3. SITE 503: EASTERN EQUATORIAL PACIFIC[1]

Shipboard Scientific Party[2]

HOLE 503

Date occupied: 6 September 1979

Date departed: 7 September 1979

Time on hole: 16 hr.

Position: 4°03.04′N, 95°38.21′W

Water depth (sea level; corrected m; echo-sounding): 3672

Water depth (rig floor; corrected m; echo-sounding): 3682

Penetration (m): 4.78

Number of cores: 1

Total length of cored section (m): 4.78

Total core recovered (m): 4.78

Core recovery (%): 100

Oldest sediment cored:
Depth sub-bottom (meters): 4.78
Nature: Siliceous marl
Age: Quaternary
Measured velocity (km/s): 1.5206

HOLE 503A

Date occupied: 7 September 1979

Date departed: 11 September 1979

Time on hole: 88.3 hr.

Position: 4°04.04′N, 95°38.21′W

Water depth (sea level; corrected m; echo-sounding): 3672

Water depth (rig floor; corrected m; echo-sounding): 3682

Penetration (m): 235.0

Number of cores: 54

Total length of cored section (m): 235.0

Total core recovered (m): 138.16

Core recovery (%): 58.8

Oldest sediment cored:
Depth sub-bottom (meters): 234.74
Nature: Siliceous nannofossil ooze
Age: late Miocene
Measured velocity (km/s): 1.5567
Shear strength (g/cm^2): 1119.75

HOLE 503B

Date occupied: 11 September 1979

Date departed: 13 September 1979

Time on hole: 52.0 hr.

Position: 4°03.02′N, 95°38.32′W

Water depth (sea level; corrected m; echo-sounding): 3672

Water depth (rig floor; corrected m; echo-sounding): 3682

Penetration (m): 112.8

Number of cores: 26

Total length of cored section (m): 112.8

Total core recovered (m): 94.17

Core recovery (%): 83.5

Oldest sediment cored:
Depth sub-bottom (meters): 111.12
Nature: Siliceous nannofossil ooze
Age: Lower Pliocene
Measured velocity (km/s): 1.5002
Shear Strength (g/cm^2): 247.5

BACKGROUND AND OBJECTIVES

Our primary objective at Site 503 (Fig. 1) was to recover a complete, undisturbed Neogene and Quaternary section in the eastern equatorial Pacific. Site 503 is located near Site 83 in an area that contains an almost continuous pelagic record of the past 10 m.y. (Hays et al., 1972). Unfortunately, Site 83 was only spot-cored, and the recovered sediment is so badly disturbed by rotary drilling that most of the detailed record is lost. The section has an average sedimentation rate of 2.0 to 2.5 cm/k.y. with good-to-moderate preservation of all the major microfossil groups. We returned to Site 83 to core the same section, using the Hydraulic Piston Corer (HPC) to obtain an undisturbed, continuous section for high-resolution stratigraphic studies.

The quality of these HPC cores, together with the data already collected at Site 502, should allow a high-resolution intercalibration of the Neogene and Quaternary magnetostratigraphy with both Atlantic and Pacific equatorial biostratigraphy. In addition, the evolution of equatorial microfossils throughout the late Neogene and Quaternary are now available for study in one section, with excellent time control. The detailed history

[1] Prell, W. L., Gardner, J. V., et al., *Init. Repts. DSDP*, 68: Washington (U.S. Govt. Printing Office).

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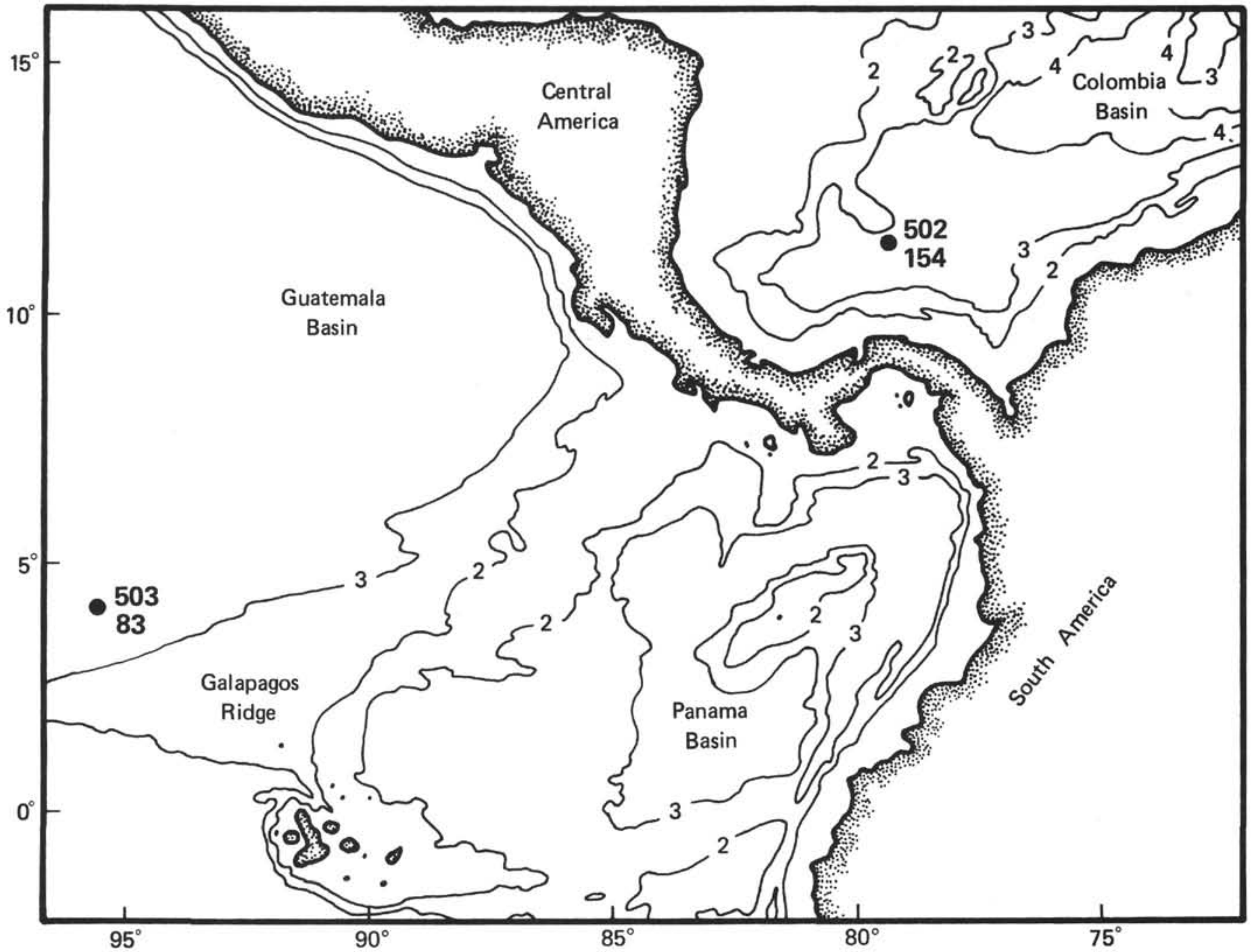


Figure 1. Location of Site 503 and Site 83 (Leg 9) in the eastern equatorial Pacific. Both sites lie on the north flank of the Galapagos Ridge within the symbol for Site 503.

of oceanographic conditions in this area, revealed by fluctuations in isotopes, calcium carbonate and opal contents, and faunal and floral assemblages, can now be studied. Sediment at Site 503, in combination with the data from Site 502, should also record changes in surface circulation and trade wind intensity. These sites also contain information on the timing of the closing of the Isthmus of Panama and initiation of Northern Hemisphere glaciation.

OPERATIONS

We departed Balboa, Panama, at 0012 hr. on 3 September 1979, deployed the geophysical gear at 0015 hr., and steamed toward the vicinity of Site 503 (Fig. 1). Our course paralleled that of *Glomar Challenger* Leg 9 (GC-9) from Site 83 (our destination) to Balboa, so we were able to follow our progress by referring to the GC-9 profiles (Fig. 2). Speed was reduced to 5 knots at 0305 hr. on 7 September because the seismic reflection profile closely resembled the profile over Site 83 (Fig. 2). We dropped the beacon at 0332 hr., retrieved the geophysical gear, and by 0400 hr. were stationed over the beacon. Site 503 is located at 4°04.4′N, 95°38.21′W at a water depth of 3672 meters (corrected), about 11 km east of Site 83. The track line of our approach and departure is shown in Figure 3. A summary of the drilling data is given in Table 1.

Core 1 from Hole 503 was retrieved on 7 September at 1430 hr. and was a full core. We raised the drill string 3.0 meters and started again so that the sediment/water interface would be recovered. We designated this second core Core 503A-1 and commenced coring Hole 503A. The operation was plagued with core catcher failures, especially with the flapper type, and core liner fracturing. We cored Hole 503A to a total depth of 235 meters (Core 54), then stopped to avoid piston coring basalt calculated to be at 240 meters. Recovery for Hole 503A was only 58.8%, principally because of core catcher failures. Rust contamination from the drill pipe was obvious once we started using pipe that had not been used at Site 502. This contamination caused a severe degradation of the paleomagnetic data.

Hole 503B was offset 100 meters to the southwest of Hole 503A and was cored continuously, again from

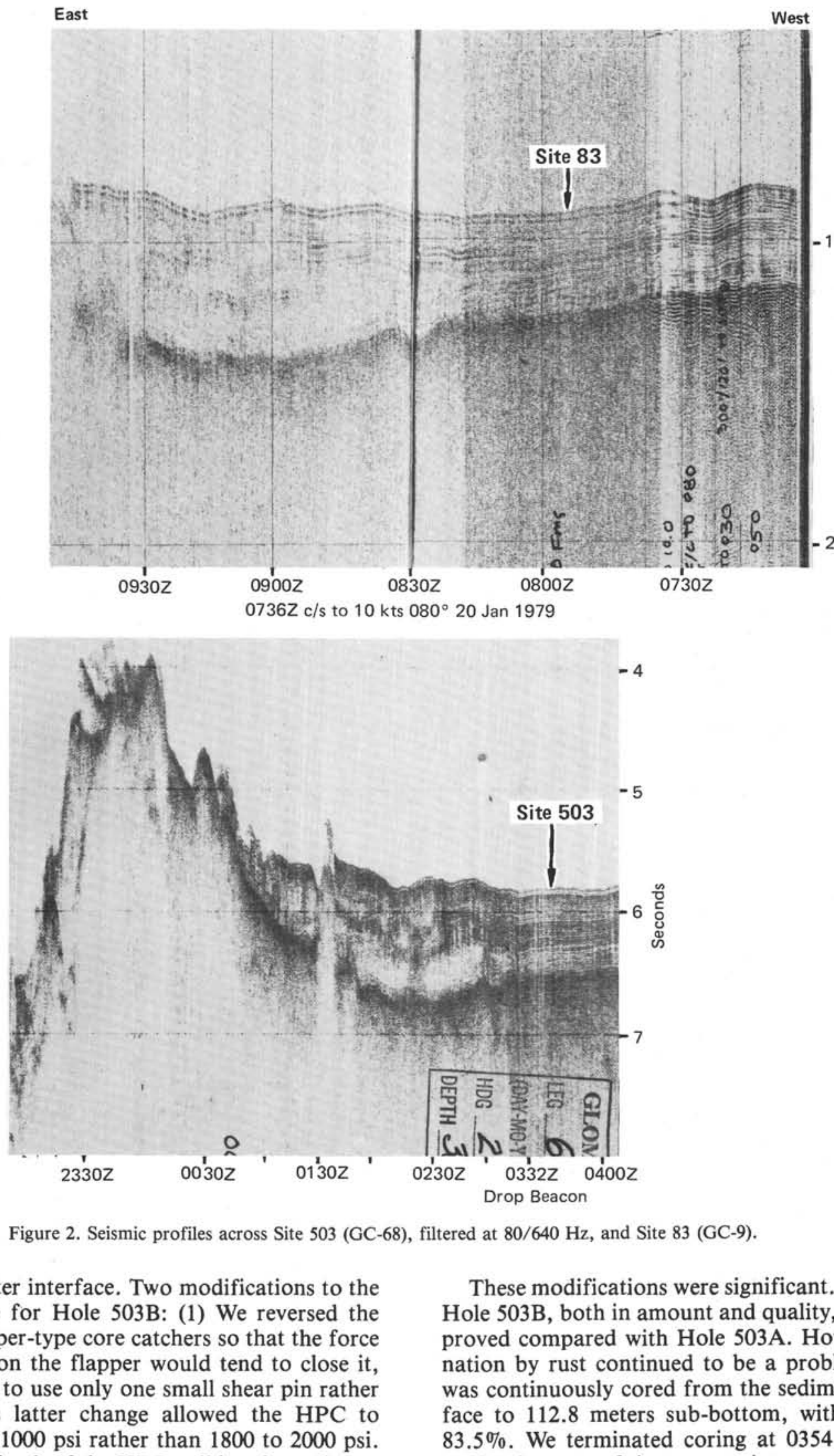


Figure 2. Seismic profiles across Site 503 (GC-68), filtered at 80/640 Hz, and Site 83 (GC-9).

the sediment/water interface. Two modifications to the HPC were made for Hole 503B: (1) We reversed the bevel on the flapper-type core catchers so that the force of the sediment on the flapper would tend to close it, and (2) we chose to use only one small shear pin rather than three. This latter change allowed the HPC to "fire" at 800 to 1000 psi rather than 1800 to 2000 psi. We felt that the shock of the HPC striking the sediment at a high velocity and its rapid deceleration at the end of the stroke may have caused some of the disturbance in Hole 503A.

These modifications were significant. The recovery at Hole 503B, both in amount and quality, was greatly improved compared with Hole 503A. However, contamination by rust continued to be a problem. Hole 503B was continuously cored from the sediment/water interface to 112.8 meters sub-bottom, with a recovery of 83.5%. We terminated coring at 0354 hr. on 13 September because of time constraints on our arrival in Salinas, Ecuador.

The geophysical gear was deployed by 1704 hr. on 13 September. We steamed to the northwest, then came

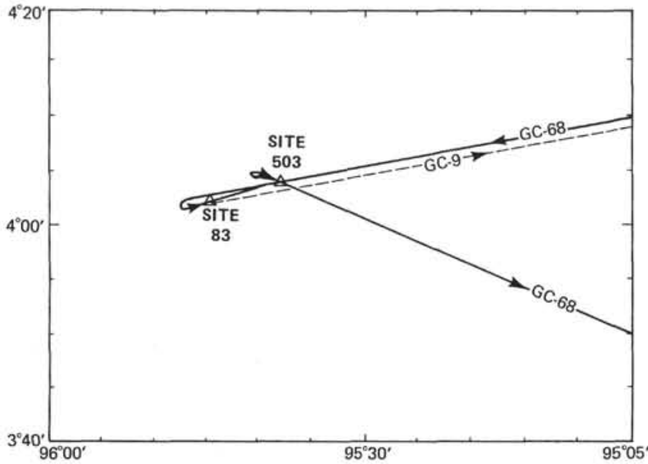


Figure 3. Approach and departure of GC 68 (solid line) from Site 503. Dashed track line is GC-9 departure from Site 83.

about and crossed over the beacon at Site 503 and continued on to the port of Salinas.

LITHOSTRATIGRAPHY

The section at Site 503 consists of one major lithologic facies that can be divided into three units. These units are defined on the basis of oxidation state and clay content of the sediment. The lithostratigraphic division of Site 503 and the ages of the units are given in Table 2. Smear slide summaries for major and minor lithologies are given in Table 3 (see Appendix, this chapter).

Major Lithofacies

The section at Site 503 is composed of three sediment types: (1) siliceous-bearing nannofossil marl, (2) calcareous siliceous ooze, and (3) siliceous nannofossil ooze. Slight variations in composition and microfossil preservation occur throughout the section but are not useful for subdivision. Color cycles, apparently with a uniform periodicity, are marked and occur throughout.

Unit A (0–8.45 m sub-bottom)

Unit A is composed of intervals of very dark grayish brown iron oxide- and silica-bearing nannofossil marl and calcareous-bearing siliceous ooze that alternates with light yellowish brown and very pale brown silica-bearing nannofossil marl and silica-bearing nannofossil ooze. Gradations between these sediment types are common. Burrows and mottles are common. Most color boundaries are gradational and/or burrowed, but some sharp boundaries occur near the base of darker lithologies.

Sediment in Unit A is uniform in composition. Clay is common (5–25%) to abundant (25–75%), but variation in clay content does not appear to correlate with color cycles. Foraminifers are common (5–25%) and moderately to poorly preserved. Nannofossils are abundant (25–75%), and diatoms and radiolarians are common (5–25%). Iron oxides are rare (1–5%) in the lighter-colored sediment and common (5–25%) in the darker-colored material. Sponge spicules, silicoflagellates, and volcanic glass sporadically occur in rare (1–5%) to trace (<1%) amounts.

Table 1. Coring summary for Site 503.

