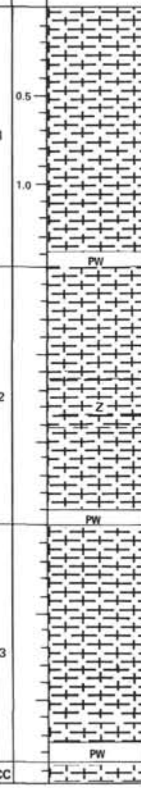
CARBONATE BOMB (%)
2, 86–88: 71
3, 99–101: 69

SITE 506 HOLE C CORE (HPC) 6 CORED INTERVAL 21.1–25.5 m

TIME – ROCK UNIT: UPPER PLEISTOCENE

BIOSTRATIGRAPHIC ZONE: *Gephyrocapsa oceanica* (N)

FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION
C	A	B	B	B	1
C	A	B	B	B	2
C	A	B	B	B	3
A	A	B	B	B	CC



LITHOLOGIC DESCRIPTION

5GY 6/1
5GY 6/1
5Y 6/1
5GY 6/1
5GY 6/1
5GY 6/1

FORAMINIFER NANNOFOSSIL OOZE
Variegated light green to darker green foraminifer nannofossil ooze. Boundaries are determined by color changes. Some of the color changes are gradational and are irregular due to extensive burrowing. Zoophycus burrows are horizontal to sub-horizontal.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-109	2-83	2-114	3-7	3-75
Clay minerals	10	10	10	10	10
Volcanic glass	15	–	–	–	–
Calc.-Dolo.-Arag.	10	–	5	–	10
Foraminifers	10	20	20	20	20
Calc. nannofossils	50	55	55	60	50
Diatoms	5	5	5	5	5
Radiolarians	TR	10	5	5	5
Sponge spicules	TR	–	–	–	–

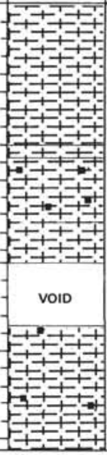
CARBON-CARBONATE (%)

	2, 84–86
Organic Carbon	3.88
Total Carbonate	79.0

SITE 506 HOLE C CORE (HPC) 7 CORED INTERVAL 25.5–28.0 m

TIME – ROCK UNIT | BIOSTRATIGRAPHIC ZONE | FOSSIL CHARACTER: FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS, SILICO-FLAGELLATES | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION

Section 1 (0.5, 1.0), Section 2, CC



5G 2/1

5GY 6/1

5GY 6/1

5GY 6/1

FORAMINIFER NANNOFOSSIL OOZE
Light to dark green foraminifer nannofossil ooze. Black clasts of basaltic glass. Shards are scattered throughout the soupy nannofossil ooze

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-112	2-50
Clay minerals	10	10
Volcanic glass	2	1
Calc.-Dolo.-Arag.	5	–
Foraminifers	20	20
Calc. nannofossils	60	65
Diatoms	1	3
Radiolarians	2	2

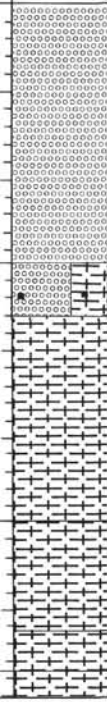
CARBON-CARBONATE (%)

	1, 119–121
Organic Carbon	0.74
Total Carbonate	71.0

SITE 506 HOLE C CORE (HPC) 8 CORED INTERVAL 28.0–31.3 m

TIME – ROCK UNIT | BIOSTRATIGRAPHIC ZONE | FOSSIL CHARACTER: FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS, SILICO-FLAGELLATES | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION

Section 1 (0.5, 1.0), Section 2, Section 3, CC



5G 2/1

N2

5GY 6/1

5GY 6/1

5GY 6/1

5GY 6/1

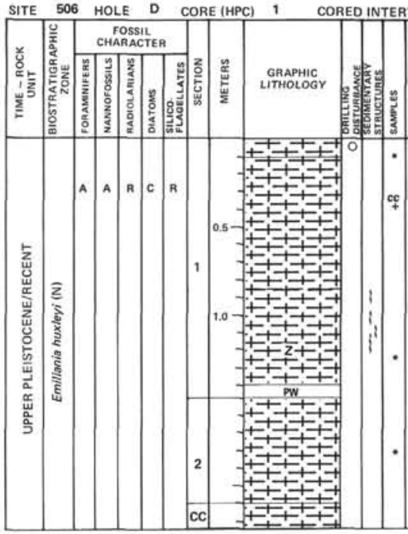
HYDROTHERMAL SEDIMENT
Dark green to black granular (breccia) sediment. Some basalt clasts are found within this unit and show glassy pillow rims. Unit is structureless and has probably fallen in the hole from above.

FORAMINIFER NANNOFOSSIL OOZE
Light green, soupy foraminifer nannofossil ooze. Some larger basalt clasts (1–2%) are dispered throughout core.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-84	3-58
Clay minerals	10	10
Volcanic glass	TR	TR
Calc.-Dolo.-Arag.	–	5
Foraminifers	15	20
Calc. nannofossils	50	55
Diatoms	–	7
Radiolarians	–	3
Green clay	25	–

SITE 506 HOLE D CORE (HPC) 1 CORED INTERVAL 0.0–2.5 m



LITHOLOGIC DESCRIPTION

10YR 3/2

5GY 6/1

5Y 5/2

5Y 5/2

5Y 5/2

FORAMINIFER NANNOFOSSIL OOZE

Very dark grayish brown, olive gray to greenish gray pelagic forminifer nannofossil ooze. Bedding changes are noted by color. The top 10 cm is a very dark grayish brown ooze which is in contact with a greenish gray ooze. This may mark an oxidation gradient.

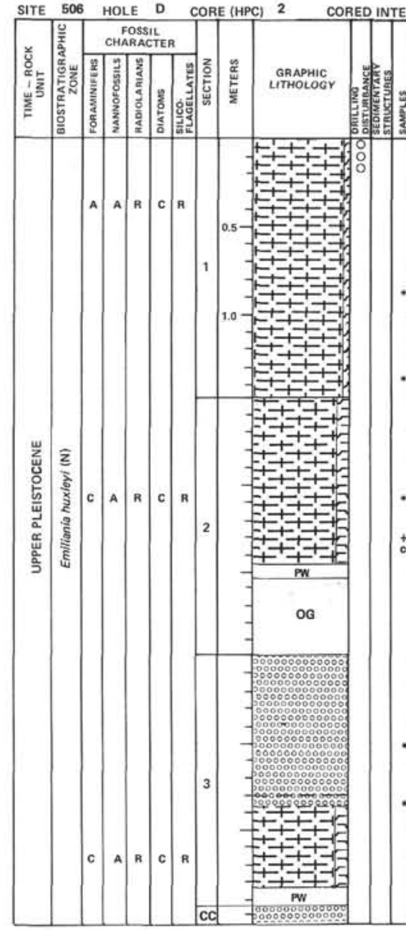
SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-10	1-126	2-31
Clay minerals	10	5	5
Volcanic glass	–	–	TR
Calc.-Dolo.-Arag.	2	3	3
Foraminifers	15	10	10
Calc. nannofossils	60	65	90
Diatoms	10	10	10
Radiolarians	1	2	2
Sponge spicules	TR	TR	–
Fe-Mn micronodules	2	–	–

CARBON-CARBONATE (%)

	1, 36–38
Organic Carbon	2.93
Total Carbonate	68.0

SITE 506 HOLE D CORE (HPC) 2 CORED INTERVAL 2.5–6.9 m



LITHOLOGIC DESCRIPTION

5Y 5/2

5GY 6/1

5GY 4/1

5GY 6/1

5GY 4/1

N5

5Y 5/2

5GY 6/1

5GY 2/1

5Y 5/2

DIATOM FORAMINIFER NANNOFOSSIL OOZE

Variegated greenish gray, dark greenish gray diatomaceous foraminifer nannofossil ooze. Included are fragments of green to black hydrothermal sediment. Some mottling is observed.

HYDROTHERMAL SEDIMENT

Granular, variegated, very dark green to greenish black hydrothermal sediment. This breccia may be the result of drilling.

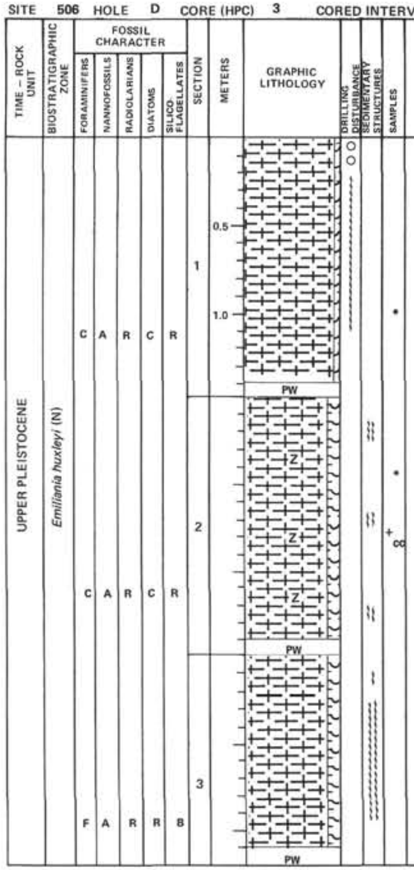
SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-89	1-134	2-57	3-51	3-85
Pyrite	TR?	TR?	–	–	–
Clay minerals	15	–	2	–	15
Volcanic glass (light)	–	–	TR	TR	–
Micronodules	–	–	–	–	1
Carbonate unspec.	15	–	3	–	3
Foraminifers	10	–	5	–	5
Calc. nannofossils	55	5	75	2	60
Diatoms	5	–	15	TR	15
Radiolarians	TR	–	TR	TR	TR
Sponge spicules	TR	–	–	–	TR
Silicoflagellates	TR	–	TR	–	TR
Green clay	–	95	–	98	–

CARBON-CARBONATE (%)

	2, 84–86
Organic Carbon	1.31
Total Carbonate	60.0

SITE 506 HOLE D CORE (HPC) 3 CORED INTERVAL 6.9–11.3 m



LITHOLOGIC DESCRIPTION

5G 6/1

5GY 6/1

5G 6/1

5GY 6/1

DIATOM FORAMINIFER NANNOFOSSIL OOZE

Variegated greenish gray diatomaceous foraminifer nannofossil ooze. Zoophycus burrow along with other large horizontal burrows are observed. Large foraminifer are visible with the naked eye. Black nodules (wisps) are found throughout the sediment.

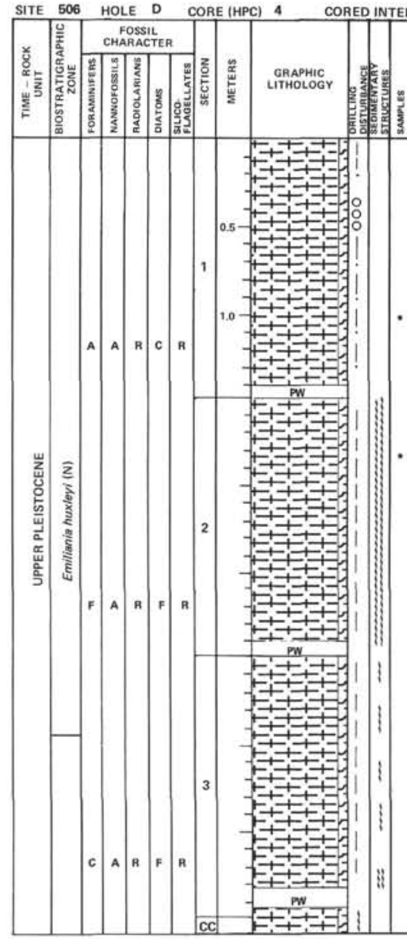
SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-100	2-42
Clay minerals	2	5
Carbonate unspec.	2	5
Foraminifers	3	20
Calc. nannofossils	85	55
Diatoms	5	15
Radiolarians	3	–
Sponge spicules	TR	–
Silicoflagellates	TR	–

CARBON-CARBONATE (%)

	2, 83–85
Organic Carbon	1.68
Total Carbonate	60.0

SITE 506 HOLE D CORE (HPC) 4 CORED INTERVAL 11.3–15.7 m



LITHOLOGIC DESCRIPTION

5GY 6/1

5GY 6/1

5G 8/1

5GY 6/1

5G 8/1

5GY 6/1

5GY 6/1

5G 4/1

5GY 8/1

5GY 6/1

DIATOM FORAMINIFER NANNOFOSSIL OOZE

Greenish gray to dark greenish gray diatom foraminifer nannofossil ooze. Volcanic glass is found in Section 2 at 33 cm (see smear slide).

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-106	2-33
Clay minerals	5	TR
Volcanic glass (light)	TR	90
Zeolite	–	5
Foraminifers	15	–
Calc. nannofossils	65	TR
Diatoms	10	–
Radiolarians	5	–
Sponge spicules	TR	–
Silicoflagellates	TR	–
Green clay	TR	TR

CARBON-CARBONATE (%)

	2, 120–122
Organic Carbon	2.11
Total Carbonate	63.0

SITE 506 HOLE D CORE (HPC) 5 CORED INTERVAL 15.7–20.1 m

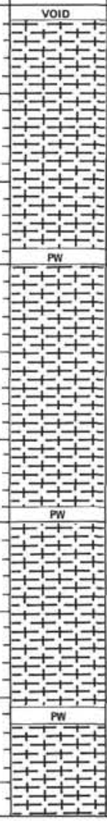
TIME – ROCK UNIT: UPPER PLEISTOCENE

BIOSTRATIGRAPHIC ZONE: *Gephyrocapsa oceanica* (N)

FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	COLOR
C	A	R	F	B	1	5GY 6/1, 5G 4/1
C	A	R	F	B	2	5GY 6/1
F	A	B	B	B	3	5GY 6/1
					CC	5GY 6/1

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES: CC

LITHOLOGIC DESCRIPTION

NANNOFOSSIL OOZE
Mottled greenish gray to dark greenish gray foraminifer nannofossil ooze. Some ash layers may have been disseminated by bioturbation. Green hydrothermal sediment mixed with ooze is found at 98 cm in Section 1.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-98	2-105	3-35
Clay minerals	5	5	5
Volcanic glass (light)	TR	TR	TR
Micronodules	TR	TR	–
Carbonate unspec.	5	2	5
Foraminifer	10	5	5
Calc. nannofossils	50	85	85
Diatoms	2	2	–
Radiolarians	1	1	TR
Green clay	25	–	–

CARBON-CARBONATE (%)

	2, 120–122
Organic Carbon	2.80
Total Carbonate	76.0

SITE 506 HOLE D CORE (HPC) 6 CORED INTERVAL 20.1–24.5 m

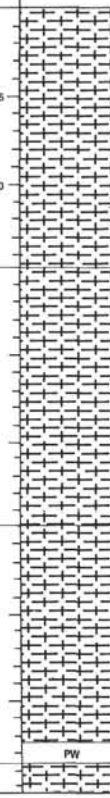
TIME – ROCK UNIT: UPPER PLEISTOCENE

BIOSTRATIGRAPHIC ZONE: *Gephyrocapsa oceanica* (N)

FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	COLOR
C	A	B	B	B	1	5GY 6/1
F	A	B	B	B	2	5GY 6/1, 5GY 8/1
F	A	B	B	B	3	5GY 8/1
					CC	5GY 8/1

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES: CC

LITHOLOGIC DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE
Greenish gray to dark greenish gray foraminifer nannofossil ooze. Areas of dark greenish gray sediment are scattered throughout core.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	1-75	3-68
Clay minerals	5	10
Volcanic glass (light)	TR	TR
Carbonate unspec.	5	5
Foraminifer	10	15
Calc. nannofossils	80	65
Diatoms	TR	2
Radiolarians	TR	3
Green clay	TR	–

CARBON-CARBONATE (%)

	2, 53–55
Organic Carbon	0.92
Total Carbonate	66.0

SITE 506 HOLE D CORE (HPC) 7 CORED INTERVAL 24.5–28.9 m

TIME – ROCK UNIT: UPPER PLEISTOCENE
BIOSTRATIGRAPHIC ZONE: *Gephyrocapsa oceanica* (N)

FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION
F	A	R	R	B	1
C	A	R	R	B	2
C	A	R	R	B	3
					CC

METERS: 0.5, 1.0
GRAPHIC LITHOLOGY: PW
DRILLING DISTURBANCE · SEDIMENTARY STRUCTURES · SAMPLES: CC

5G 8/1
5Y 5/3
5GY 8/1
5GY 8/1
5GY 6/1

LITHOLOGIC DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE
Light greenish gray to greenish gray foraminifer nannofossil ooze. Bioturbation exists in the top section.