Core No.	Date (September 1979)	Time (hr.)	Depth from Drill Floor (m) Top Bottom	Depth below Seafloor (m) Top Bottom	Length Cored (m)	Length Recovered (m)	Recovery (%)
Hole 503							
1	7		3678.8–3083.0	0–4.4	4.4	4.78	108.6
Hole 503A							
1	7	1642	3679.9–3680.6	0–1.8	1.8	1.73	97.2
2	7	1823	3680.6–3685.0	1.8–6.2	4.4	3.76	85.5
3	7	2022	3685.0–3689.4	6.2–10.6	4.4	—	—
4	7	2203	3689.4–3693.8	10.6–15.0	4.4	3.15	71.6
5	7	2333	3693.8–3698.2	15.0–19.4	4.4	4.15	94.3
6	8	0123	3698.2–3702.6	19.4–23.8	4.4	0.02	cc only
7	8	0254	3702.6–3707.0	23.8–28.2	4.4	4.12	93.6
8	8	0417	3707.0–3711.4	28.2–32.6	4.4	—	—
9	8	0536	3711.3–3715.8	32.6–37.0	4.4	3.48	79.1
10	8	0705	3715.8–3720.2	37.0–41.4	4.4	3.64	82.7
11	8	0825	3720.2–3724.6	41.4–45.8	4.4	4.21	95.7
12	8	0947	3724.6–3729.0	45.8–50.2	4.4	3.85	87.50
13	8	1128	3729.0–3733.4	50.2–54.6	4.4	4.23	96.1
14	8	1305	3733.4–3737.8	54.6–59.0	4.4	3.26	74.1
15	8	1432	3737.8–3742.2	59.0–63.4	4.4	3.97	90.2
16	8	1605	3742.2–3746.6	63.4–67.8	4.4	3.06	69.5
17	8	1735	3746.6–3751.0	67.8–72.2	4.4	1.45	33.0
18	8	1850	3751.0–3755.4	72.2–76.6	4.4	0.06	1.4
19	8	2012	3755.4–3759.8	76.6–81.0	4.4	2.93	66.6
20	8	2315	3764.2–3768.6	81.0–85.4	4.4	4.35	98.9
21	7	2315	3764.2–3768.6	85.4–89.8	4.4	4.20	96.8
22	9	0047	3768.6–3773.0	89.8–94.2	4.4	—	—
23	9	0223	3773.0–3777.4	94.2–98.6	4.4	2.66	60.0
24	9	0342	3777.4–3781.8	98.6–103.0	4.4	4.10	93.4
25	9	0459	3781.8–3786.2	103.0–107.4	4.4	—	—
26	9	0630	3786.2–3790.6	107.4–111.8	4.4	—	—
27	9	0809	3790.6–3795.0	111.8–116.2	4.4	0.99	33.0
28	9	0953	3795.0–3799.4	116.2–120.6	4.4	—	—
29	9	1114	3799.4–3803.8	120.6–125.0	4.4	4.17	93.6
30	9	1300	3803.8–3808.2	125.0–129.4	4.4	2.86	69.3
31	9	1416	3888.2–3812.6	129.4–133.8	4.4	4.47	103.4
32	9	1529	3812.6–3817.0	133.8–138.2	4.4	0.70	17.0
33	9	1655	3817.0–3821.4	138.2–142.6	4.4	1.18	36.8
34	9	1927	3821.1–3825.8	142.6–147.0	4.4	3.56	88.2
35	9	2103	3825.8–3830.2	147.0–151.4	4.4	0.77	20.5
36	9	2240	3830.2–3824.6	151.4–155.8	4.4	3.38	78.6
37	9	2357	3834.6–3839.0	155.8–160.2	4.4	2.71	64.8
38	10	0126	3839.0–3843.4	160.2–164.6	4.4	0.06	1.6
38	10	0301	3843.4–3847.8	164.6–169.0	4.4	3.05	73.6
40	10	0420	3844.8–3852.2	169.0–173.4	4.4	1.01	30.9
41	10	0537	3852.2–3856.6	173.4–177.8	4.4	4.21	96.4
42	10	0954	3856.6–3861.0	177.8–182.2	4.4	3.99	91.1
43	10	1232	3861.0–3865.4	182.2–186.6	4.4	3.54	80.5
44	10	1354	3865.4–3869.8	186.6–191.0	4.4	3.97	90.2
45	10	1524	3869.8–3874.2	191.0–195.4	4.4	—	—
46	10	1652	3874.2–3878.6	195.4–199.8	4.4	1.15	26.1
47	10	1810	3878.6–3883.0	199.8–204.2	4.4	1.00	22.7
48	10	1940	3883.0–3887.4	204.2–208.6	4.4	3.65	83.0
49	10	2118	3887.4–3891.8	208.6–213.0	4.4	1.90	44.5
50	10	2304	3891.8–3896.2	213.0–217.4	4.4	4.35	98.9
51	11	0059	3896.2–3900.6	217.4–221.8	4.4	5.23	73.4
52	11	0215	3900.6–3905.0	221.8–226.2	4.4	3.86	87.7
53	11	0340	3905.0–3909.4	226.2–230.6	4.4	3.83	89.0
54	11	0508	3909.4–3913.8	230.6–235.0	4.4	4.15	94.3
Total					235.0	138.16	58.8
Hole 503B							
1	11	1048	3678.8–3681.6	0.0–2.8	2.8	2.64	94.3
2	11	1220	3681.6–3686.0	2.8–7.2	4.4	2.94	66.8
3	11	1342	3686.0–3690.4	7.2–11.6	4.4	4.35	99.61
4	11	1520	3690.4–3694.8	11.6–16.0	4.4	4.23	96.14
5	11	1702	3694.8–3699.2	16.0–20.4	4.4	4.19	95.23
6	11	1816	3699.2–3703.6	20.4–24.8	4.4	4.36	99.09
7	11	1925	3703.6–3708.0	24.8–29.2	4.4	4.20	95.45
8	11	2105	3708.0–3712.4	29.2–33.6	4.4	4.35	98.86
9	11	2231	3712.4–3716.8	33.6–38.0	4.4	0.34	7.72
10	12	0221	3716.8–3721.2	38.0–42.4	4.4	4.21	95.68
11	12	0356	3721.2–3725.6	42.4–46.8	4.4	4.57	103.8
12	12	0536	3725.6–3730.0	46.8–51.2	4.4	4.07	92.5
13	12	0707	3730.0–3734.4	51.2–55.6	4.4	3.65	83.86
14	12	0828	3734.4–3738.8	55.6–60.0	4.4	4.07	92.5
15	12	0959	3738.8–3743.2	60.0–64.4	4.4	4.29	97.5
16	12	1134	3743.2–3747.6	64.4–68.8	4.4	4.27	97.04
17	12	1252	3747.6–3752.0	68.8–73.2	4.4	3.98	90.45
18	12	1409	3752.0–3756.4	73.2–77.6	4.4	4.43	100.68
19	12	1630	3756.4–3760.8	77.6–82.0	4.4	3.71	84.32
20	12	1908	3760.8–3765.2	82.0–86.4	4.4	2.86	65.00
21	12	2029	3765.2–3769.6	86.4–90.8	4.4	4.71	107.05
22	12	2147	3769.6–3774.0	90.8–95.2	4.4	4.67	106.14
23	12	2330	3774.0–3778.4	95.2–99.6	4.4	1.17	26.59
24	13	0106	3778.4–3782.8	99.6–104.0	4.4	2.60	59.09
25	13	0230	3782.8–3787.2	104.0–108.4	4.4	2.60	59.09
26	13	0354	3787.2–3791.6	108.4–112.8	4.4	2.72	61.82
Total					112.8	94.17	83.5

Table 2. Lithostratigraphic summary for Site 503.

Unit	Hole	Core/Section	Depth Sub-bottom (m)	Age (m.y.)	Description
A	503 503A 503B	1-1 to 1,CC 1-1 to 2,CC 1-1 to 3,CC	0–8.45	0–0.4	Oxidized dark brown and orange silica-bearing-nannofossil marl alternating with calcareous-bearing siliceous ooze with manganese and iron oxides–hydroxides.
B	503A 503B	4-1 to 52,CC 3-1 to 26,CC	8.45–226.2	0.4–7.5	Reduced dark greenish to very pale greenish yellow silica-bearing nannofossil marl alternating with calcareous siliceous ooze gradational from dark at the top to light at the base. Clay content decreases downsection.
C	503A	53-1 to 54,CC	226.2–235.0	7.5–7.8	Reduced dark greenish to pale greenish yellow siliceous nannofossil marl alternating with calcareous–silica-bearing clay. Contains pyrite and greater than 25% clay.

The yellowish brown to brown silica-bearing nannofossil marl of Unit A overlies a pale olive silica-bearing nannofossil marl. We use this color change as the boundary between Units A and B.

Unit B (8.45–226.20 m sub-bottom)

Unit B is composed of silica-bearing nannofossil marl, calcareous siliceous ooze, and siliceous nannofossil ooze that contains small amounts of pyrite and has colors characteristic of reduced oxidation states. The unit has small-scale variations of both color and composition that have a range similar to the overall gradational trends in the section.

Color cycles in the uppermost part of the unit are in the green hue—from greenish black to light greenish gray. The colors lighten downsection, hues of yellow and yellow green beginning below 30 meters sub-bottom. Brownish hues appear below 170 meters sub-bottom as minor constituents of the total range in color; however, the overall aspect of the colors continues to lighten downsection.

Clay content in Unit B decreases with depth. Clay comprises less than 10% of the sediment in the dominant lithologies. Below 220 meters, clay content increases and exceeds 25% abundance below 226.2 meters, which marks the boundary with Unit C. Calcium carbonate content exhibits high-frequency fluctuations throughout the unit (see Gardner, this volume). Silica content is variable and does not show a consistent trend within the unit.

We chose the boundary between Units B and C where the clay content rapidly increased to more than 25%. The transition to over 25% clay abundance occurs between Cores 52 and 53 of Hole 503A at 226.2 meters sub-bottom.

Unit C (226.20–234.75 m sub-bottom)

Unit C is composed of siliceous nannofossil marl, silica-bearing nannofossil marl, and calcareous- and silica-bearing clay, all of which are enriched in clay in comparison to the overlying sediment. The colors of Unit C are somewhat darker than those of the overlying sediment. Clay is abundant (25–75%) but varies greatly. The proximity of the base of this unit to basement (we estimate the bottom of Hole 503A is within 10 m of oceanic crust) suggests that the clay may reflect a hydrothermal or thermal alteration of the sediment (see Baker, this volume). These basal clays are composed predominantly of smectite minerals (see Zimmerman, this volume). Foraminifers are rare (1–5%) to absent. Nannofossils are common (5–25%) to abundant (25–75%), and unspecified carbonate is common. Diatoms and radiolarians are uniformly common (5–25%). Minor amounts of pyrite, ash, and silicoflagellates make up the remainder of the sediment.

Discussion

The lithofacies at Site 503 have several interesting aspects. The abrupt change from reduced to oxidized sediment at 8.45 cm sub-bottom (see Frontispiece, this volume, and core photographs) is similar to that at Site 502 in the western Caribbean. The significance of this event is not well understood, but it apparently represents postdepositional reduction of the sediment. Clay minerals throughout the section are dominated by smectites that probably reflect halmyrolytic formation of the clays by convection of pore waters that are thermally driven. The large increase in clay mineral content in Unit C may reflect the proximity of altered basaltic rocks. Unit B has trace amounts of illite and rare amounts of chlorite and kaolinite, whereas abundant occurrences of chlorite and kaolinite and rare amounts of illite occur in Unit A. Smectite is still the dominant clay mineral; however, the small increase in detrital clay input may reflect a change in oceanographic current patterns in the Holocene.

Several horizons of dispersed ash occur throughout the section (see Ledbetter, this volume). The Miocene and lowermost Pliocene sections contain only trace amounts of ash at infrequent intervals. However, several lower Pliocene through Quaternary horizons contain abundant dispersed ash, with the greatest incidence in the uppermost Quaternary. The ash in the lowermost section is dominantly dark glass, whereas the upper section is dominated by light glass (see smear slide summary, Table 3).

Large nodules of microcrystalline rhodochrosite, $MnCO_3$, (Fig. 4) occur within Units B and C from 19.4 meters to the base of the section (last occurrence in Sample 503A-53-2, 13 cm at 227.8 m sub-bottom) (see Coleman et al., this volume). Semiindurated carbonate occurs around burrows at about 13 meters. The nodules are most abundant in the interval from 19.4 to 80 meters sub-bottom and appear to have formed around burrows. This relationship suggests that either the burrowing organism or the burrows themselves created a geochemical microenvironment favorable to the subsequent precipitation of rhodochrosite. Several nodules show not only the major burrow but additional burrows intersecting the major one.

Biogenic parts (briefly discussed and figured in the Site 502 chapter, this volume) appear scattered throughout the section in trace abundances. The most common element found is probably a hook from a squid arm (C. B. Miller, personal communication).

Bioturbation is common to abundant throughout the section (Figs. 5 and 6). Mottles commonly are "reaction

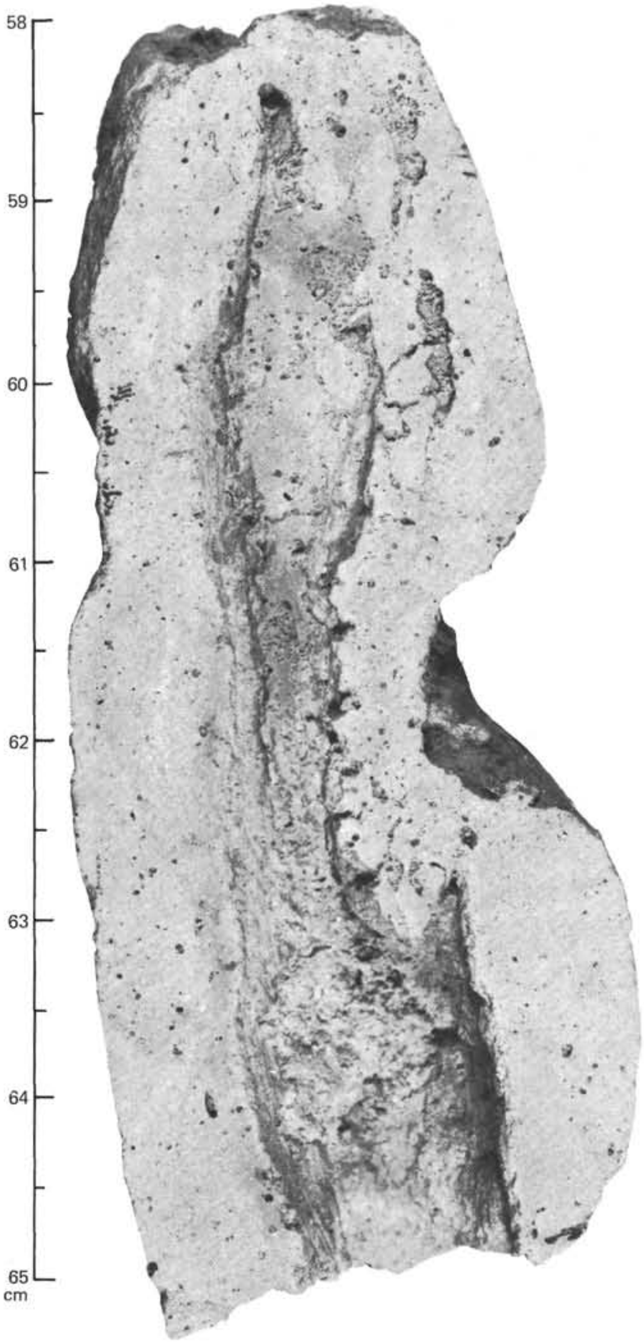


Figure 4. Rhodochrosite nodule from Sample 503B-2, 58-65 cm. The nodule apparently formed around a burrow.

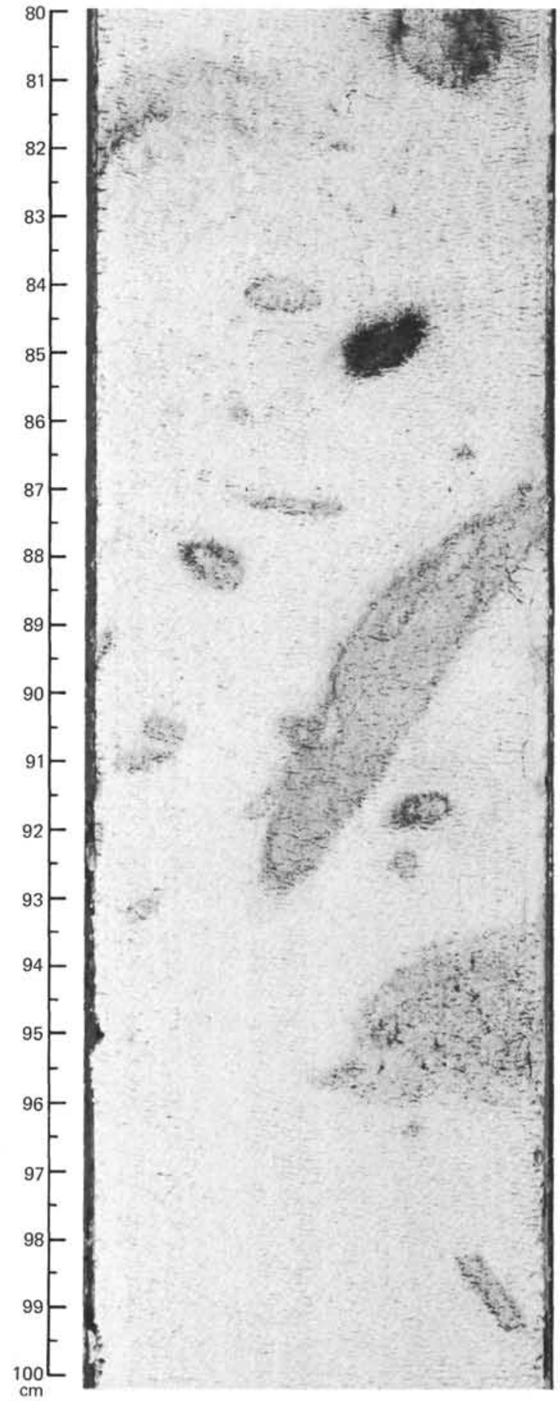


Figure 5. Example of undisturbed burrows in Sample 24A-2, 80-100 cm at approximately 100 meters sub-bottom. Little to no distortion occurs along the sides of the core.

rims" around burrows. In some instances, concentric millimeter-thick dark laminae enriched in pyrite encircle burrows. Intense bioturbation occurs in numerous intervals. Burrows are most evident at sharp color changes and they are very often pyritized. *Zoophycus* are common throughout the section. Open burrows are common in Unit B (Fig. 6) from 9.3 to 64 meters sub-bottom. These burrows have cemented walls that are generally pyritized. Fecal pellets occur in one burrow at 9.3 meters (Fig. 6).

Color cycles are a dominant feature of this section. The color changes reflect lithologic composition, especially carbonate content. We measured the lengths of the color cycles as the distance between the tops of consecutive layers of the same shade (Fig. 7). The lengths of the cycles in Hole 503A show a wide range that may reflect a change in sedimentation rates. A shift to longer cycles occurs at the bottom of Hole 503A (Fig. 7). A single strong mode occurs at 80 to 100 cm per color cycle down to 110 meters depth. This corresponds to a periodicity of 32 to 40 k.y. per cycle if we use an estimate of a 2.5

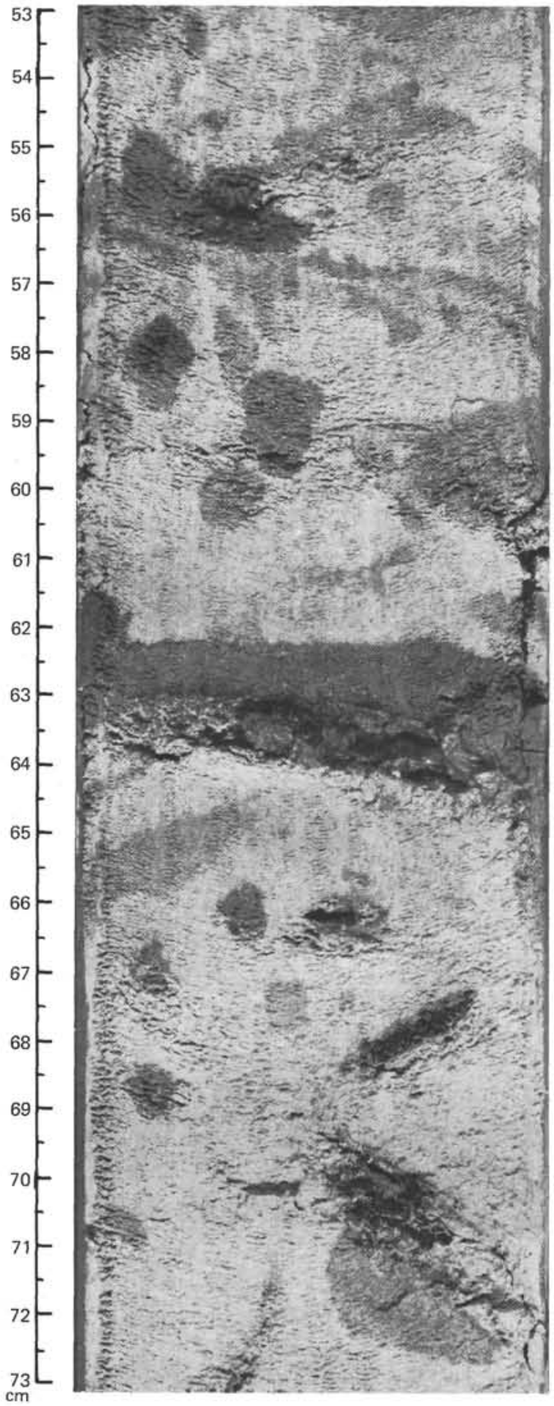


Figure 6. Open burrows and a burrow filled with fecal pellets in Sample 503B-3-2, 53–73 cm (approximately 9 m sub-bottom). These structures illustrate the undisturbed nature of HPC cores. See frontispiece, this volume, for a color photograph of these features.

cm/k.y., for the sedimentation rate. This estimate is slightly biased to shorter periodicities, because we ignored the layer at the top and the bottom of each core and the change of the longer rather than the shorter cycles straddling core breaks is greater. Carbonate content also shows a cyclic variation (Fig. 8) (Gardner, this volume), with periodicities similar to those of color cycles.