SMEAR SLIDE SUMMARY (%)

	1-111	2-9
COMPOSITION:		
Clay minerals	10	TR
Volcanic glass (light)	TR	TR
Zeolite	TR	TR
Micronodules	TR	TR
Carbonate unspec.	5	5
Foraminifers	15	20
Calc. nannofossils	60	65
Diatoms	3	5
Radiolarians	2	5
Sponge spicules	TR	–

CARBON-CARBONATE (%)

	2, 11–13
Organic Carbon	3.78
Total Carbonate	73.0

SITE 506 HOLE D CORE (HPC) 8 CORED INTERVAL 28.9–30.9 m

TIME – ROCK UNIT: UPPER PLEISTOCENE
BIOSTRATIGRAPHIC ZONE: *Gephyrocapsa oceanica* (N)

FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION
C	A	R	R	B	1
C	A	R	R	B	2

METERS: 0.5, 1.0
SAMPLES: CC

5GY 6/1
5G 8/1
5GY 6/1

LITHOLOGIC DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE
Poorly preserved dark greenish gray foraminifer nannofossil ooze. A few scattered pieces of basaltic glass are observed around the edge of the core liner.

SMEAR SLIDE SUMMARY (%)

	1-103
COMPOSITION:	
Clay minerals	2
Volcanic glass (light)	TR
Zeolite	TR
Micronodules	TR
Carbonate unspec.	8
Foraminifers	20
Calc. nannofossils	60
Diatoms	5
Radiolarians	5

CARBON-CARBONATE (%)

	1, 141–143
Organic Carbon	1.23
Total Carbonate	78.0

SITE 506 HOLE D CORE (HPC) 9 CORED INTERVAL 30.9–31.9 m

SECTION: 1, CC
METERS: 0.5
SAMPLES: CC, T, T, T

5G 8/1
5GY 6/1

LITHOLOGIC DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE
Light greenish gray foraminifer nannofossil ooze with scattered basalt fragments up to 1 cm in diameter. These clasts are concentrated at the bottom of the core.

BASALT FRAGMENTS:
Name: Sparsely plagioclase-clinopyroxene phyric basalts.
Thin Section Descriptions:

9-1, 48 cm
Texture: variolitic
Phenocrysts: plagioclase, 5%, 1 mm, euhedral; clinopyroxene, 2%, 0.5 mm, anhedral to subhedral
Groundmass: plagioclase, 2%, 0.5 mm, microlites magnetite, 2%, skeletal; glass, 87%
Vesicles: 2%, 1 mm, scattered and void

9-1, 53 cm
Texture: axiolitic
Phenocrysts: plagioclase, 2%, 0.05 mm, subhedral; clinopyroxene, 2%, 0.3 mm, anhedral
Groundmass: plagioclase, 2%, 0.3–0.5 mm, microlites; clinopyroxene, 1%, <0.1 mm, microcrysts; magnetite, 10%, skeletal; glass, 80%
Vesicles: 3%, 0.04 mm, scattered and spherical

9, CC, 17 cm
Texture: axiolitic
Phenocrysts: plagioclase, 5%, 0.3–0.5 mm, euhedral and subhedral; clinopyroxene, 1–2%, 0.4 mm, anhedral
Groundmass: plagioclase, 5%, 0.5–2 mm, microphenocrysts and microlites; clinopyroxene, 3%, 0.1–0.5 mm; magnetite, 8%, skeletal; glass, 77%
Vesicles: 1–2%, 1 mm, scattered and void
Alteration: clays, <1% replacing glass or in vesicles

SITE 506 HOLE G CORE (HPC) 1 CORED INTERVAL 27.5–29.5 m

SECTION: 1
METERS: 0.5, 1.0
GRAPHIC LITHOLOGY: VOID

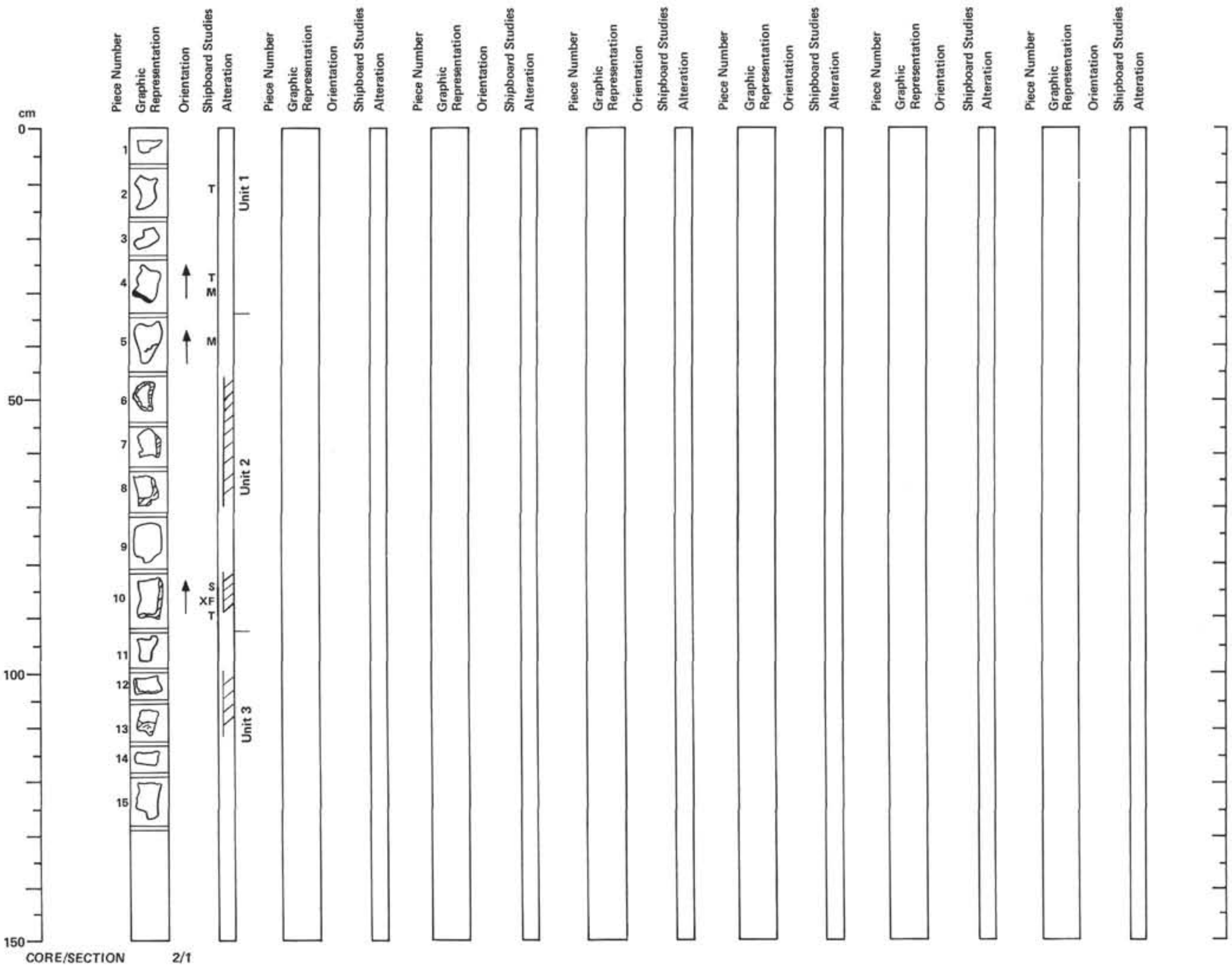
N1
5GY 2/1
5GY 8/1

LITHOLOGIC DESCRIPTION

HYDROTHERMAL SEDIMENT
Black to greenish black, fine to coarse grained sand with some silty sand. Sediment is angular and is the result of drilling. Apparent grading is due to drilling. This unit may or may not have directly overlain the basalt.

SMEAR SLIDE SUMMARY (%)

	1-108	1-141	1-141	1-141
COMPOSITION:				
Volcanic glass (light)	5	–	–	–
Foraminifers	15	–	–	–
Calc. nannofossils	10	–	–	–
Green clay	70	100	100	100



70-506G-2 **Depth: 2743.0–2745.0 m (29.5–32.5 mBSF)**

2-1, Pieces 1–4 (Unit 1)

Dominant Lithology: Fine- to medium-grained, aphyric to sparsely plagioclase clinopyroxene phyric basalt.

Macroscopic Description: Fine- to medium-grained aphyric to sparsely plagioclase-clinopyroxene phyric basalt. The basalts are fresh. Vesicles (0.5 mm–1 mm) are evenly distributed and empty. This cooling unit is defined on the basis of glass margin found on oriented Piece 4.

Thin Section Descriptions

2-1, 11–14 cm (Piece 2):

Name: Aphyric, medium-grained basalt

Texture: Axiolitic to intersertal to hyalopilitic

Phenocrysts: Olivine(?) < 1%, 0.75x0.75 mm subhedral; plagioclase, < 1%, 0.5x0.3 mm, lathy-equant, clinopyroxene, < 1%, 0.4x0.3 mm, anhedral

Groundmass: Plagioclase, 50%, 0.5x0.1 mm, skeletal (mature sheaf); clinopyroxene, 35%, 0.1x0.1 mm, anhedral; magnetite, 10%, skeletal; glass, 5%

Vesicles: 1%, 0.3 mm, scattered and empty

2-1, 31–33 cm (Piece 4):

Name: Fine-grained sparsely plagioclase-clinopyroxene phyric basalt (flow interior)

Texture: Variolitic

Phenocrysts: Plagioclase, < 5%, 0.4x0.2 mm, lathy; clinopyroxene, <5%, 0.08x0.04 mm, anhedral

Groundmass: Magnetite, 2%; glass, 5%; microlites, 90%, 0.01x 0.001 mm, composed of plagioclase and clinopyroxene, acicular

Vesicles: 1–3%, 0.01 mm, scattered, round shape; empty with some filled with glass and some rimmed with smectite

Alteration: Clays 1%, filling vesicles

2-1, Pieces 5–10 (Unit 2)

Dominant Lithology: Fine- to medium-grained, vesicular, aphyric to sparsely plagioclase phyric basalt.

Macroscopic Description: Fine- to medium-grained vesicular aphyric to sparsely plagioclase phyric basalt. The basalts are very fresh. Vesicles (0.5–1 mm) are mostly empty except for vesicles located near margin which are coated with a secondary blue clay. This blue clay also coats fresh exterior surface. Alteration rinds are present.

Thin Section Description

2-1, 90–93 cm (Piece 10):

Name: Medium-grained aphyric basalt (flow interior)

Texture: Hyalopilitic

Phenocrysts: Plagioclase, < 1%, 0.2x0.1 mm, equant to lathy

Groundmass: Plagioclase, 40%, 0.1x0.01 mm, skeletal laths; clinopyroxene, 40%, 0.05x0.04 mm, anhedral; magnetite, 5–10%, skeletal; glass, 10–15%

Vesicles: 2–3%, 0.1x0.1 mm, scattered, with some filled with smectite near rock boundaries.

Alteration: Clays, <1%, filling voids

2-1, Piece 11–15 (Unit 3)

Dominant Lithology: Very fine-grained vesicular aphyric to sparsely plagioclase phyric basalt.

Macroscopic Description: Very fine- to medium-grained (Piece 11) vesicular aphyric to sparsely plagioclase phyric basalt. Vesicles are mostly empty with some partly coated with blue clay minerals or coated and filled with a brownish red infilling mineral.

SITE 506 HOLE H CORE (HPC) 1 CORED INTERVAL 26.1–34.1 m

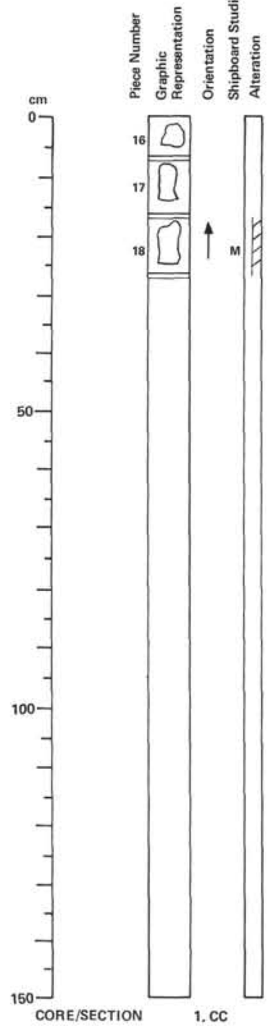
TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SILICO-FLAGELLATES	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
							CC						5GY 6/1 5BG 7/2

FORAMINIFER NANNOFOSSIL OOZE

Greenish gray to pale blue green foraminifer nannofossil ooze. The base of the Core-Catcher contains basalt fragments. They are black, aphyric basalt with small vesicles which are circular and void. A few of these vesicles are possibly rimmed with an infilling material.

SMEAR SLIDE SUMMARY (%)

COMPOSITION:	CC-4	CC-9	CC-10
Volcanic glass (light)	TR	–	–
Foraminifers	10	10	10
Calc. nannofossils	75	70	60
Diatoms	TR	–	–
Green clay	–	20	30



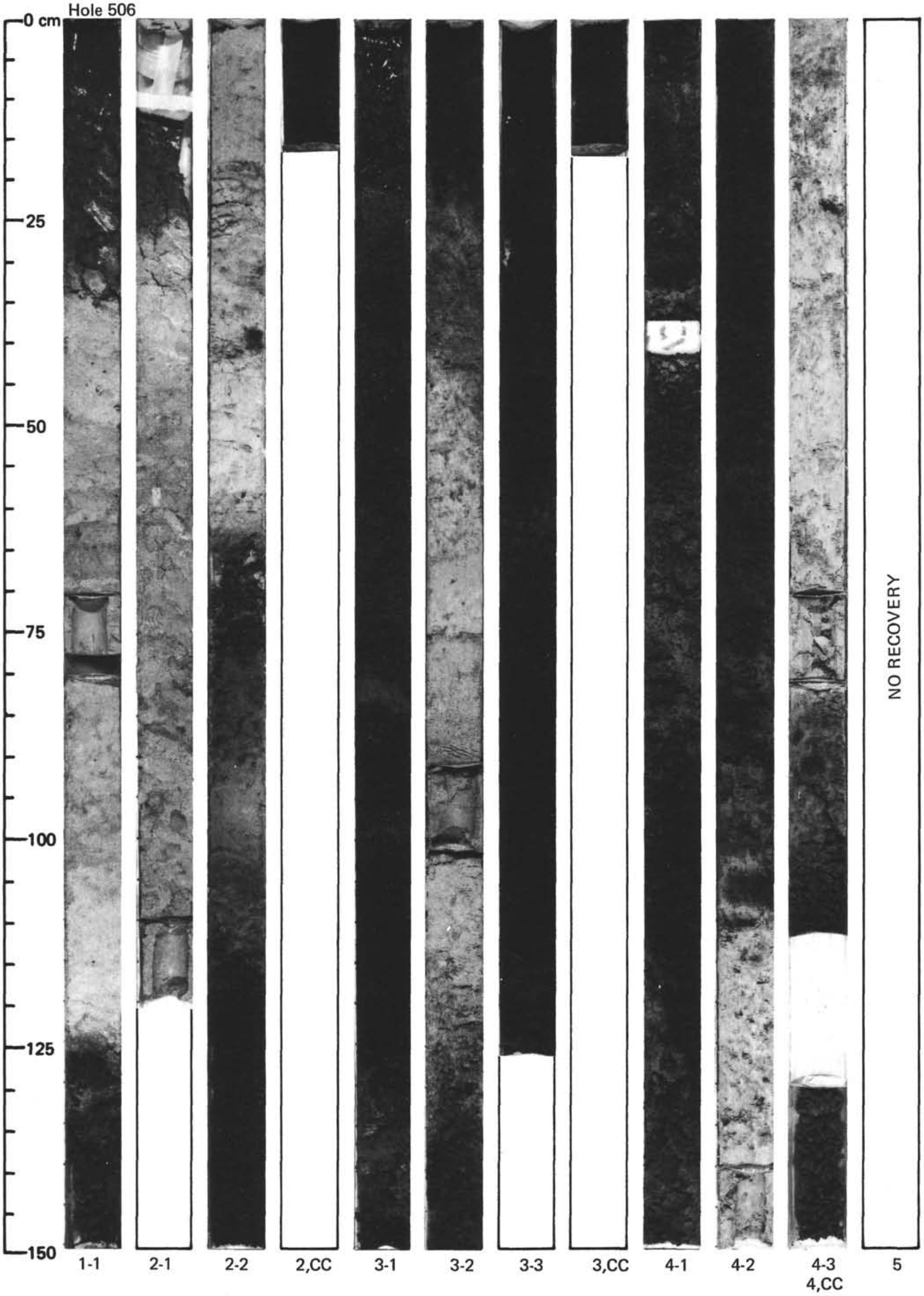
70-506I-1 Depth: 2743.0–2746.5 m (26.1–29.6 mBSF)