Our lithostratigraphic subdivision differs from that at Site 83 (Hays et al., 1972). The lithostratigraphy at Site 83 is subdivided into three formations (Clipperton Oceanic Formation, San Blas Oceanic Formation, and Line Island Oceanic Formation), and the San Blas Oceanic Formation is further subdivided into three units. Our subdivision of the section is compared to that of Site 83 in Table 4. Our Unit A can be correlated with the Clipperton Oceanic Formation. Unit B correlates roughly with the San Blas Oceanic Formation but differs in some aspects. We do not recognize the increased carbonate content in the upper section of our Unit B that was noted by Hays et al. (1972) in their Unit 1 of the San Blas Oceanic Formation. We also did not detect a change in the frequency of burrowing in our Unit B that had been noted in Unit 3 of the San Blas Oceanic Formation. The carbonate nodules that are so abundant at Site 503 apparently were not found at Site 83. We believe these differences are simply the result of the differences in quality of HPC versus rotary-drilled samples. Our Unit C correlates to an unrecovered interval above the Line Islands Oceanic Formation at Site 83. Site 503 did not penetrate a facies that correlates to the Line Islands Oceanic Formation at Site 83.

PHYSICAL PROPERTIES

Standard DSDP methods (Boyce, 1976, 1977) were used for the analyses of physical properties at Site 503 (see Introduction and Explanatory Notes for details). Zones of obvious sediment disturbance were not sampled or analyzed. Vane shear and penetrometer measurements were made on split cores. One sample per core (usually from Section 2) of known volume was taken and sealed with rubber cement. A 2-minute GRAPE count was run on these subsamples. They were then refrigerated in sealed containers to await additional analysis ashore. A detailed discussion of the results appears in Mayer (this volume).

Low values of shear strength occur in the uppermost section at Site 503 (Fig. 9). The expected increase of shear strength with depth, however, occurs only to a depth of about 15 meters, where a value of about 400 gm/cm^2 occurs. Shear strength below this depth remains fairly constant but with small variations down to about 210 meters sub-bottom. Shear strength rapidly increases at about 210 meters to a maximum of 1686 g/cm^2 at 224 meters. The lack of an increase in shear strength with depth in the upper 200 meters of the sediment column implies that the sediment is extremely undercompacted. This is consistent with the associated high porosities and water contents. The cause of the undercompaction may be the high percentage of biogenous silica. The spiney biogenous tests may mechanically interlock to form a supporting framework. The small variations about the mean in shear strength may be due to subtle lithologic changes. The rapid increase in shear strength at 210 meters probably reflects the increase in the clay content (see Lithostratigraphy) together with the collapse of the interlocking framework due to the weight of the overburden, the dissolution and

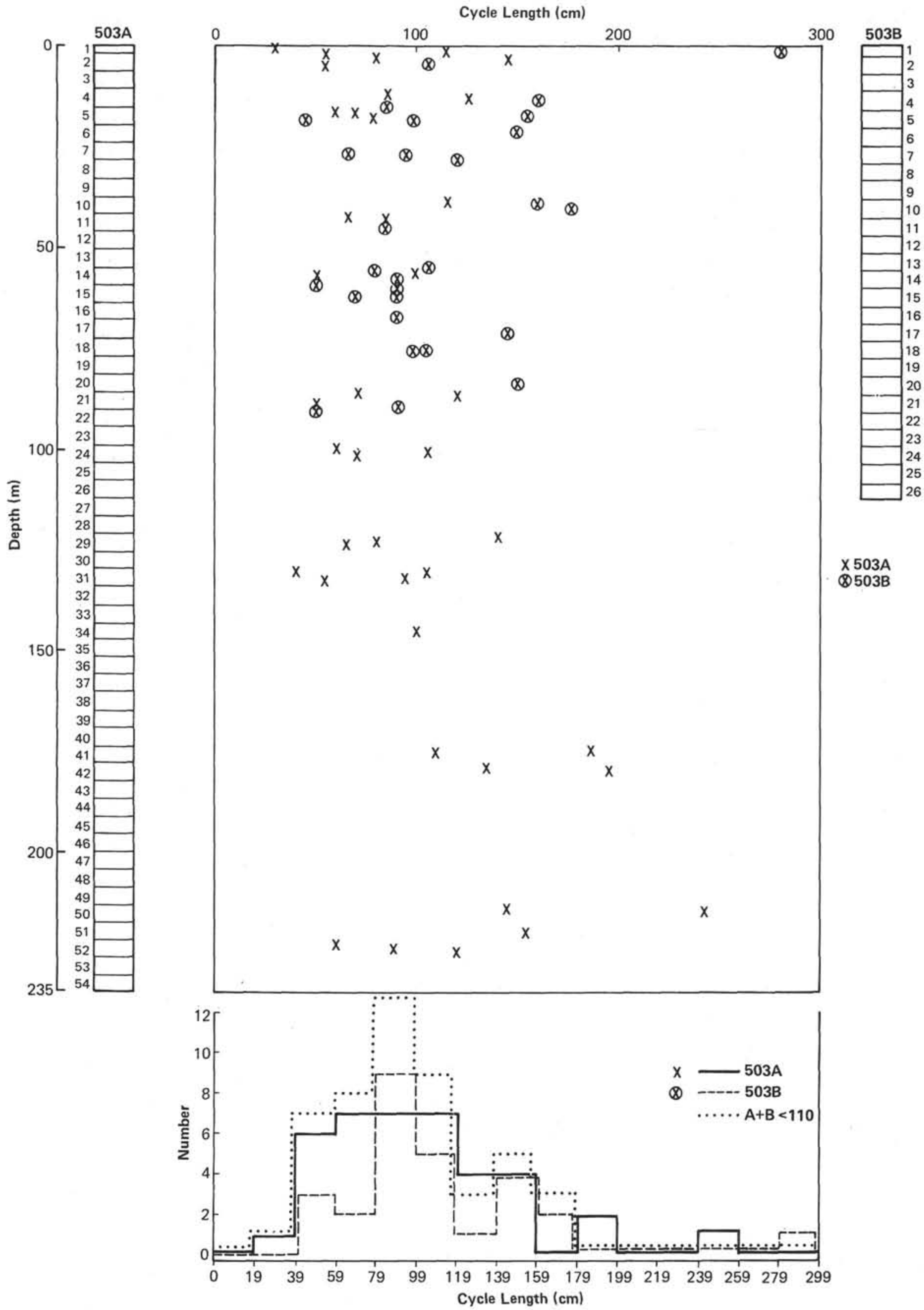


Figure 7. The distribution of the length (cm) of color cycles versus sub-bottom depth (m) in Holes 503A and 503B. A histogram of cycle length is also shown. Note the strong mode at 80–100 cm for the combined data at depths less than 110 meters.

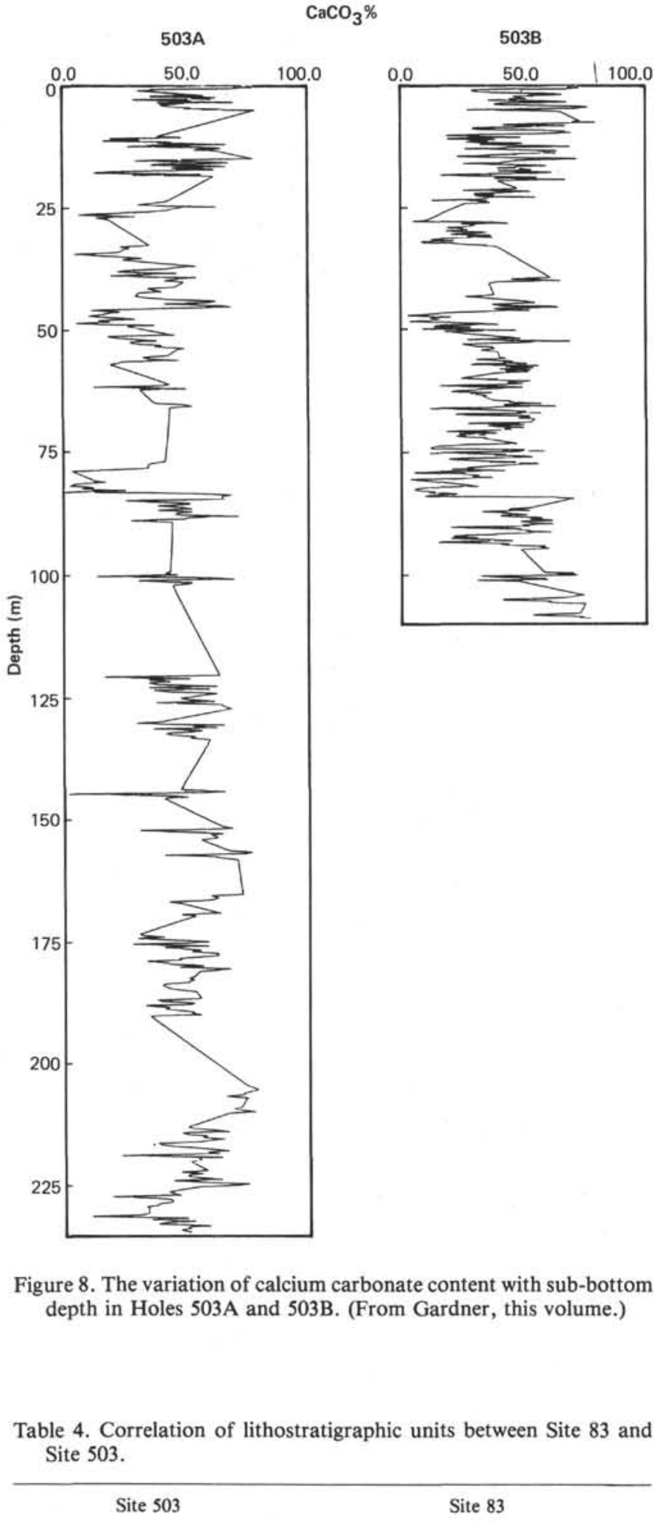


Figure 8. The variation of calcium carbonate content with sub-bottom depth in Holes 503A and 503B. (From Gardner, this volume.)

Table 4. Correlation of lithostratigraphic units between Site 83 and Site 503.

Site 503 Lithostratigraphic Unit	Site 503 Depth (m)	Site 83 Lithostratigraphic Unit	Site 83 Depth (m)
Unit A	0–8.5	Clipperton Oceanic Fm.	0–12.6
Unit B	8.5–226.2	San Blas Oceanic Fm.	12.6–222
		Unit 1	12.6–49.6
		Unit 2	49.6–150.0
		Unit 3	150.0–222.0
Unit C	226.2–235	Line Islands Oceanic Fm.	232.9–234.4

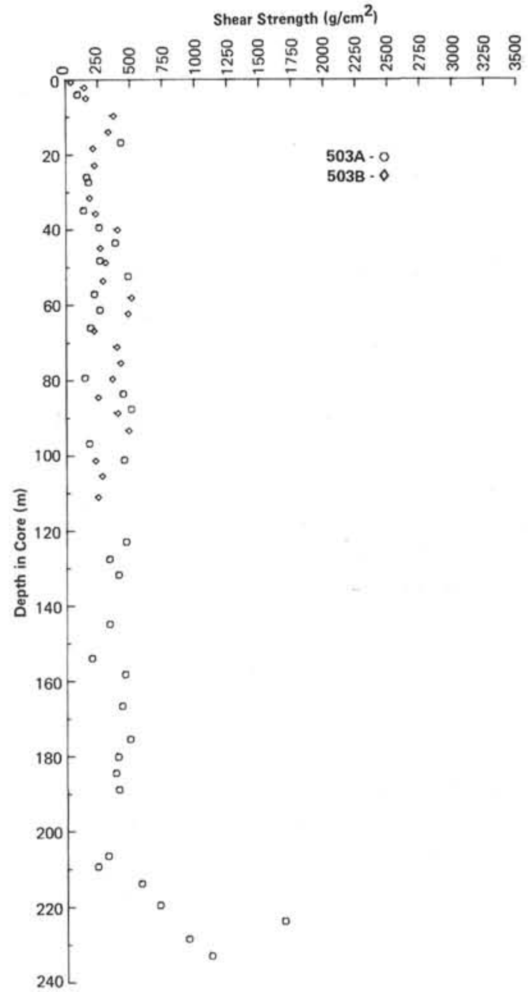


Figure 9. The variation of shear strength (g/cm^2) with sub-bottom depth in Holes 503A and 503B.

reprecipitation of silica, or possibly a thermal effect caused by proximity to basement. Biostratigraphy virtually eliminates a major hiatus at this depth.

In order to place the vane shear measurements in the proper perspective, shear strengths were determined on several calibration samples. Each sample was run ten times with the utmost of care. The shear strength of day-old Jewish rye bread dough (without seeds) was found to be 47.53 g/cm^2. Cream cheese proved to have a strength of 66.13 g/cm^2. Ginger cookie dough had values of 70.26 g/cm^2. A value could not be determined for lime jello, probably because of the large pineapple inclusions interspersed throughout the host material. Several attempts were made to measure the shear strength of chocolate chip cookie dough, but in each case the cookies were eaten before a measurement could be made.

The penetrometer data (Fig. 10) also indicate that the section is undercompacted, although the data seem to be slightly more sensitive to small amounts of compaction that have occurred. The general trend shows a very gentle decrease in penetration down to about 210 meters after a rapid decrease from very high (>4.4 cm) values

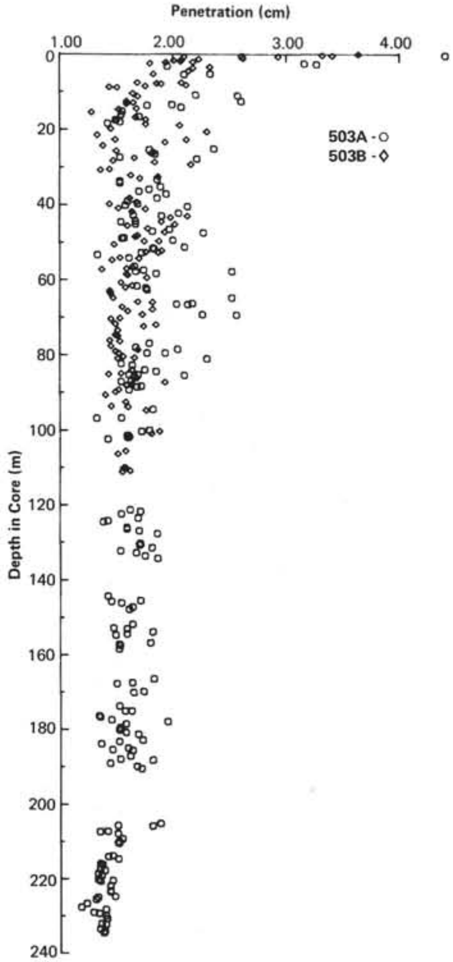


Figure 10. The variation in penetrometer penetration (cm) with sub-bottom depth in Holes 503A and 503B.

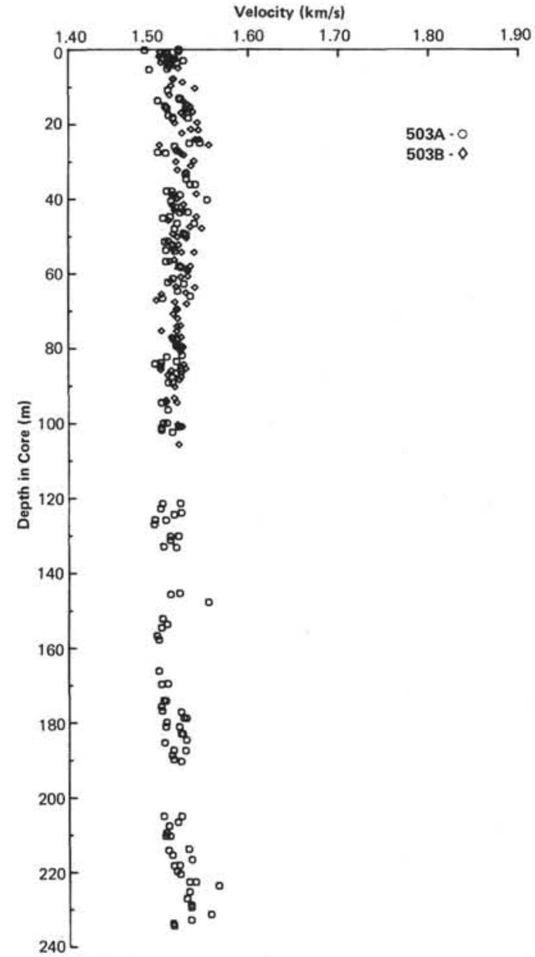


Figure 11. The variation in seismic velocity (km/s) with sub-bottom depth for Holes 503A and 503B.

in the uppermost sediment. Very large-scale, high-frequency fluctuations in penetration are superimposed on this trend. These fluctuations appear to be the result of lithologic variations. High-frequency fluctuations end below 210 meters sub-bottom, and penetration values drop below about 1.4 cm. This drop in values coincides with the zone of increased shear strength.

P-wave velocities were measured both through the liner and on chunk samples. The velocity values are extremely low ($V_p = 1.515$ km/s) and are typical of highly siliceous sediment. The velocity curve (Fig. 11) is characterized by high-frequency, low-amplitude fluctuations. The total range in values (1.495–1.570 km/s) is only slightly greater than the precision of any one measurement (5%), and we thus conclude that the velocity fluctuations are insignificant. This constant velocity may in part explain the absence of sub-bottom reflections on the 3.5 kHz profiles. The velocity baseline appears to increase to 1.54 km/s below 210 meters sub-bottom. This increase coincides with the increase in shear strength and clay content discussed earlier.

Density, water content, and porosity were determined by gravimetric analyses and continuous and 2-minute GRAPE counts. Low densities (Fig. 12) and high porosities and water contents occur throughout the section (Fig. 13). These data are also consistent with the extremely undercompacted nature of the section. Minimum densities of 1.13 g/cm^3 are found between 30 and 50 meters sub-bottom, and maximum densities of 1.37 g/cm^3 are found between 205 and 220 meters sub-bottom. Interestingly, the densities decrease in the deepest samples, where shear strength and velocity increase. The lack of a coincident increase in density in the bottom ten meters of the section may imply that the shear strength and velocity increases are due to a small increase in clay content or a thermal effect.

SEISMIC CORRELATION

On the approach to Site 503, the *Glomar Challenger*'s seismic array consisted of a 40 in.^{3} and a 5 in.^{3} airgun that were fired at 10-s intervals. Records were made at 10-s sweep filtered at 80/160 Hz and at 5-s delayed sweep filtered at 80/640 Hz. The 3.5-kHz profiler was in operation, but the record is of such low quality that it cannot be used for high-resolution studies of the section.

P-wave velocities on individual samples from Site 503 give an average velocity of 1.510 km/s. No intervals of high velocity or even a gradual increase in velocity occur

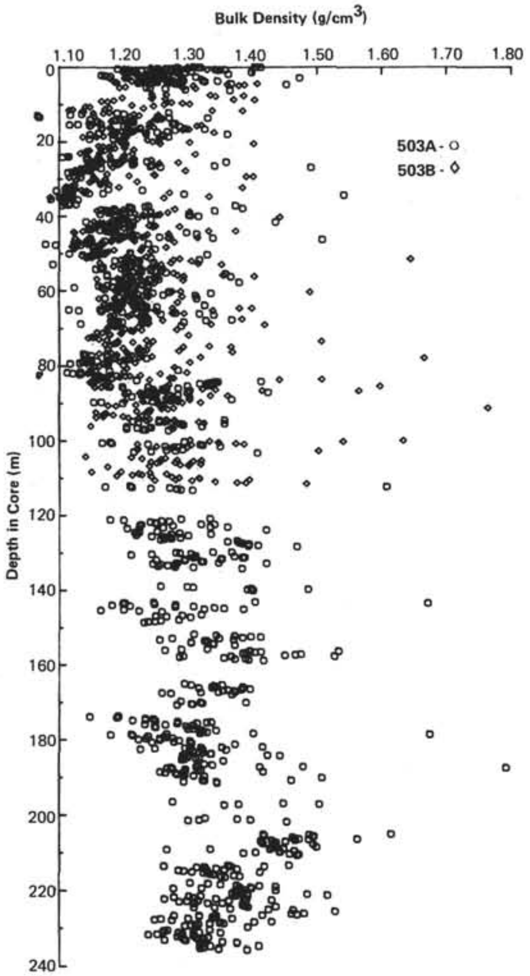


Figure 12. The variation in saturated bulk density (g/cm³) with sub-bottom depth for Holes 503A and 503B.

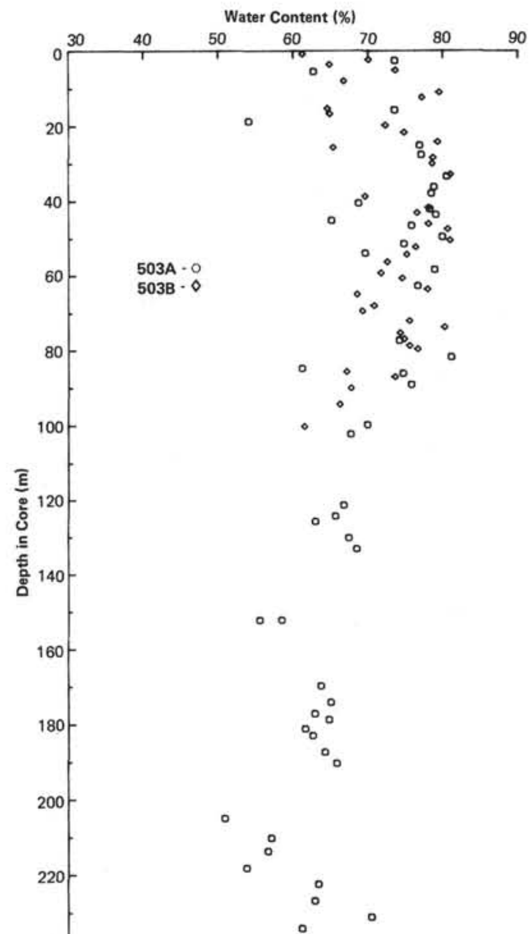


Figure 13. The variation of water content (%) with sub-bottom depth in Holes 503A and 503B.

with depth in the section (Fig. 11). Therefore, we use a constant 1.510 km/s to convert the time record to a depth section (Fig. 14).

Four acoustic units can be defined on the seismic profiles. Acoustic Unit 1, from 0 to 16 meters, is an acoustically transparent section that contains one reflector. Acoustic Unit 2, from 16 to 178 meters, is uniformly stratified with almost no variation in the distances between internal reflectors. Acoustic Unit 3, from 178 to 240 meters, differs from Acoustic Unit 2 in that the interval reflectors are not so uniformly spaced. Acoustic Unit 4 is basaltic basement, based on the results from Site 83 (Hays et al., 1972).

A rough correlation is observed between the acoustic units and the lithostratigraphic units (Fig. 14). However, the boundary between Acoustic Units 2 and 3 does not coincide with the boundary between Lithostratigraphic Units B and C.

BIOSTRATIGRAPHY

Sediment recovered at Site 503 represents a relatively complete section from the Quaternary through the upper part of the upper Miocene. The sediment contains both calcareous and siliceous microfossils that are sufficiently numerous and well preserved to permit us to compare the biostratigraphy of all major planktonic groups. However, several problems became apparent. Nannofossils are affected by dissolution in the Quaternary section. Reworking obscures some of the stratigraphically significant events near the Pliocene/Pleistocene boundary, in the lower Pliocene, and throughout the Miocene. Foraminifers are rarely well preserved or abundant and require the treatment of large samples to obtain sufficient number of specimens. Diatoms are rare and poorly preserved in the Quaternary section but are somewhat better preserved in the Pliocene and become abundant and very well preserved in the Miocene section. This good preservation and an assemblage dominated by forms characteristic of the present Peru-Chile Current implies high silica productivity during the Miocene. Radiolarians are somewhat corroded and sparse in several cores near the Pliocene/Pleistocene boundary and show some reworking of Miocene species into the entire section.

The Pliocene/Pleistocene boundary occurs in the upper part of Core 503A-9 and the upper part of Core 503B-10 if it is defined by the extinction of *Discoaster brouweri*. But the boundary is higher (Cores 503A-7 and 503B-7) if it is defined by foraminiferal, radiolarian, or

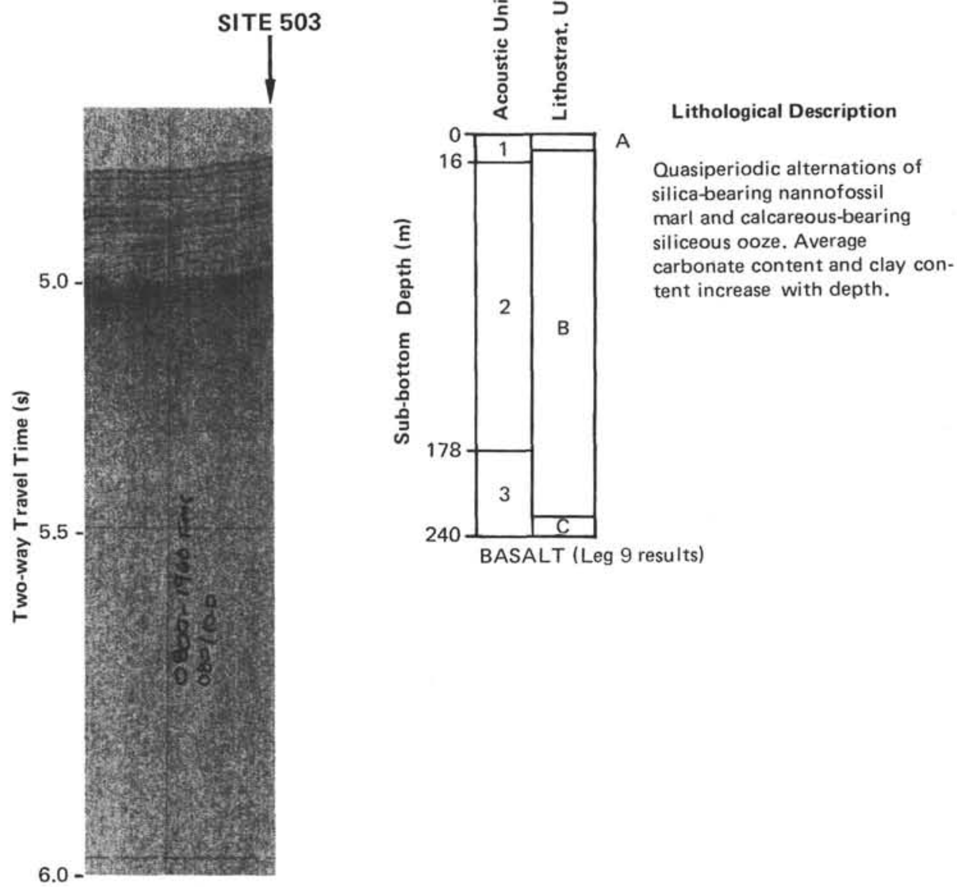


Figure 14. Seismic profile (GC68) was filtered at 80/640 Hz. The correlation with acoustic and lithostratigraphic units at Site 503.

diatom datums. Poor sediment recovery and scarcity of various marker species combine with reworking to make the precise determination of the Pliocene/Pleistocene boundary difficult. We subdivided the Pliocene into early and late intervals at the last appearance of the planktonic foraminiferal genus *Sphaeroidinellopsis* (Samples 503A-20-2, 50 cm and 503B-19-2, 75 cm). The Miocene/Pliocene boundary at Site 503 is defined by the first appearance of *Globorotalia tumida* in Sample 503-37,CC. Details of the diatom, radiolarian, calcareous nannofossil, and foraminiferal zonations are given in the following and are summarized in Figures 15 and 18.

Calcareous Nannofossils

The section at Site 503 contains most of the nannofossil zones from early late Miocene to Quaternary age. Marked variations in abundance and preservation of nannofossils occur throughout the section, so that several datums cannot be precisely determined. Reworking of Miocene and Pliocene forms was noted throughout the section. A detailed discussion of the distribution of Plio-Pleistocene calcareous nannofossils at Site 503 is found in Rio (this volume). Here, we summarize the shipboard biostratigraphy of the calcareous nannofossils, with emphasis on epoch boundaries (Figs. 15 and 18).

Biostratigraphic subdivision of the Quaternary section is hampered by poor preservation of nannofossils. However, all zones except the *Emiliania huxleyi* Acme and the small *Gephyrocapsa* Zones (Gartner, 1977) are recognized at Site 503. A short interval just above the uppermost occurrence of *Helicopontosphaera sellii* (Samples 503A-5-2, 108 cm to 503A-5-3, 48 cm; Cores 503B-2, 40 cm to 503B-3, 40 cm) in which no large *G. oceanica* were found may represent the small *Gephyrocapsa* Zone. A few reworked discoasters of Miocene and Pliocene age are found near the base of the Quaternary.

The Pliocene/Pleistocene boundary as defined by the last occurrence of the nannofossil *Discoaster brouweri* is somewhat difficult to determine in this section because of reworking. Therefore we defined the boundary by the first consistent downcore occurrence of *D. brouweri*, which is located between Samples 503A-9-1, 108 cm and 503A-9-2, 48 cm and between Samples 503B-10-1, 40 cm and 503B-10-2, 40 cm. The succession of discoaster extinctions in the upper Pliocene was easily determined (see Fig. 15). However, in the lower Pliocene, the top of the *D. tamalis* Zone (Samples 503A-13-3, 48–108 cm; 503B-13-2, 40 cm to 503B-13-3, 40 cm) is difficult to determine because of the sparsity of this species at the top of its range. The *Reticulofenestra pseudoumbilica* and *D. asymmetricus* zones could not be differentiated in this section because of the rarity of *Amaurolithus tricorniculatus*, which is used to define the top of the *D. asymmetricus* Zone. However, the base of the *D. asymmetricus* Zone occurs between Samples 503A-26,CC and 503A-27,CC in Hole 503A and between 503B-21,CC and 503B-22,CC in Hole 503B.

The Miocene/Pliocene boundary is placed at the last consistent occurrence of *D. quinqueramus* (Core 503A-33) at a sub-bottom depth of approximately 138 meters. Considerable reworking of nannofossils is apparent at this boundary, as shown by specimens of *D. quinqueramus* that occur as high as Core 503A-31.

Almost all of the Miocene sequence falls into the *D. quinqueramus* Zone (see Fig. 15). *A. primus* is found intermittently to Core 503A-49, at a depth of approximately 208 meters. We found a moderately well-preserved flora at the base of Hole 503A that includes *D. neorectus*. *D. neorectus* was also found at about 185–190 meters sub-bottom but is probably reworked. A downward decrease in abundance and preservation also characterizes this interval.

Planktonic Foraminifers

Planktonic foraminifers are present in nearly all samples but are rarely abundant because of carbonate dissolution and dilution by siliceous microfossils. For these reasons, examination of large samples (about 30 cc) of core catcher material was often necessary. Despite this difficulty, important zonal marker species are sufficiently abundant and well preserved to use a modified version of the foraminiferal zonation developed for the eastern equatorial Pacific (Jenkins and Orr, 1972). A summary of the foraminiferal biostratigraphy is shown in Figures 15 and 18. A detailed discussion of the Neogene biostratigraphy, including the precise location of specific datums and zonal boundaries and the biogeography of planktonic foraminifers, is given in Keigwin (this volume).

The Pliocene/Pleistocene boundary at Site 503, as placed by the first appearance of *Globorotalia truncatulinoides*, is found between Samples 503A-7,CC and 503A-9,CC in Hole 503A and in Sample 503B-8,CC in Hole 503B. Jenkins and Orr (1972) defined the Pliocene/Pleistocene boundary by the last occurrence of *Globigerinoides fistulosus*, but we found this datum to be inconsistent and difficult to locate precisely. We place the early/late Pliocene boundary at the last appearance of genus *Sphaeroidinellopsis* at Core Sample 503A-20-2, 50 cm in Hole 503A and at 503B-19-2, 75 cm in Hole 503B. Jenkins and Orr (1972), however, appear to define their early/late Pliocene boundary by the last occurrence of *Sphaeroidinellopsis subdehiscens* (several meters lower than the last appearance of *S. seminulina*). The last appearance of *Sphaeroidinellopsis* at Site 503 is close to the first appearance of *G. fistulosus* (Samples 503A-20-1, 100 cm; and 503B-19-1, 75 cm). Consequently, the early/late Pliocene boundary is actually marked by two datums.

The Miocene/Pliocene boundary at Site 503 is based on the first appearance of *Globorotalia tumida* (Sample 503A-37,CC), which has been shown to be a reliable marker (Saito et al., 1975). The Miocene/Pliocene boundary at Site 83 is based on the boundary between the nannofossil zones *Ceratolithus rugosus* and *C. tricorniculatus* (Hays et al., 1972) and is about 30 meters shallower than the Miocene/Pliocene boundary defined by planktonic foraminifers at Site 503.

Several planktonic foraminiferal datums that may be useful for subdividing the upper Miocene occur at Site 503 (see Keigwin, this volume). The last appearance of *Globoquadrina dehiscens* (Sample 503A-33,CC), which is rare at Site 503, occurs near the Miocene/Pliocene boundary and is a useful marker for that boundary. The genus *Pulleniatina* first appears in Hole 503A, Sample 503A-38,CC, preceded by an interval of sinistral *Neogloboquadrina acostaensis* between about 187–191 meters. These datums appear more distinct and stratigraphically useful in the Pacific than they are in the Caribbean. The last occurrence of *Globigerinoides bulloideus* found in Panama Basin DSDP Sites 84 and 158 (Keigwin, 1976) occurs in Hole 503A in Sample 503A-40,CC at 169.90 meters sub-bottom. This extinction may provide an important horizon for correlating Caribbean and eastern equatorial Pacific sequences. The age of basal sediments is estimated to be about 8 m.y.

Silicoflagellates

Neogene silicoflagellates at Site 503 are especially abundant and well preserved in Miocene Cores 503A-30 to 54, but Pliocene assemblages in Cores 503A-12 to 30 are less abundant and contain increased numbers of dissolution-thinned specimens. A full description of the silicoflagellate Neogene zonation, evolution, and systematics appears in Bukry (this volume). Here, we summarize the biostratigraphy, with emphasis on epoch and zonal boundaries.

The base of the *Dictyocha stapedia* Zone occurs in the upper lower Pliocene at Sample 503A-19-2, 124–125 cm. The base of the late Miocene–early Pliocene *D. fibula* Zone is defined by the Asperoid/Fibuloid reversal of *Dictyocha*. Unfortunately, the detailed counts made possible by the HPC sediments reveal six reversals of the Asperoid/Fibuloid ratio through the previously described interval of the *D. fibula* Zone. Hence the ratio is not a consistent criterion for the zonal boundary. Likewise, the top of the *D. brevispina* Zone cannot be established because reversals of the Asperoid/Fibuloid ratio indicate that the *D. fibula* Zone occurs as deep as Core 503A-54. The assemblages are diverse, and several new species are found (Bukry, this volume). The increased detail of the HPC record suggests that the upper Miocene zonation is not unique and that the Asperoid/Fibuloid ratio is quite variable.