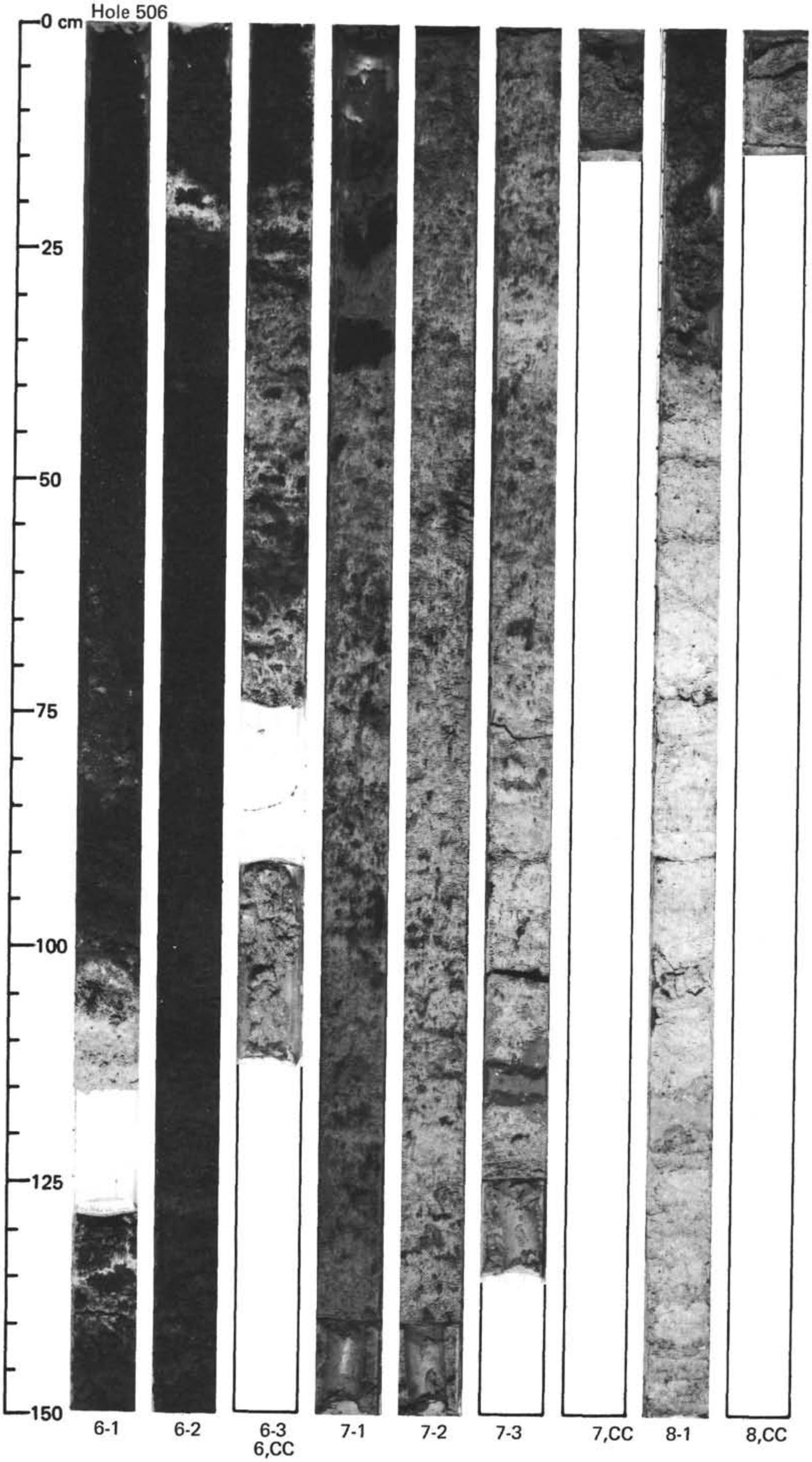
Piece Number

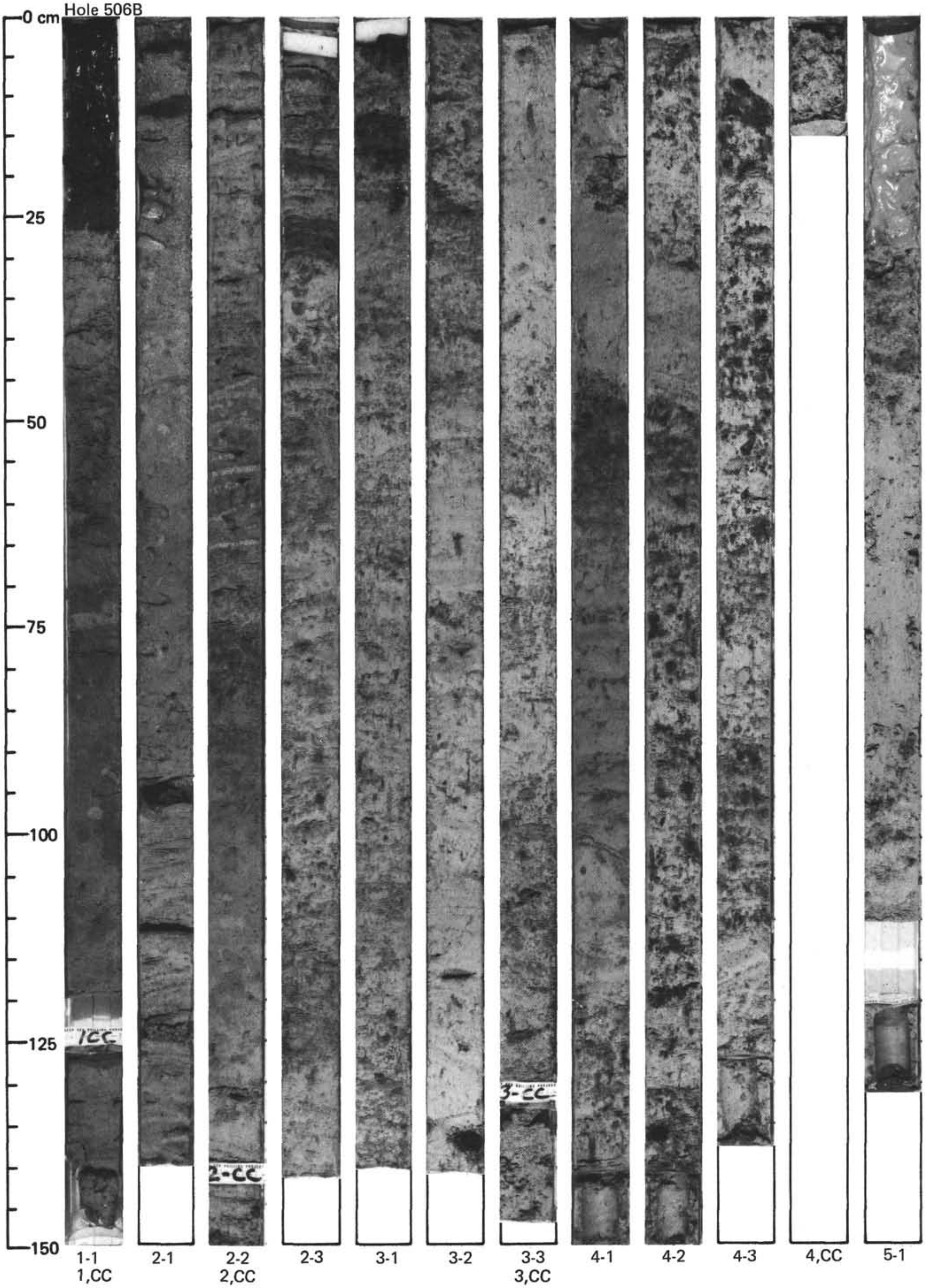
1, CC, Pieces 16–18

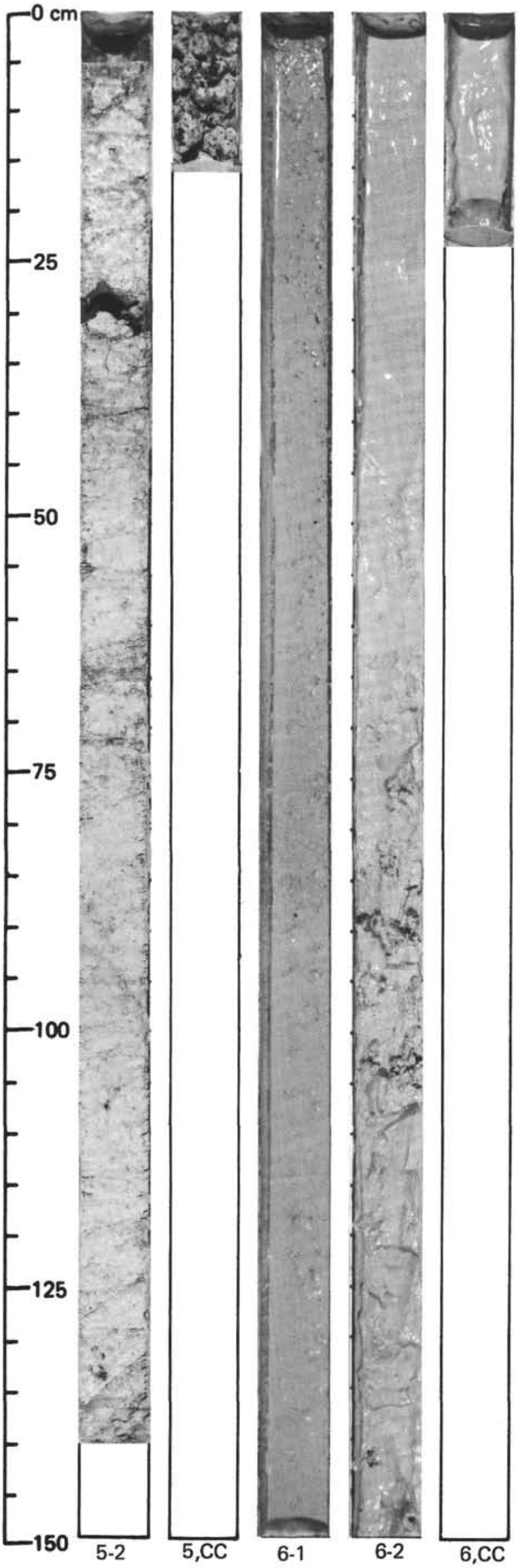
Dominant Lithology: Fine-grained vesicular, aphyric basalt.

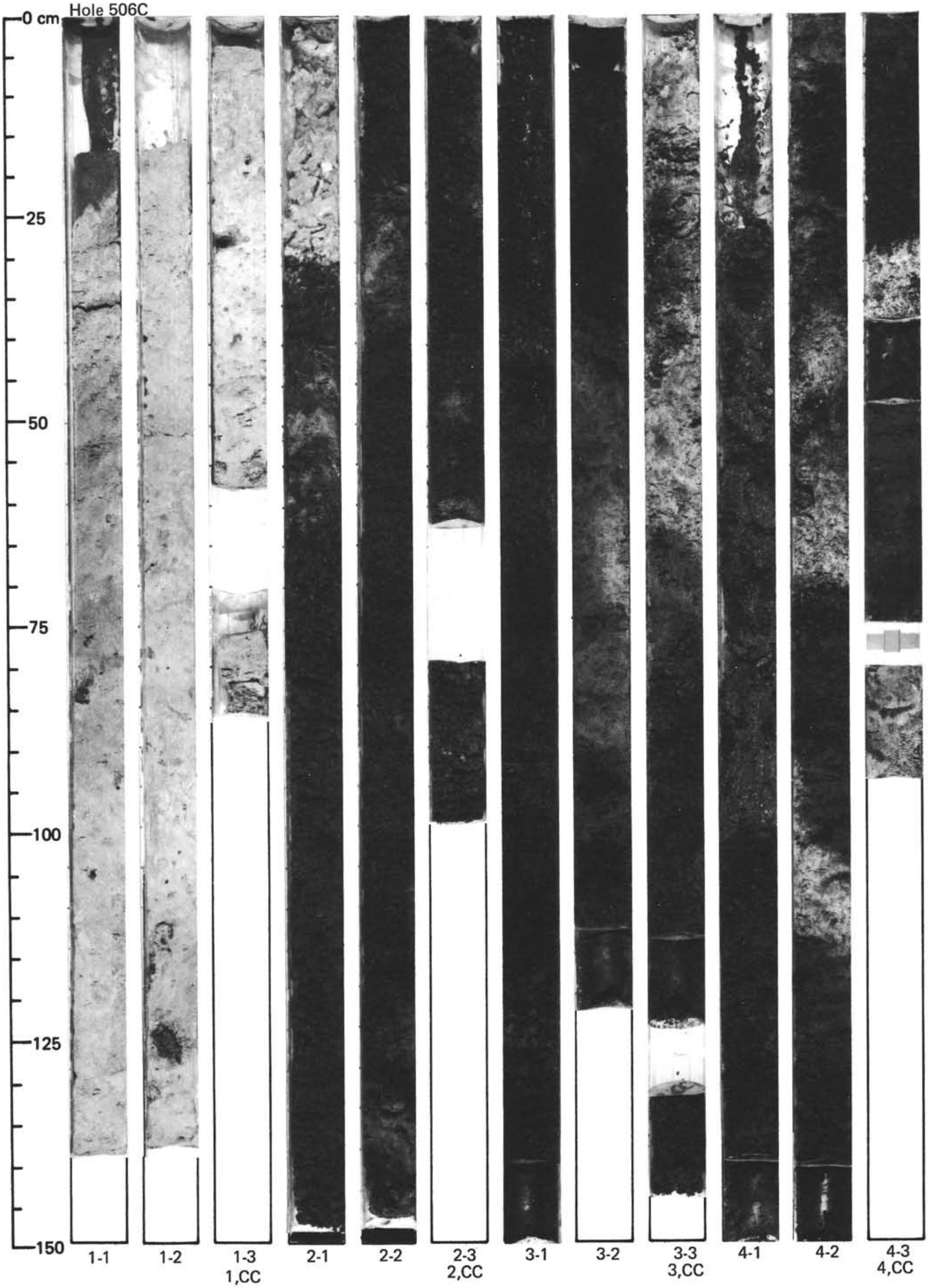
Macroscopic Description: Fine-grained vesicular aphyric basalt. Vesicles are coated with bluish-white mineral; others are coated with red brown rims or white glassy mineral. Pyrite occurs as a vesicle filling or coating in Piece 17.