Diatoms

Diatoms are rare and poorly preserved throughout the Quaternary section at Site 503 (Cores 503A-1 through 503A-8 and 503B-1 through 503B-8), common and well preserved in the Pliocene section (Cores 503A-9 through 503A-32 and 503B-9 through 503B-26), and abundant and very well preserved in the upper Miocene section (Cores 503A-32 through 503A-54). The upper Miocene

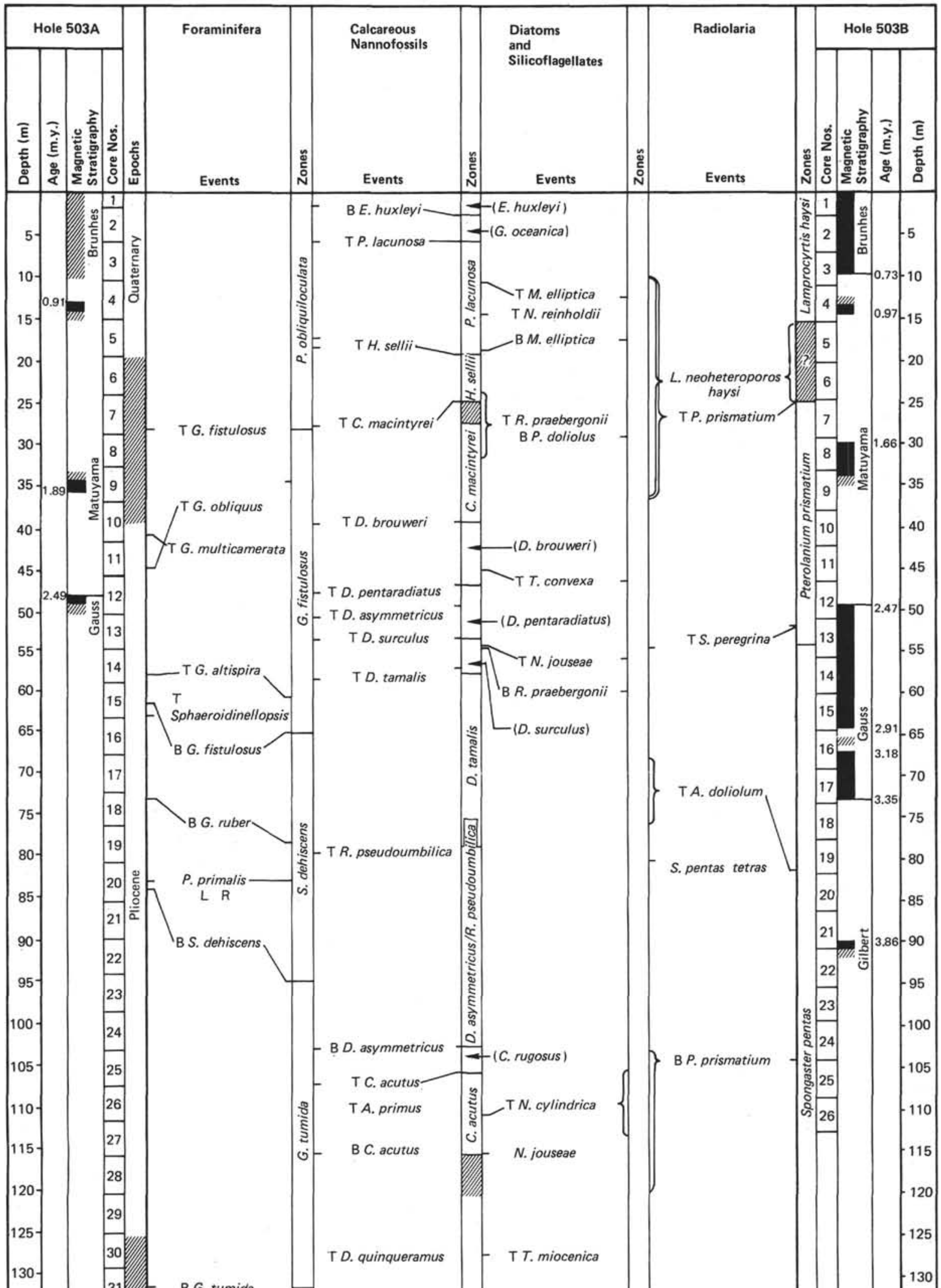
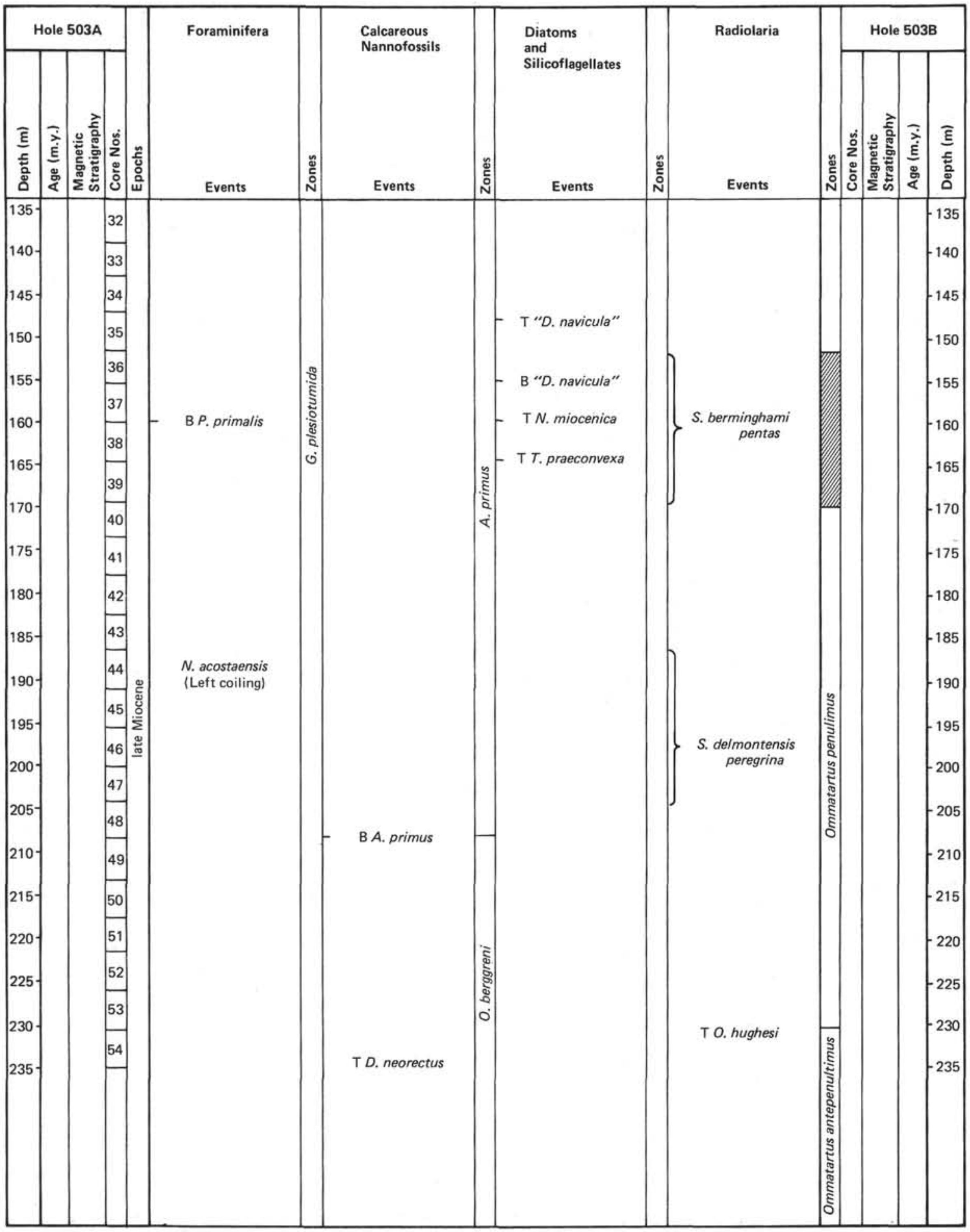


Figure 15. Biostratigraphic summary of Site 503.



T (for "top") indicates upper limits of ranges, and B (for "bottom") lower limits. Substantial ranges of uncertainty (longer than the length of one core) are indicated in the "Events" columns by braces (}), and elsewhere by hachuring. Positions indicated on the left side of each " Event " column refer to Hole 503A, and indications on the right side refer to Hole 503B.

Figure 15. (Continued).

interval is dominated by the genera *Thalassionema* and *Thalassiothrix*. This group is the major diatom component in Holocene sediment that underlies the Peru–Chile Current (Burckle, personal communication). The abundance of this group in upper Miocene sediment may imply significant upwelling and productivity during the late Miocene. A summary of the diatom biostratigraphy is shown in Figures 15 and 18. Here, we define only the epoch boundaries at Site 503. A detailed study of the diatom biostratigraphy, including the location of species datums and zonal boundaries in Holes 503A and 503B, is given in Sancetta (this volume).

The Pliocene/Pleistocene boundary as defined by Burckle (1977) occurs between the last appearance of *Rhizosolenia praebergonii* Samples (503A-7-3, 48 cm and 503B-7-2, 40 cm) and the first occurrence of *Pseudoeunotia doliolus* (503A-9-2, 102 cm and 503B-10-1, 40 cm). The Miocene/Pliocene boundary as defined by Burckle (1978) coincides with the last appearance of *Thalassiosira miocenica* (Sample 503A-33,CC). Slight but consistent reworking (10% of stratigraphically useful species) appears in the lower Pleistocene, and significant reworking (up to 80% of stratigraphic markers) appears in the lowermost Pliocene (Cores 503A-30 and 503A-31). The reworked flora in both intervals is composed of late Miocene species.

Radiolarians

Radiolarians are well preserved and common throughout the sediment from Holes 503A and 503B but are less common and somewhat corroded in some samples from Cores 503A-4 to 503A-9 and 503B-6 to 503B-10. Reworking of Miocene radiolarians occurs in Cores 503A-1 through 503A-29 and 503B-1 through 503B-13. The amount of reworking is generally small but approaches 20% in samples from Cores 503A-4, 5, 7, 10, and 11 and 503B-3, 6, and 7. Reworked faunas represent more than 50% of the assemblage in Cores 503A-7, 9, and 503B-8.

A summary of the radiolarian biostratigraphy is shown in Figures 15 and 18. Here, we present only the epoch boundaries at Site 503. A detailed summary of the Neogene radiolarian biostratigraphy, including the specific location of radiolarian events and zones, is given in Riedel and Westberg (this volume).

The top of the *Pterocanium prismatium* Zone, which is considered to be approximately the Pliocene/Pleistocene boundary, is placed between Core Samples 503A-7-2, 50–54 cm, and 503A-7-3, 50–54 cm. This boundary occurs in the same interval in Hole 503B. The Pliocene *P. prismatium* Zone occurs between Samples 503A-13-3, 50–54 cm and 503A-7-3, 50–54 cm in Hole 503A and between 503B-14-2, 50–54 cm and 503B-7-3, 50–54 cm in Hole 503B. The Pliocene *Spongaster pentas* Zone occurs between Samples 503A-31-2, 50–54 cm and 15-2, 66–70 cm in Hole 503A and from the base of Hole 503B to Sample 503B-14-2, 50–54 cm.

We place the Miocene/Pliocene boundary near the evolutionary transition from *S. berminghami* to *S. pentas* that takes place between Samples 503A-31-3, 50–54 cm and 503A-34-2, 50–54 cm. Hole 503A penetrated the late Miocene *Didymocyrtis penultima* Zone (Samples 503A-44-3, 50–54 cm to 503A-34-2, 50–54 cm) and reached the top of the *D. antepenultimus* Zone (Samples 503A-54-3, 52–55 cm to 503A-48-2, 50–54 cm).

PALEOMAGNETISM

The paleomagnetic measurements at Site 503 followed the procedure described in the paleomagnetics discussion of the Site 502 chapter (this volume). Each core was measured with the long-core spinner magnetometer at 10-cm intervals, and one or more discrete samples were taken from each 1.5-meter section for measurement on the small-sample spinner magnetometer.

We encountered several problems at Site 503 that degraded the quality of the magnetic data. The most serious problem is the presence of rust scale from the drill pipe. The dark scales of rust are concentrated at the top of each core but also are smeared inside the liner to several meters depth even in otherwise undisturbed portions of the core. The rust scale is highly magnetic and consequently, when present, obscures the magnetic properties of the sediment.

The rust scale is a serious problem in Hole 503A but less so in Hole 503B. Site 503 was deeper than 502, and drill pipe was deployed that had not been used for several months. The relative contribution of the rust contamination to the magnetic measurements is accentuated at Site 503 because of remanent intensities of about 40 (10^{-5}) emu. Generally, long-core magnetic data from at least the topmost 1.5-meter section of most cores could not be used because of the high noise level.

In contrast to these difficulties, various modifications to the corer between Sites 502 and 503 greatly improved core-to-core orientation. There was also greater attention to handling cores on deck to minimize relative rotation between core sections as well as disturbance of this less cohesive sediment. These improvements in part offset the problem of the rust scale, particularly in Hole 503B. The combination of long-core and discrete sample measurements allows us to recognize the gross features of magnetostratigraphy to the middle of the Gilbert Chron, approximately the top 100 meters of the section. Sediment magnetism below approximately 130 meters sub-bottom (near the Miocene/Pliocene boundary) becomes very weak and difficult to measure.

The depths of the magnetic reversals in the two holes are given in Table 5 and plotted with respect to the geomagnetic polarity reversal timescale (modified from Mankinen and Dalrymple, 1979) in Figure 16. We tentatively identify most of the recognized paleomagnetic chrons and subchrons to the Gauss Chron. We emphasize that many of the boundaries are based on discrete samples spaced 0.5 meter or more apart. Core recovery is poor in the Gilbert Chron, and we have not been able to refine the level of reversal boundaries in this interval. Magnetization of sediment below about 130 meters is so weak as to make the determination of a polarity stratigraphy for the upper Miocene section almost impossible.

ACCUMULATION RATES

We used 12 horizons to generate sedimentation rate and accumulation rate data for Site 503 (Table 6). These

Table 5. Location in each hole and the sub-bottom depths of the paleomagnetic boundaries found at Site 503.

Paleomagnetic Chrons and Subchrons	Hole 503A Sample (interval in cm)	Hole 503A Sub-bottom Depth (cm)	Hole 503B Sample (interval in cm)	Hole 503B Sub-bottom Depth (cm)
Brunhes/Matuyama	—	—	3-3, 60–70	10.82 ± 0.05
top of Jaramillo	4-2, 100–120	12.17 ± 0.05	—	—
bottom of Jaramillo			4-2, 30–40[b]	13.33 ± 0.05
top of Olduvai	—	—	7-3, 110 to 8-2, 20[a]	29.9 ± 0.90
bottom of Olduvai	9-2, 100–130[a]	35.12 ± 0.15	—	—
Matuyama/Gauss	12-2, 60–90	47.95 ± 0.15	12-2, 60–100	49.20 ± 0.10
top of Kaena	14-3, 30–40	57.15 ± 0.05		
bottom of Kaena	—	—	—	—
top of Mammoth	—	—	15-3, 80–100	63.55 ± 0.10
bottom of Mammoth	—	—	16-2, 75–140	66.84 ± 0.30
Gauss/Gilbert	—	—	17-3, 80–100	72.51 ± 0.10
top of Cochiti	21A-3, 10–40[a]	88.65 ± 1.15	21-3, 25–45	89.70 ± 0.10

[a] The paleomagnetic record is not definitive at these levels.
[b] Selection of this level assumes correct orientation between Cores 503B-7 and 503B-8.

horizons represent the eight best magnetostratigraphic boundaries, the three best-dated biostratigraphic datum levels, and an assumed zero age for the sediment/water interface. The age and thickness of the 11 time intervals bounded by these horizons is given in Table 6. The thickness of each interval was computed in holes that contain the inclusive age boundaries so that differences in sub-bottom depth between holes are eliminated.

A sedimentation rate for each interval was calculated from the age versus depth relationship. Sedimentation rate is a function of both sediment influx at the time of deposition and postdepositional compaction, so bulk accumulation rates were calculated in order to remove some of the compaction effect. The calculated accumu-

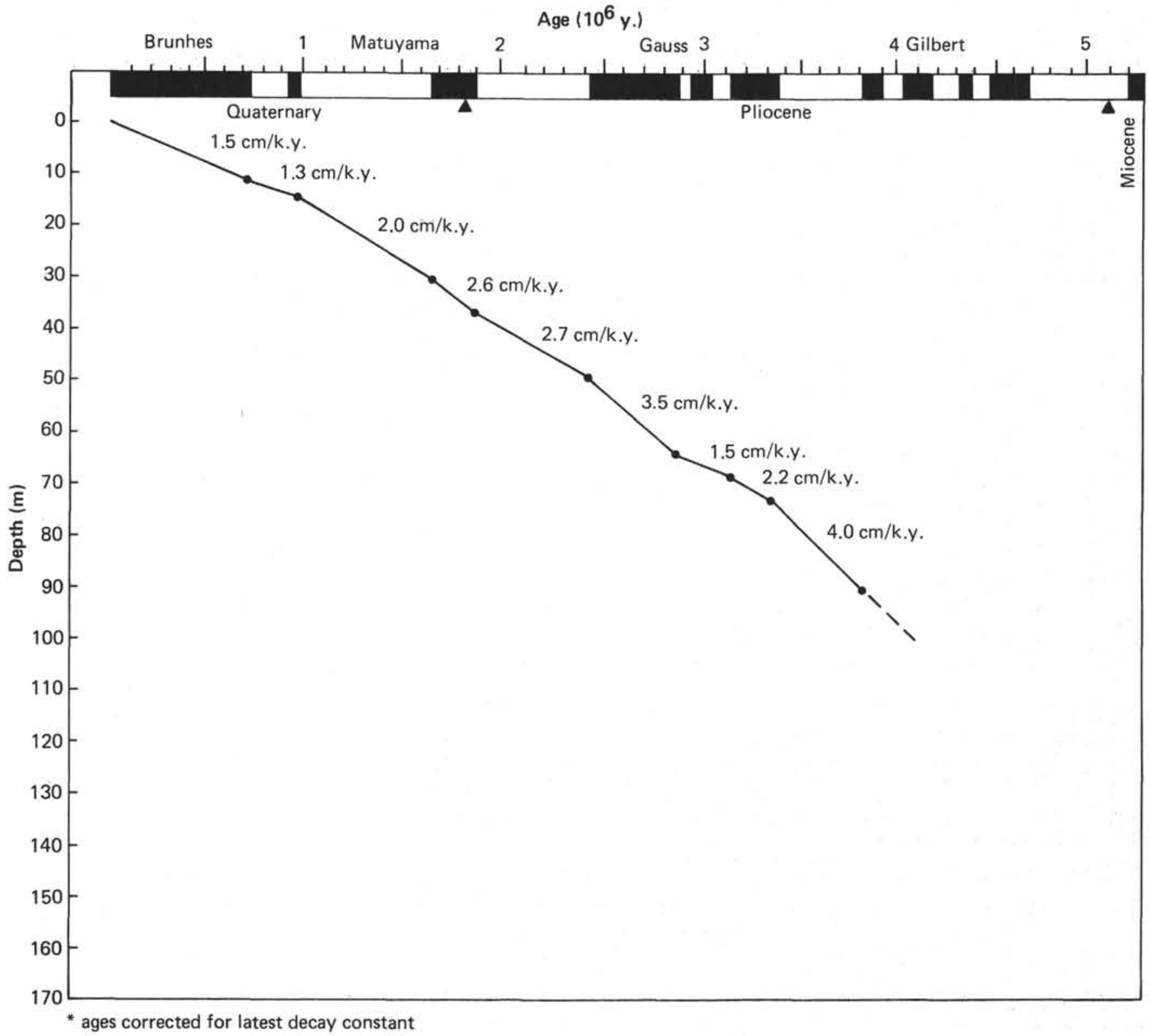


Figure 16. Age versus sub-bottom depth for magnetostratigraphic boundaries at Site 503.

Table 6. Measured and calculated parameters used to determine sedimentation and accumulation rates.

Time Interval	Age (m.y.)	Depth[a] (m)	Mean Thickness[b] (m)	Sedimentation Rate (cm/k.y.)	Mean δ_w[c] g/cm³	W.C. %	Mean δ_d[d] g/cm³	Bulk Accumulation Rate[e] (g/cm²/k.y.)	Mean $CaCO_3$ (%)	Accumulation Rate[6] $CaCO_3$ (g/cm²/k.y.)	Accumulation Rate[6] Non-$CaCO_3$ (g/cm²/k.y.)
1. 0 to Brunhes/Matuyama	0–0.73	0–?	10.8	1.5	1.4	71	0.80	1.20	54	0.65	0.55
		0–10.8			1.4	72			—		
2. Brunhes/Matuyama to	0.73–0.98	?–13.5			1.35	—	0.70	0.70	35	0.24	0.46
bottom of Jaramillo		10.8–13.3	2.5	1.0	1.30	80			—		
3. Bottom of Jaramillo to	0.98–1.66	13.5–?	16.6	2.4	1.3	73	0.75	1.80	43	0.77	1.03
top of Olduvai		13.3–29.9			1.3	74			—		
4. Top of Olduvai to	1.66–2.48	?–48.0	19.2	2.3	1.3	79	0.70	1.60	33	0.53	1.07
Gauss/Matuyama		29.9–49.1			1.3	80			—		
5. Gauss/Matuyama to	2.48–2.92	48.0–57.1	11.8	2.7	1.3	78	0.70	1.90	34	0.65	1.25
top of Kaena		49.1–63.6			1.35	78			—		
6. Top of Kaena to	2.92–3.18	57.1–?	3.2	1.2	1.3	—	0.80	1.00	44	0.44	0.56
bottom of Mammoth		63.6–66.8			1.4	72			—		
7. Bottom of Mammoth to	3.18–3.40	?	5.7	2.6	1.3	—	0.70	1.80	—	0.63	1.17
Gauss/Gilbert		66.8–72.5			1.3	75			35		
8. Gauss/Gilbert to	3.40–3.86	?–88.6	16.9	3.7	1.3	75	0.75	2.80	35	0.98	1.82
top of Cochiti		72.5–89.8			1.35	76			—		
9. Top of Cochiti to	3.86–5.0	88.6–127.0	38.4	3.4	1.4	71	0.80	2.70	46	1.24	1.46
LAD *T. miocenica*		89.8–?			—	—			—		
10. LAD *T. miocenica* to	5.0–5.7	127–160	33	4.7	1.4	65	0.85	4.00	53	2.10	1.90
LAD *T. praeconvexa*		?			—	—			—		
11. LAD *T. praeconvexa* to	5.7–6.5	160–208	48	6.0	1.3	66	0.80	4.80	53	2.54	2.26
FAD *A. primus*		?			—	—			—		

[a] Depths for each time interval for Holes 503A and 503B.
[b] Mean thickness computed using boundaries of a time interval recovered in either hole.
[c] Wet bulk density from GRAPE data.
[d] Calculated dry bulk density: $\delta_d = \delta_w/(1 + wc)$.
[e] Bulk accumulation rate = sedimentation rate × δ_d.
[f] Accumulation rate of carbonate = bulk accumulation rate × % carbonate; non-carbonate rate = bulk − carbonate rate.
LAD = last occurrence datum
FAD = first occurrence datum

lation rate provides a better approximation of sediment influx rate, particularly in older, more compacted sediment (van Andel and others, 1975).

Sedimentation rates at Site 503 range from 1.0 to 6.0 cm/k.y., with an average of 2.9 cm/k.y. We found the highest sedimentation rates in the upper Miocene and lower Pliocene sections and the lowest rates in the Pleistocene sequence. A short interval in the mid-Pliocene is characterized by low sedimentation rates. Because only slight changes in age or thickness will result in variations of the same order of magnitude, fluctuations about this trend may be due to the resolution of the time scale.

The wet-bulk density (GRAPE) and water content data were used to calculate bulk accumulation rates for each time interval used in the sedimentation rate curve (Table 6). Trends in bulk accumulation rates (Fig. 17) decrease throughout the section, with highest values in the upper Miocene and a sharp decrease in the mid-Pliocene similar to the trend of sedimentation rates. The decrease in rates is consistent with the trends for the equatorial Pacific (van Andel and others, 1975) and may be due to several factors, including reduction of sediment influx from terrigenous sources, decreased biogenic productivity, and reduced carbonate preservation. In order to distinguish among these components the carbonate and noncarbonate accumulation rates were calculated from bulk density and average carbonate content (Table 6 and Fig. 16). Carbonate accumulation rates decrease through the section, with highest rates in the upper Miocene and lower Pliocene interval (>4 m.y.) and lowest in the Pleistocene sequence. The trend is consistent with the equatorial Pacific pattern shown by van Andel and others (1975). The mid-Pliocene and Quaternary (4 Ma to Holocene) are characterized by a uniformly low carbonate accumulation rate, with values less than 1.0 g/cm²/k.y. The decrease in carbonate accumulation rates in this interval may reflect the deepening of the site as the plate moved from the spreading center.

Noncarbonate accumulation rates also decrease throughout the section. The decrease in noncarbonate rates throughout the equatorial Pacific (van Andel and others, 1975) may be due to a reduction in the siliceous biogenic component (see Sancetta, this volume) rather than to a reduction in the influx of terrigenous material (see Rea, this volume).

SUMMARY AND CONCLUSIONS

Our objective at Site 503 was to recover an undisturbed, complete upper Neogene and Quaternary section using the Hydraulic Piston Corer (HPC). Our major objective was met by coring two holes to a total depth of 235.0 meters sub-bottom, and we recovered a reasonably complete section that represents approximately the past 8 m.y. We recovered 58.8% of the cored interval in Hole 503A and 83.5% in Hole 503B, with about 81% and 86%, respectively, of the sediment undisturbed. After modifications to the core catcher and shear pins, the HPC performed well. The value of the HPC in obtaining undisturbed sediment can be appreciated when Site 503 is compared to Site 83 (see Frontispiece, this volume). A summary of recovery, lithology, paleomagnetism, biostratigraphy, and bulk accumulation rate is given in Figure 18.

Hays et al. (1972) indicated that Site 83 was on the east flank of the East Pacific Rise. However, total field magnetometer data recorded on our approach to and departure from Site 503 indicate that both Site 503 and 83 are actually located on the north flank of Galapagos

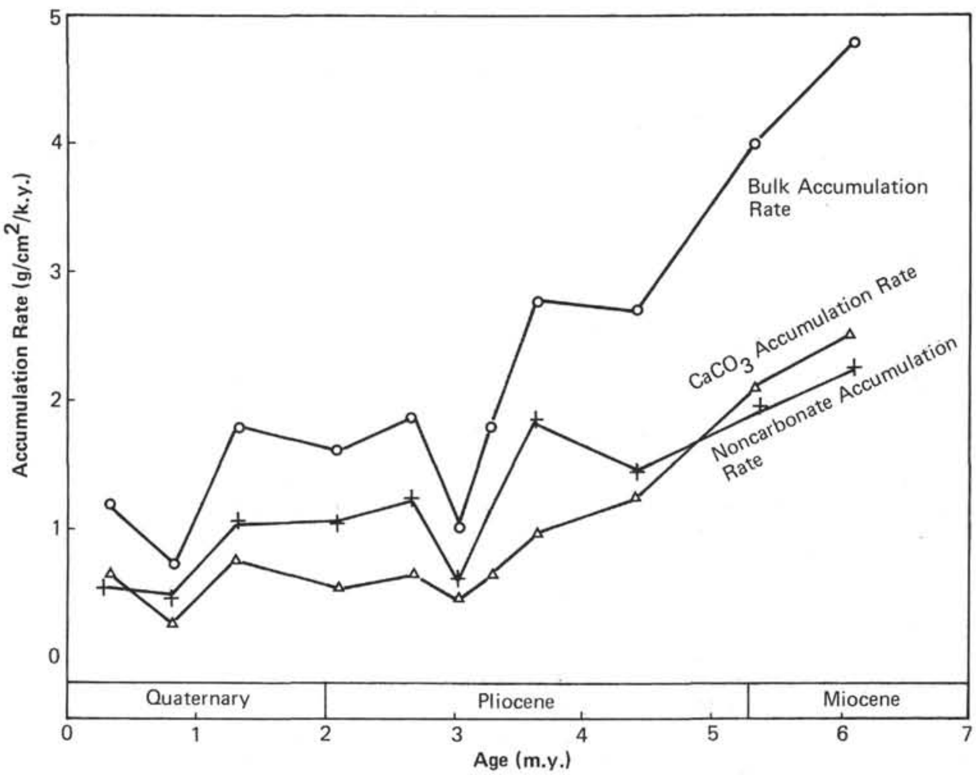


Figure 17. Plots of bulk, carbonate, and noncarbonate accumulation rates ($g/cm^2/10^3y.$) versus time for Site 503. The data points are midpoints of each time interval from Table 6.

Ridge, not the east flank of East Pacific Rise (see Gardner's Underway Geophysics, this volume).

The section at Site 503 is rather uniform and is composed of pelagic sediment with only minor compositional changes. Cycles of carbonate and color changes are apparent throughout the entire section, with periodicities on the order of 40 k.y. per cycle. Curiously, very little volcanic glass and no zeolites were found. The sediment changes from an oxidized to a reduced oxidation state at 8.45 meters and is reduced throughout the remainder of the section. The lack of sediment disturbance is illustrated by open burrows that occur from 9.3 to 64.0 meters sub-bottom. Nodules formed of rhodochrosite around burrows occur from 13.5 to 235 meters and are common from 13.5 to 50 meters. Clay content remains fairly constant at low percentages from 0 to 226 meters but then abruptly increases to greater than 25%. This increase occurs within 10 meters of the oceanic basement and may be caused by an increase of clay produced by seafloor weathering of the basement.

Detailed measurements of shear strength, sonic velocity, bulk density, water content, porosity, and cohesion show that the entire section is undercompacted. Shear strengths average about 400 g/cm^2 from 15 to about 210 meters. Although similar values were obtained at 25 meters depth at Site 502, they increased with depth. The maximum value of shear strength at Site 503 is only 1686 g/cm^2 and occurred below 210 meters. Porosities are approximately 90%, and water contents are about 80% down to a depth of 210 meters. Sonic velocities average 1.510 km/s down to a depth of 210 meters. The change in all physical properties at about 210 meters may indicate a "collapse" of the section at this level. One explanation may be that the siliceous microfossils, especially radiolarians, hold the sediment in a highly porous state until some threshold lithostatic load is applied. The section collapsed at loads above the threshold and became less porous, which results in higher velocities and shear strengths and lower water contents.

The sediment contains microfossil assemblages that range in age from Quaternary through the latter part of the late Miocene. Calcareous and siliceous microfossils are sufficiently numerous and well preserved for detailed stratigraphic interpretation. Cyclic zones of carbonate dissolution appear to occur throughout the sequence. Reworked assemblages of nannofossils and a monospecific diatom assemblage appears in the late Miocene. Radiolarians and diatoms are poorly preserved in Quaternary sediment, but preservation is good in the Tertiary section.

We were able to identify most magnetostratigraphic chrons and subchrons above the Gauss/Gilbert boundary, even though rust contamination was a serious problem, especially in Hole 503A. Most magnetostratigraphic datums are located to the nearest meter, because discrete sample measurements were needed to avoid rust contamination. We observed distinct cycles of NRM intensity with wavelengths comparable to the carbonate cycles. This covariance implies a direct correlation of intensity with lithology. Unfortunately, the rust problem

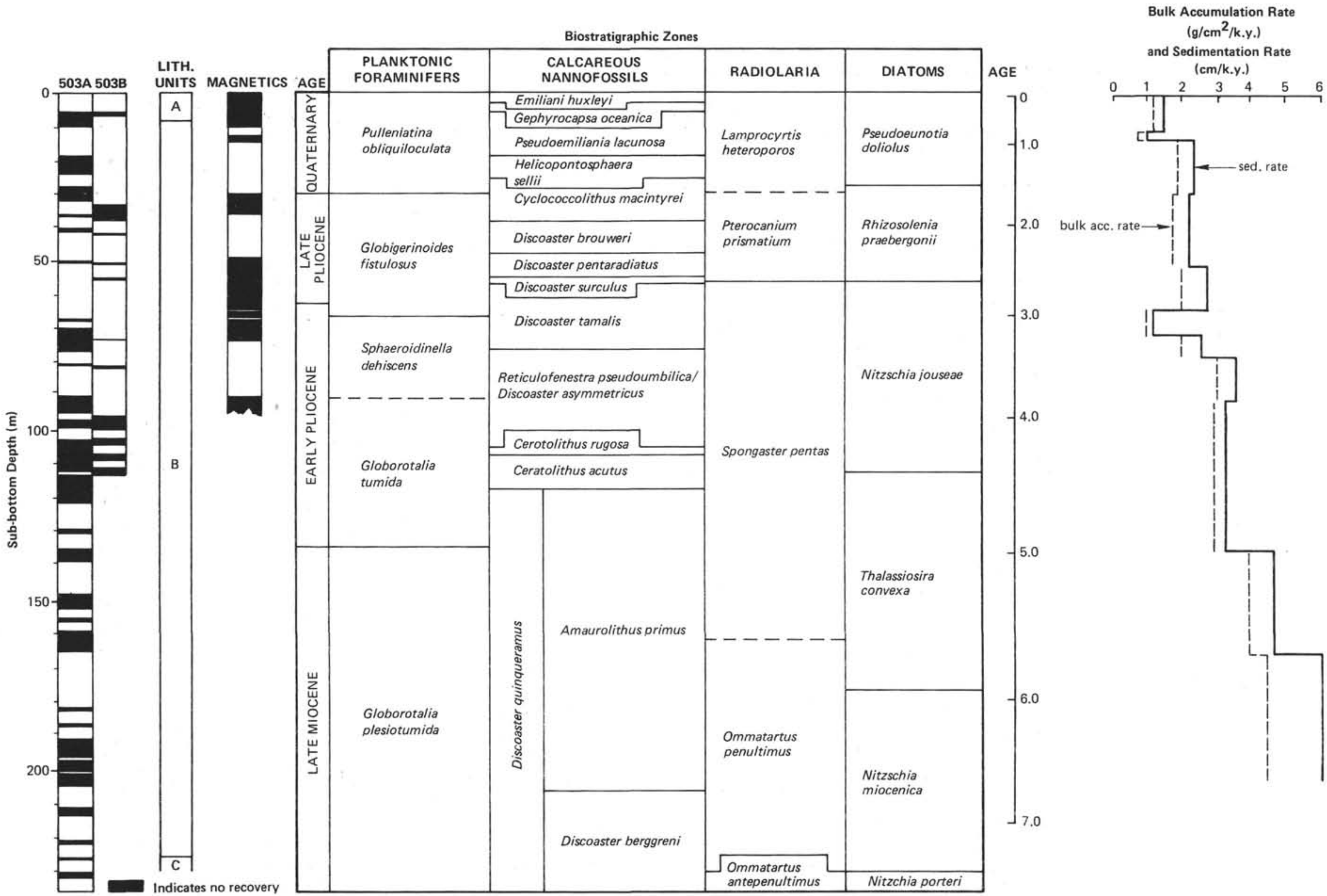


Figure 18. Summary of the recovery, lithostratigraphy, magnetostratigraphy, biostratigraphy, and sediment accumulation rates for Site 503.

obscures many of paleomagnetic trends, but a decrease in the NRM intensity does occur during the lower Gilbert Chron.

Bulk accumulation rates at Site 503 steadily decrease from late Miocene (4.0 g/cm^2/k.y.) to late Quaternary (1.2 g/cm^2/k.y.) with a distinct interval of low accumulation rates (1.2–1.6 g/cm^2/k.y.) in the mid-Pliocene. The rate of both carbonate and noncarbonate accumulation mimics the trend of bulk accumulation, and noncarbonate components (silica and clay) generally reflect the carbonate pattern.

REFERENCES

Boyce, R. E., 1976. Definitions and laboratory techniques of compressional sound velocity parameters and wet-water content, wet-bulk density, and porosity parameters by gravimetric and gamma ray attenuation techniques. *In* Schlanger, S. O., Jackson, E. D., et al., *Init. Repts. DSDP*, 33: Washington (U.S. Govt. Printing Office), 931–958.

________, 1977. Deep Sea Drilling Project procedures for shear strength measurement of clayey sediment using modified Wykeham and Farrance laboratory vane apparatus. *In* Barker, P. F., Dalziel, I. W. D., et al., *Init. Repts. DSDP*, 36: Washington (U.S. Govt. Printing Office), 1059–1068.

Burckle, L. H., 1977. Pliocene and Pleistocene diatom datum levels from the equatorial Pacific. *Quat. Res.*, 7:330–340.

________, 1978. Early Miocene to Pliocene diatom datum levels for the equatorial Pacific. *Spec. Publ. Geol. Res. and Develop. Centre, Republic of Indonesia*, pp. 25–44.

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

Hays, J. D., et al., 1972. *Init. Repts. DSDP*, 9: Washington (U.S. Govt. Printing Office).

Jenkins, G. D., and Orr, W. N., 1972. Planktonic foraminiferal biostratigraphy of the eastern equatorial Pacific, Leg 9. *In* Hays et al., *Init. Repts. DSDP*, 9: Washington (U.S. Govt. Printing Office), 1059–1205.

Keigwin, L. D., Jr., 1976. Late Cenozoic planktonic foraminiferal biostratigraphy and paleoceanography of the Panama Basin. *Micropaleontology*, 22:419–442.

Mankinen, E. A., and Dalrymple, G. B., 1979. Revised geomagnetic timescale for interval 0–5 m.y.B.P. *J. Geophys. Res.*, 84:615–626.

Saito, T., Burckle, L. H., and Hays, J. D., 1975. Late Miocene to Pleistocene biostratigraphy of equatorial Pacific sediments. *Late Neogene Epoch Boundaries:* Micropaleontol. Spec. Publ. 1: New York (Micropaleontology Press), 226–244.

van Andel, Tj. H., Heath, G. R., and Moore, T. C., Jr., 1975. Cenozoic history and paleoceanography of the central equatorial Pacific Ocean. *Geol. Soc. Am. Mem. 143*.

APPENDIX

Table 3. Smear slide summary of major and minor lithologies for Site 503. The estimates are qualitative, using <5% estimate = rare, 5–25% = common, 25–75% = abundant, and >75% = dominent.

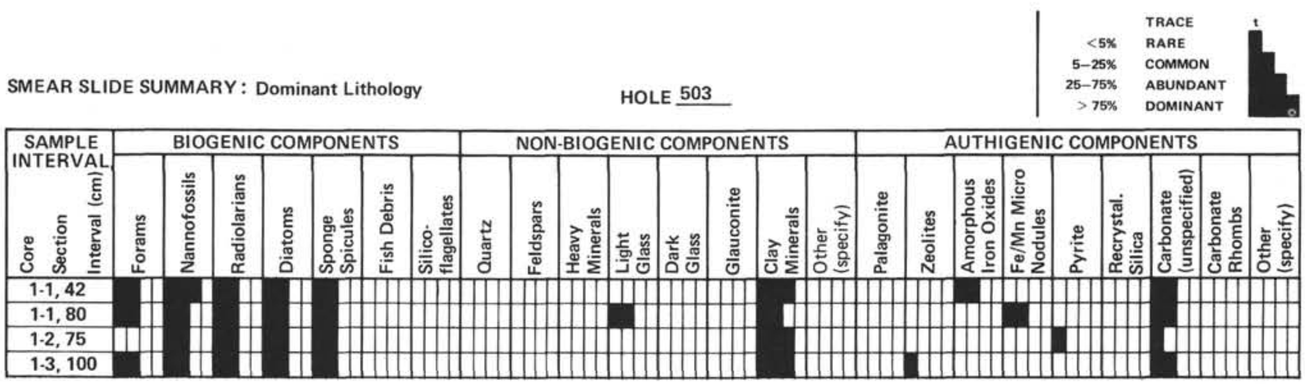


Table 3. (Continued).