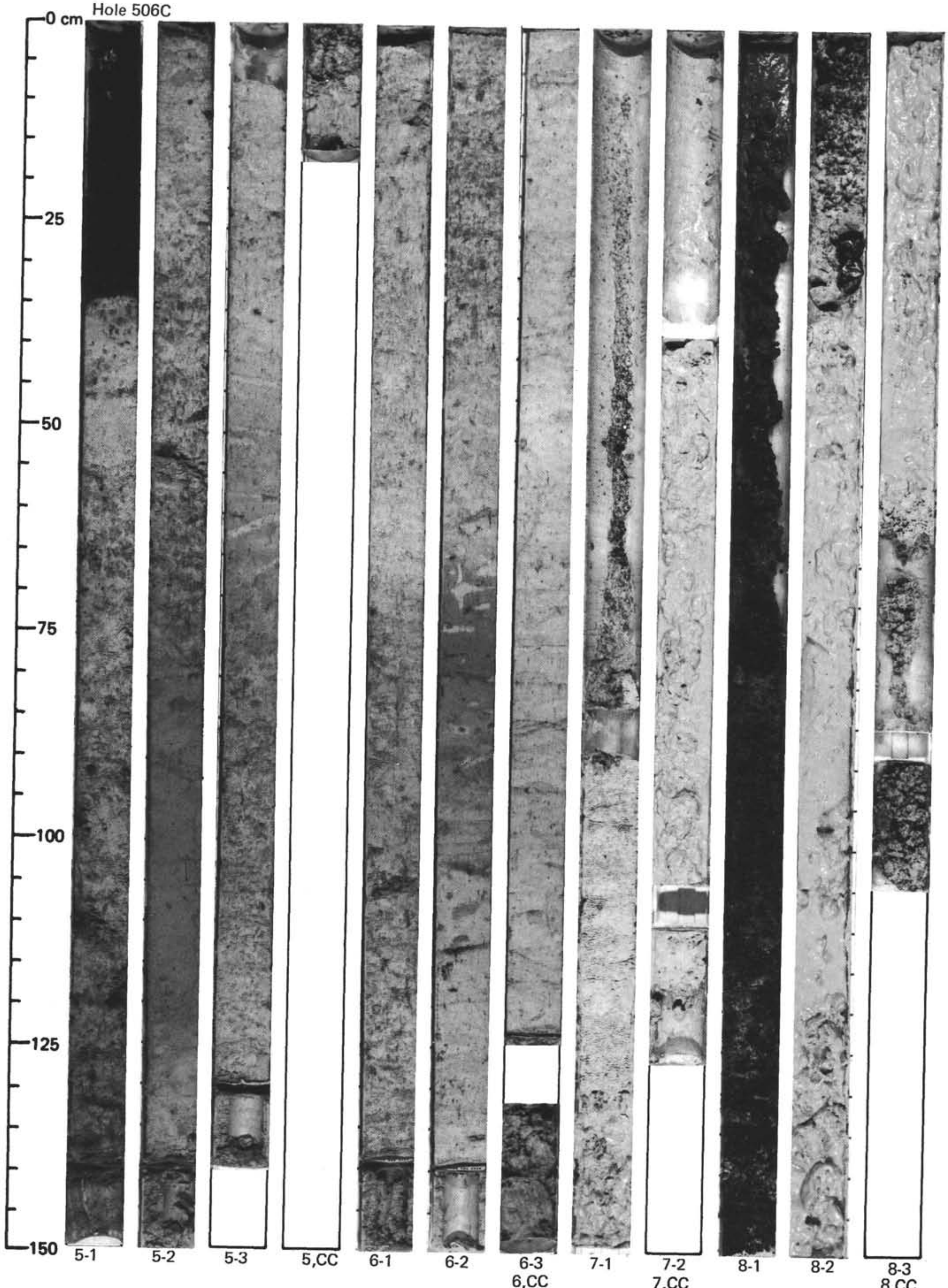

Hole 506
0 cm
25
50
75
100
125
150
1-1
2-1
2-2
2,CC
3-1
3-2
3-3
3,CC
4-1
4-2
4-3
4,CC
5
NO RECOVERY