TRACE t
<5% RARE
5–25% COMMON
25–75% ABUNDANT
> 75% DOMINANT

SMEAR SLIDE SUMMARY: Dominant Lithology

HOLE 503A

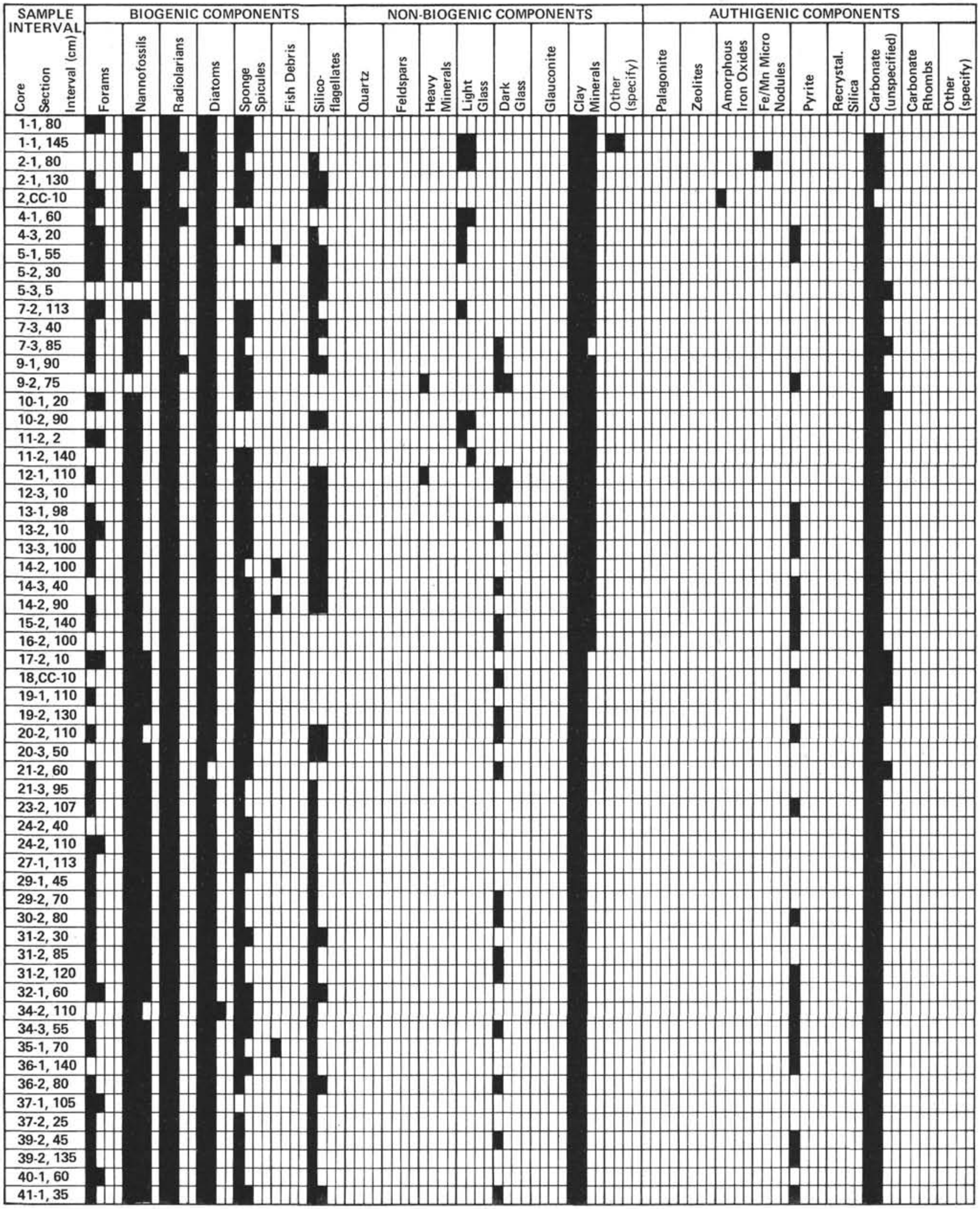


Table 3. (Continued).

SMEAR SLIDE SUMMARY: Dominant Lithology

HOLE 503A

	TRACE	t
<5%	RARE	
5–25%	COMMON	
25–75%	ABUNDANT	
> 75%	DOMINANT	

SAMPLE INTERVAL Core Section Interval (cm)	BIOGENIC COMPONENTS: Forams	Nannofossils	Radiolarians	Diatoms	Sponge Spicules	Fish Debris	Silico-flagellates	NON-BIOGENIC COMPONENTS: Quartz	Feldspars	Heavy Minerals	Light Glass	Dark Glass	Glauconite	Clay Minerals	Other (Specify)	AUTHIGENIC COMPONENTS: Palagonite	Zeolites	Amorphous Iron Oxides	Fe/Mn Micro Nodules	Pyrite	Recrystal. Silica	Carbonate (unspecified)	Carbonate Rhombs	Other (specify)
41-2, 40	R	A	C	C			R					R		C								C		
42-2, 80	R	A	C	C			C							C						R		C		
42-3, 70		A	C	C			C					R		C						R		C		
43-1, 80	R	A	R	C			C							C						R		C		
44-2, 30		A	C	C			C							C						R		C		
44-2, 100	R	A	R	C			C							C						R		C		
46-1, 140	R	A	C	C			R							C						R		C		
47-1, 120	R	A	C	C			R							C						R		C		
48-2, 80	R	A	C	C			C							C								C		
49-1, 125		A	C	C			R					R		C						R		C		
49,CC-12	R	A	R	C			R							C						R		C		
50-2, 115	R	A	R	C	R		R							C						R		C		
50-3, 85		A	C	C			R							C						R		C		
52-1, 20		A	C	C	C							R		C						R		C		
51-2, 60	R	A	C	C	C		R							C						R		C		
52-1, 80	R	A	C	C	R		R							C						R		C		
52-1, 120	R	A	C	C			C							C						R		C		
53-1, 110		A	C	C			R					R		C						R		C		
53-2, 100	R	A	C	C			R							C						R		C		
54-1, 77		C	C	C			C							A						R		C		
54-2, 110		A	C	C			C							A						R		C		

SMEAR SLIDE SUMMARY: Minor Lithology

HOLE 503A

	TRACE	t
<5%	RARE	
5–25%	COMMON	
25–75%	ABUNDANT	
> 75%	DOMINANT	

SAMPLE INTERVAL Core Section Interval (cm)	BIOGENIC COMPONENTS: Forams	Nannofossils	Radiolarians	Diatoms	Sponge Spicules	Fish Debris	Silico-flagellates	NON-BIOGENIC COMPONENTS: Quartz	Feldspars	Heavy Minerals	Light Glass	Dark Glass	Glauconite	Clay Minerals	Other (specify)	AUTHIGENIC COMPONENTS: Palagonite	Zeolites	Amorphous Iron Oxides	Fe/Mn Micro Nodules	Pyrite	Recrystal. Silica	Carbonate (unspecified)	Carbonate Rhombs	Carbonaceous Material
4-2, 100	R	C	C	C	R		C				R			C						C		C		
4-2, 31	R	C	C				C							C						C		C		
5-1, 8																								
5-1, 96	R	C	R	C										A						C		C		
5-3, 27	R	R	C	C	R		R				R			C						A		C		C
9-1, 4	R		C											C								t		
9-2, 14		C	C	C	C		C					R		A						C		C		
10-1, 50	C	C	C	C	C		C							C						R		C		
11-3, 64											R											D		
13-1, 142		C	C	C	C	R	C							A						C		C		
15-2, 62																						D		
15-3, 20		C	C	C	C							R		C						C		C		
21-3, 10	R	A	C	C	R		R							C						C		C		
24-2, 35	C	A	C	C	C							R	C	C						C		C		
24-2, 128	C	A	C	C	C		R					R		C						C		C		
29-3, 88		A	C	C	R									C								C		
31-2, 30		A	C	C	C		R							C						C		C		
36-2, 60	C	A	R	C	C		R							C						C		C		
43-2, 3	C	A	C	C			C					R		C								C		
43-3, 7	R	A	R	C			C							C						R		C		
50-3, 7																								
51-3, 16 ·																								

Table 3. (Continued).

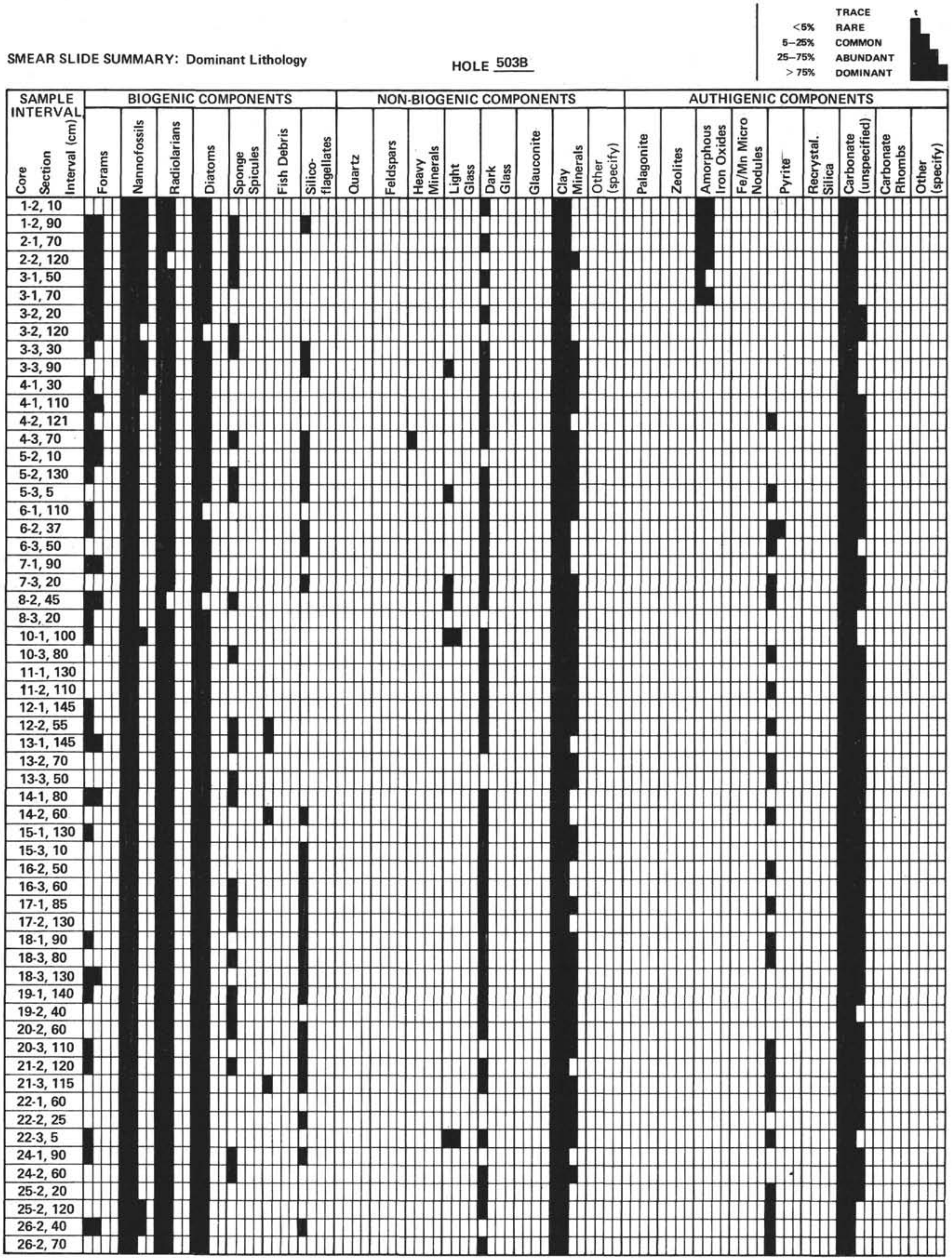


Table 3. (Continued).

	TRACE	t
<5%	RARE	
5–25%	COMMON	
25–75%	ABUNDANT	
> 75%	DOMINANT	

SMEAR SLIDE SUMMARY: Minor Lithology

HOLE 503B

SAMPLE INTERVAL (Core-Section, Interval (cm))	BIOGENIC COMPONENTS: Forams	Nannofossils	Radiolarians	Diatoms	Sponge Spicules	Fish Debris	Silico-flagellates	NON-BIOGENIC COMPONENTS: Quartz	Feldspars	Heavy Minerals	Light Glass	Dark Glass	Glauconite	Clay Minerals	Other (specify)	AUTHIGENIC COMPONENTS: Palagonite	Zeolites	Amorphous Iron Oxides	Fe/Mn Micro Nodules	Pyrite	Recrystal. Silica	Carbonate (unspecified)	Carbonate Rhombs	Other (specify)
1-1, 118	COMMON	ABUNDANT	COMMON	COMMON	RARE		RARE					RARE		COMMON								COMMON		
3-2, 63	RARE	COMMON	COMMON	RARE	RARE							RARE		ABUNDANT								ABUNDANT		
4-2, 52	RARE	COMMON	COMMON	COMMON	RARE		RARE					RARE		COMMON						RARE		ABUNDANT		
7-1, 108														DOMINANT								COMMON		
10-1, 30		RARE	RARE											DOMINANT						RARE		COMMON		
12-1, 109	COMMON	COMMON	COMMON	COMMON								RARE		COMMON						RARE		ABUNDANT		
12-1, 72		COMMON	COMMON	COMMON	RARE							RARE		ABUNDANT						RARE		ABUNDANT		

SITE 503 HOLE CORE (HPC) 1 CORED INTERVAL 0.0–4.4 m

TIME – ROCK UNIT: Quaternary

BIOSTRATIGRAPHIC ZONE: *E. huxleyi* (N); *P. obliquiloculata* (F); *G. oceanica* (N)

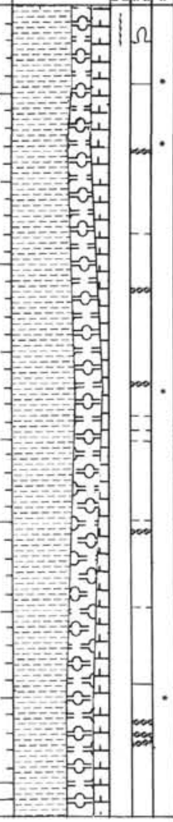
FOSSIL CHARACTER: FORAMINIFERS: CP; NANNOFOSSILS: CM, CM; DIATOMS: CG

SUB-BOTTOM DEPTH (m): 0.00, 1.50, 3.00, 4.50, 4.60, 4.69

SECTION: 1, 2, 3, 4, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5YR 2/2

10YR 5/4 to 10YR 6/4

5YR 2.5/2

10YR 4/4

5YR 3/4

10YR 5/6

5YR 3/4

10YR 4/4

10YR 6/4

5YR 3/4

10YR 4/4

10YR 6/4

10YR 4/4

10YR 6/4

7.5YR 4/4

Cyclic alternation of IRON OXIDE-BEARING SILICEOUS NANNO MARL, which is dark reddish brown (5YR 2.5/2) in color; CALCAREOUS CLAY, which is dark yellowish brown (10YR 4/4) in color; and SILICEOUS CALCAREOUS MARL, which is light yellowish brown (10YR 6/4) in color. Burrowing and mottling is abundant. The sediment types alternate downcore with common gradation between endtypes in color and composition.

SMEAR SLIDE SUMMARY

	1-42	1-80	2-75	3-100
	D	D	D	D
Pyrite	–	–	1/T	–
Clay minerals	25/A	15/C	67/A	49/A
Volcanic glass (lt)	–	15/C	–	–
Zeolites	–	–	–	1/T
Micronodules	–	10/C	–	–
Carbonate unspec.	5/C	10/C	2/R	5/C
Foraminifers	15/C	5/C	–	5/C
Calcareous nannofossils	25/A	5/C	5/C	15/C
Diatoms	10/C	10/C	10/C	10/C
Radiolarians	5/C	5/C	5/C	5/C
Sponge spicules	10/C	10/C	10/C	10/C
Fe-oxides	5/C	–	–	–

CLAY MINERALOGY (<2 μm): 2-71 cm

Smectite	50%
Illite	14%
Chlorite & Kaolinite	36%

CARBON-CARBONATE: 1, CC

% Carbonate	39
% Organic carbon	0.3

SITE 503 HOLE A CORE (HPC) 1 CORED INTERVAL 0.0–1.8 m

TIME – ROCK UNIT: Quaternary

BIOSTRATIGRAPHIC ZONE: *P. obliquiloculata* (F) *E. huxleyi* (N); *B. invaginata* (R)

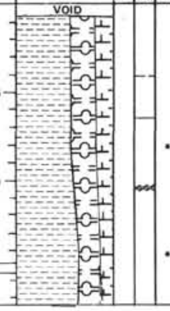
FOSSIL CHARACTER: FORAMINIFERS: CP, FP; NANNOFOSSILS: FP; RADIOLARIANS: CG; DIATOMS: FM

SUB-BOTTOM DEPTH (m): 0.00, 1.45, 1.52, 1.73

SECTION: 1, 2, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID



LITHOLOGIC DESCRIPTION

5YR 3/3

5YR 3/3 to 10YR 6/6

10YR 4/4

5YR 3/3

Cycles of CALCAREOUS-BEARING SILICEOUS OOZE ranging in color from dark reddish brown (5YR 3/3) to brownish yellow (10YR 6/6). Burrowing and mottling are common.