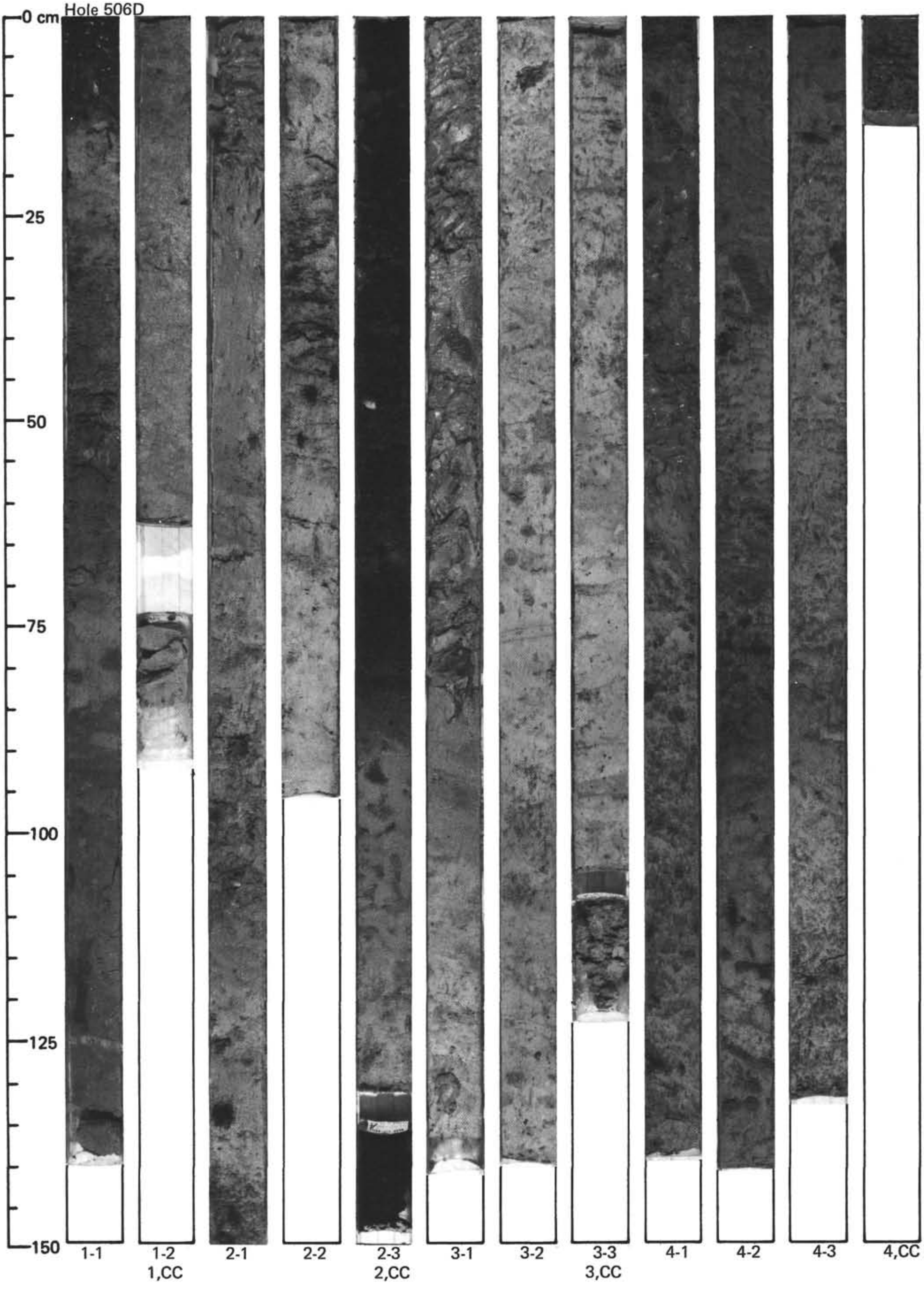

Hole 506
0 cm
25
50
75
100
125
150
6-1
6-2
6-3
6,CC
7-1
7-2
7-3
7,CC
8-1
8,CC

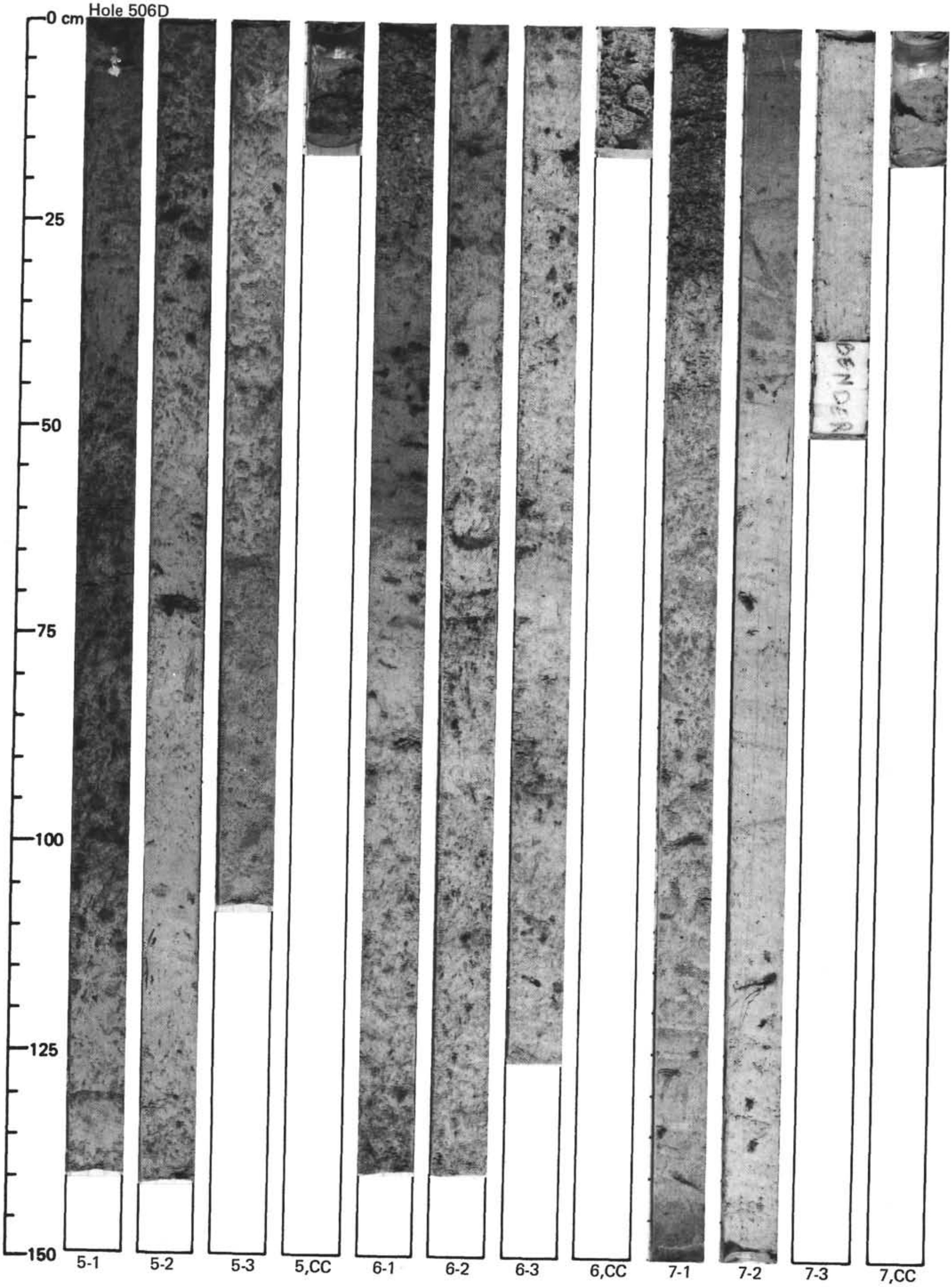

Hole 506B
0 cm
25
50
75
100
125
150
1CC
2-CC
3-CC
1-1
1,CC
2-1
2-2
2,CC
2-3
3-1
3-2
3-3
3,CC
4-1
4-2
4-3
4,CC
5-1


0 cm
25
50
75
100
125
150
5-2
5,CC
6-1
6-2
6,CC

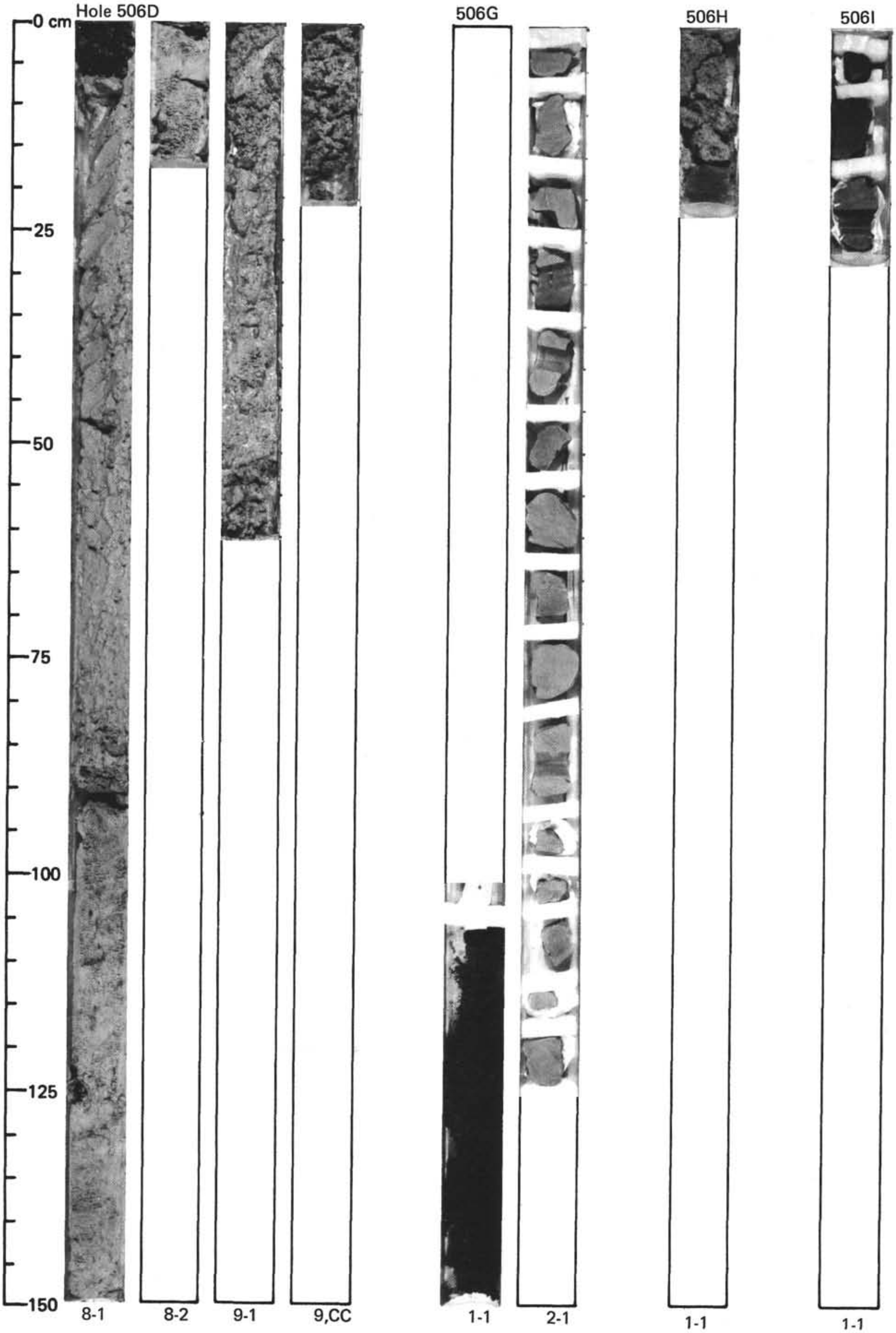

0 cm
Hole 506C
25
50
75
100
125
150
1-1
1-2
1-3
1,CC
2-1
2-2
2-3
2,CC
3-1
3-2
3-3
3,CC
4-1
4-2
4-3
4,CC


Hole 506C
0 cm
25
50
75
100
125
150
5-1
5-2
5-3
5,CC
6-1
6-2
6-3
6,CC
7-1
7-2
7,CC
8-1
8-2
8-3
8,CC


0 cm
Hole 506D
25
50
75
100
125
150
1-1
1-2
1,CC
2-1
2-2
2-3
2,CC
3-1
3-2
3-3
3,CC
4-1
4-2
4-3
4,CC



Hole 506D
0 cm
25
50
75
100
125
150
5-1
5-2
5-3
5,CC
6-1
6-2
6-3
6,CC
7-1
7-2
7-3
7,CC


0 cm
25
50
75
100
125
150
Hole 506D
8-1
8-2
9-1
9,CC
506G
1-1
2-1
506H
1-1
506I
1-1