SMEAR SLIDE SUMMARY

	1-80	1-145
	D	D
Clay minerals	50/A	45/A
Volcanic glass (lt)	–	10/C
Carbonate unspec.	–	10/C
Foraminifers	10/C	–
Calcareous nannofossils	10/C	5/C
Diatoms	15/C	10/C
Radiolarians	5/C	5/C
Sponge spicules	10/C	10/C
Fe-oxides	–	5/C

CARBONATE BOMB:

1-9 cm = 66%	1-89 cm = 72%
1-19 cm = 64%	1-99 cm = 62%
1-29 cm = 66%	1-109 cm = 43%
1-39% = 64%	1-119 cm = 36%
1-49 cm = 74%	1-129 cm = 37%
1-59 cm = 70%	1-139 cm = 31%
1-64 cm = 78%	1-149 cm = 34%
1-79 cm = 73%	

CLAY MINERALOGY (<2 μm): 1-71 cm

Smectite	67%
Chlorite & Kaolinite	33%

CARBON-CARBONATE: 1, CC

% Carbonate	33
% Organic carbon	0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 2 CORED INTERVAL 1.8–6.2 m

TIME-ROCK UNIT: Quaternary

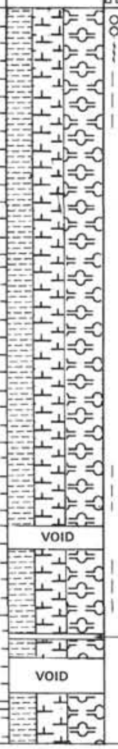
BIOSTRATIGRAPHIC ZONE: *C. tuberosa* (R); *P. obliquiloculata* (F) *N. reinholdii* (D) *G. oceanica* (N); *A. ypsilon* (R); *P. lacunosa* (N)

FOSSIL CHARACTER: Radiolarians CM, RP, CG; Foraminifers CP; Nannofossils A/MG; Diatoms RM

SUB-BOTTOM DEPTH (m): 1.80, 3.23, 4.73, 5.20, 5.30, 5.38, 5.56

SECTION: 1, 2, 3, CC — METERS: 0.5, 1.0

GRAPHIC LITHOLOGY:



10YR 5/4; 10YR 3/2; 10YR 4/3; 5Y 8/2, 6/2; 10YR 4/3; 10YR 3/2; 10YR 4/3; 10YR 3/2; 10YR 3/2, 10YR 4/3; VOID; 10YR 5/4

LITHOLOGIC DESCRIPTION

Cycle alternation of CALCAREOUS AND MICRONODULE-BEARING SILICEOUS OOZE, which is dark grayish brown (10YR 3/2) in color, and SILICEOUS MARL, which is white (5Y 8/2) and light olive gray (5Y 6/2) in color. Gradations between endtypes in color and composition are common. Burrowing and mottling are common from 40–77 cm in Section 1 and in the remaining sections of the core.

SMEAR SLIDE SUMMARY

	1-80	1-130	CC, 10
	D	D	D
Amorphous iron oxide	–	–	5/C
Clay minerals	28/A	30/A	35/A
Volcanic glass (lt)	–	5/C	–
Micronodules	15/C	–	–
Carbonate uspec.	10/C	10/C	3/R
Foraminifers	–	3/R	7/C
Calcareous nannofossils	4/R	20/C	25/A
Diatoms	15/C	15/C	10/C
Radiolarians	25/A	7/C	5/C
Sponge spicules	1/T	5/C	5/C
Silicoflagellates	2/R	5/C	5/C

CARBONATE BOMB:

1-59 = 58%	2-19 cm = 53%	2-129 cm = 44%
1-69 cm = 37%	2-29 cm = 49%	2-139 cm = 44%
1-79 cm = 36%	2-39 cm = 69%	2-149 cm = 48%
1-89 cm = 53%	2-49 cm = 70%	3-19 cm = 52%
1-99 cm = 63%	2-59 cm = 39%	3-29 cm = 53%
1-109 cm = 56%	2-69 cm = 50%	3-39 cm = 50%
1-119 cm = 53%	2-79 cm = 48%	3-49 cm = 64%
1-129 cm = 61%	2-89 cm = 46%	3-59 cm = 57%
1-139 cm = 29%	2-99 cm = 40%	3-69 cm = 69%
1-149 cm = 32%	2-109 cm = 42%	3-99 cm = 79%
2-9 cm = 42%	2-119 cm = 41%	

CARBON-CARBONATE: 2, CC
% Carbonate 77
% Organic carbon 0.1

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 3 CORED INTERVAL 6.2–10.6 m

TIME-ROCK UNIT: Quaternary

BIOSTRATIGRAPHIC ZONE: *A. ypsilon* (R) *P. lacunosa* (N); Above *N. reinholdii* (D)

FOSSIL CHARACTER: Nannofossils A/MG; Diatoms FM

SECTION: CC

LITHOLOGIC DESCRIPTION

No core recovered. (Biostratigraphy based upon mud streaked on core liner.)

CARBON-CARBONATE: 3, CC
% Carbonate 57
% Organic carbon 0.2

SITE 503 HOLE A CORE (HPC) 4 CORED INTERVAL 10.6–15.0 m

TIME-ROCK UNIT: Quaternary

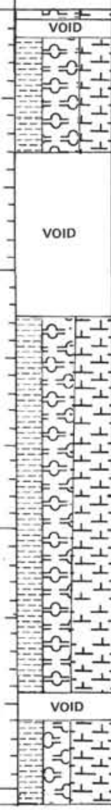
BIOSTRATIGRAPHIC ZONE: *M. quadrangula*, Top ? *N. fossilis* (D) *P. lacunosa* (N); *P. obliquiloculata* (F) *A. angulare* (R); Small *Gephyrocapsa* (N) *N. reinholdii* (D); Acme *R. matuyamai* (D); *A. ypsilon*; *M. quadrangula*, Top ? *N. fossilis*; *N. reinholdii*; Acme *R. matuyamai*

FOSSIL CHARACTER: Foraminifers FM, FM, CP; Nannofossils CG, FM, CM, FM, FM; Radiolarians FM, RP; Diatoms FG, FG, FG, FG, FM

SUB-BOTTOM DEPTH (m): 10.60, 10.65, 11.30, 11.30, 12.52, 13.45, 13.85, 14.01

SECTION: 1, 2, 3, 4 — METERS: 0.5, 1.0

GRAPHIC LITHOLOGY:



5G 6/1 & 5G 5/1; 5G 4/1 & 5G 6/1; 5G 3/1; 5G 4/1, 5G 6/1, & 5G 8/1; 5G 8/1; 5G 2/1 to 5G 8/1; 5G 4/1; 5G 8/1; 5G 8/1 with 5G 6/1 mottles

LITHOLOGIC DESCRIPTION

Cyclic alternation of NANNO RADIOLARIAN OOZE, which is dark greenish gray (5G 6/1 and 5G 5/1) in color, and SILICEOUS MARL, which is light greenish gray (5G 8/1) in color. The sediment is burrowed and mottled with some areas of pyrite enrichment (Smear Slide 2-100 and 3-31).

SMEAR SLIDE SUMMARY

	1-60	2-100	3-20	3-31
	D	M	D	M
Pyrite	–	10/C	1/T	10/C
Clay minerals	30/A	20/C	21/C	22/C
Volcanic glass (lt)	5/C	3/R	4/R	–
Carbonate unspec.	8/C	15/C	20/C	10/C
Foraminifers	2/R	3/R	10/C	3/R
Calcareous nannofossils	20/C	7/C	15/C	20/C
Diatoms	5/C	5/C	10/C	10/C
Radiolarians	30/A	20/C	15/C	20/C
Sponge spicules	–	2/R	–	–
Fish debris	–	5/C	–	5/C

CARBONATE BOMB:

1-19 cm = 39%	2-99 cm = 17%	3-49 cm = 37%
1-29 cm = 45%	2-109 cm = 40%	3-59 cm = 27%
1-39 cm = 49%	2-119 cm = 45%	3-69 cm = 48%
1-49 cm = 37%	2-129 cm = 39%	3-79 cm = 63%
1-59 cm = 20%	2-139 cm = 41%	3-89 cm = 65%
1-69 cm = 28%	2-149 cm = 56%	3-119 cm = 62%
2-29 cm = 29%	3-9 cm = 67%	3-129 cm = 57%
2-39 cm = 32%	3-19 cm = 62%	3-139 cm = 54%
2-49 cm = 21%	3-29 cm = 51%	3-149 cm = 62%
2-59 cm = 17%	3-39 cm = 35%	

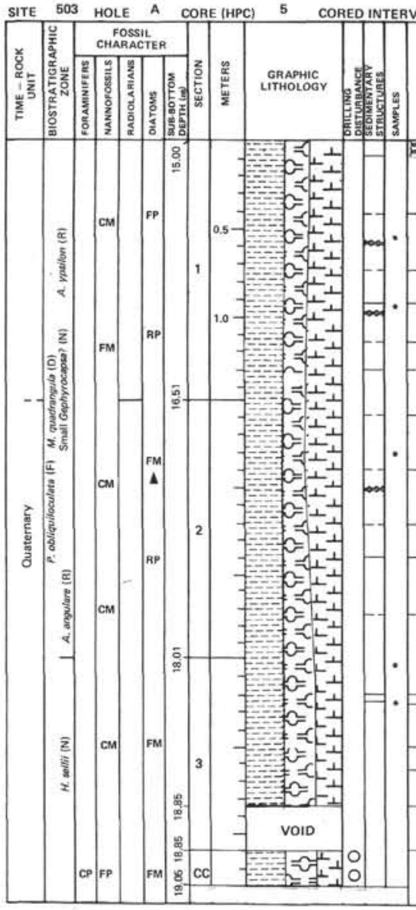
CLAY MINERALOGY (<2 μm): 2-121 cm
Smectite 93%
Chlorite & Kaolinite 7%

CARBON-CARBONATE: 4, CC
% Carbonate 50
% Organic carbon 0.3

SITE 503 HOLE A CORE (HPC) 5 CORED INTERVAL 15.0–19.4 m

TIME-ROCK UNIT: Quaternary

BIOSTRATIGRAPHIC ZONE: *A. ypsilon* (R); *M. quadrangula* (D), Small *Gephyrocapsa*? (N); *P. obliquiloculata* (F); *A. angulare* (R); *H. sellii* (N)



Colors: 5G 8/1; 5G 4/1; 5BG 7/2; 5G 2/1 to 5Y 5/1; 5Y 6/2; 5G 6/1; 5G 8/1; 5G 6/1; 5G 8/1; 5G 6/1; 5G 4/1; N2; 5G 6/1 & 5G 8/1; 5G 4/1; 5G 8/1; 5G 6/1

LITHOLOGIC DESCRIPTION

Cyclic alternation of SILICEOUS MARL, which is light greenish gray (5G 8/1) in color, and CALCAREOUS SILICEOUS OOZE, which is dark greenish gray (5G 4/1) in color. Gradations between endmembers in color and composition are common. Mottling and burrowing are common. Black (N2) burrows and zones enriched in pyrite are common.

SMEAR SLIDE SUMMARY

	1-55 D	1-96 M	2-30 D	3-5 D	3-27 M
Pyrite	2/R	15/C	–	–	30/A
Clay minerals	35/A	35/A	30/A	30/A	10/C
Volcanic glass (lt)	1/T	–	–	–	2/R
Carbonate unspec.	15/C	20/C	20/C	30/A	10/C
Foraminifers	5/C	2/R	5/C	–	4/R
Calcareous nannofossils	10/C	15/C	20/C	–	4/R
Diatoms	10/C	10/C	10/C	15/C	10/C
Radiolarians	15/C	3/R	10/C	20/C	20/C
Sponge spicules	–	–	–	–	2/R
Fish debris	2/R	–	–	–	–
Silicoflagellates	5/C	–	5/C	5/C	3/R
Carbonaceous material	–	–	–	–	5/C

CARBONATE BOMB:

1-9 cm = 77%	1-139 cm = 37%	2-119 cm = 46%
1-19 cm = 78%	1-149 cm = 47%	2-129 cm = 32%
1-29 cm = 69%	2-9 cm = 36%	2-139 cm = 18%
1-39 cm = 49%	2-19 cm = 63%	2-149 cm = 22%
1-49 cm = 54%	2-29 cm = 67%	3-9 cm = 13%
1-59 cm = 35%	2-39 cm = 61%	3-19 cm = 16%
1-69 cm = 30%	2-49 cm = 54%	3-29 cm = 33%
1-79 cm = 47%	2-59 cm = 45%	3-39 cm = 57%
1-89 cm = 62%	2-69 cm = 46%	3-49 cm = 51%
1-99 cm = 68%	2-79 cm = 62%	3-59 cm = 29%
1-109 cm = 65%	2-89 cm = 62%	3-69 cm = 56%
1-119 cm = 59%	2-99 cm = 62%	3-79 cm = 62%
1-129 cm = 54%	2-109 cm = 47%	

CLAY MINERALOGY (<2 μm): 2-71 cm

Smectite 96%
Chlorite & Kaolinite 4%

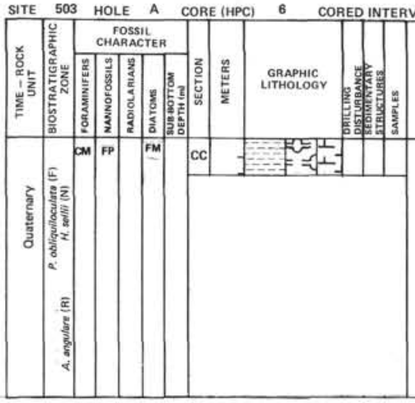
CARBON-CARBONATE: 5, CC

% Carbonate 52
% Organic carbon 0.4

SITE 503 HOLE A CORE (HPC) 6 CORED INTERVAL 19.4–23.8 m

TIME-ROCK UNIT: Quaternary

BIOSTRATIGRAPHIC ZONE: *P. obliquiloculata* (F), *H. sellii* (N); *A. angulare* (R)



LITHOLOGIC DESCRIPTION

No core recovered. A residue of sediment found in the Core-Catcher was used for biostratigraphy.

CARBON-CARBONATE: 6, CC

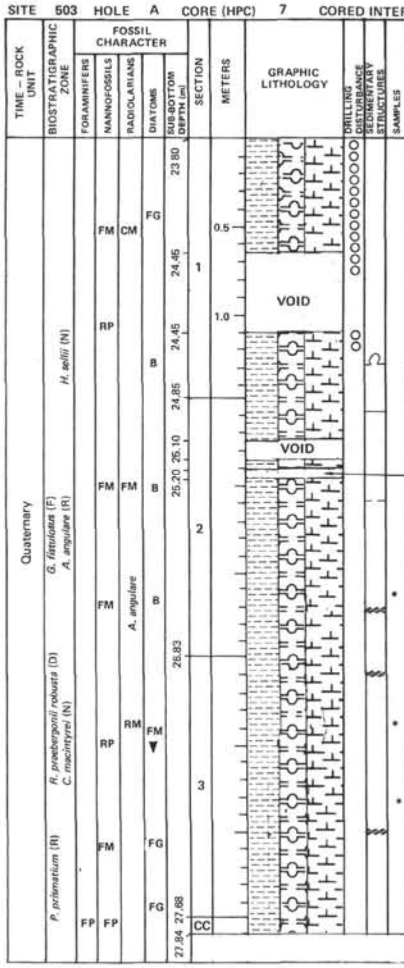
% Carbonate 51
% Organic carbon 0.3

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 7 CORED INTERVAL 23.8–28.2 m

TIME-ROCK UNIT: Quaternary

BIOSTRATIGRAPHIC ZONE: *H. sellii* (N); *G. fistulosus* (F), *A. angulare* (R); *R. praebergonii robusta* (D), *C. macintyrei* (N); *P. prismatium* (R)



Colors: 5G 4/1; N2; 5G 7/1; VOID; 5G 6/1; N2 rings on 5G 6/1; 5G 7/1; 5G 8/1; 5G 6/1 to 5Y 4/1; 5Y 6/2, 5Y 4/3, N2, and 5G 4/1; N2; 5Y 6/2; 5Y 4/3, N2, and 5G 4/1; 5Y 6/2 and N2

LITHOLOGIC DESCRIPTION

Cyclic alternation of SILICEOUS MARL, light greenish gray (5G 8/1), in color, and CALCAREOUS-BEARING SILICEOUS OOZE, olive (5Y 4/3) and light olive gray (5Y 6/2) in color. Gradations between the end-types in color and composition are common. Beds enriched in pyrite, grayish black (N2) in color, are at 0–3 cm in Section 2 and 73–76 cm in Section 3. A large mottle with concentric millimeter rings enriched in pyrite is at 72–90 cm in Section 2. The sediment is highly mottled and burrowed.

SMEAR SLIDE SUMMARY

	2-113 D	3-40 D	3-85 D
Clay minerals	27/A	30/A	17/C
Volcanic glass (lt)	3/R	–	–
Volcanic glass (dk)	–	–	4/R
Carbonate unspec.	10/C	10/C	30/A
Foraminifers	8/C	2/R	3/R
Calcareous nannofossils	25/A	5/C	6/C
Diatoms	10/C	20/C	15/C
Radiolarians	10/C	20/C	20/C
Sponge spicules	5/C	5/C	1/T
Silicoflagellates	2/R	8/C	4/R

CARBONATE BOMB:

1-19 cm = 43%	2-139 cm = 35%
1-49 cm = 38%	3-19 cm = 20%
1-139 cm = 31%	3-49 cm = 7%
2-19 cm = 63%	3-79 cm = 30%
2-49 cm = 49%	3-109 cm = 14%
2-79 cm = 45%	3-139 cm = 19%
2-109 cm = 43%	

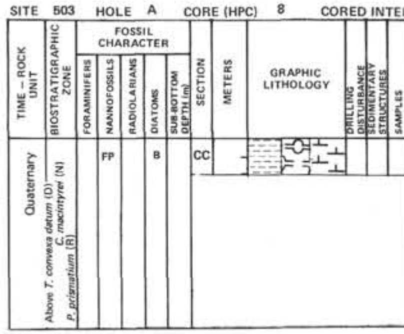
CARBON-CARBONATE: 7, CC

% Carbonate 40
% Organic carbon 0.3

SITE 503 HOLE A CORE (HPC) 8 CORED INTERVAL 28.2–32.6 m

TIME-ROCK UNIT: Quaternary

BIOSTRATIGRAPHIC ZONE: Above *T. convexa* datum (D), *C. macintyrei* (N); *P. prismatium* (R)



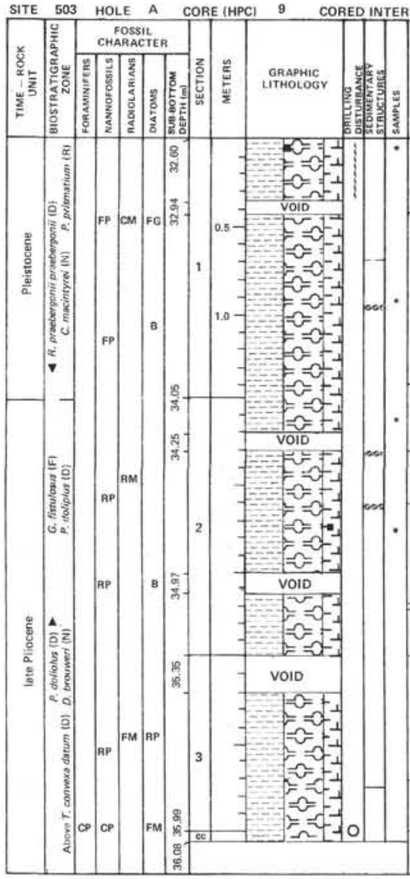
LITHOLOGIC DESCRIPTION

No core recovered. (Biostratigraphy based upon sediment streaked on the core liner.)

CARBON-CARBONATE: 8, CC

% Carbonate 6
% Organic carbon 0.4

SITE 503 HOLE A CORE (HPC) 9 CORED INTERVAL 32.6–37.0 m



LITHOLOGIC DESCRIPTION

Cycles of CALCAREOUS-BEARING SILICEOUS OOZE ranging in color from greenish black (5GY 2/1) to grayish green (5G 5/2). Gradation between the endtypes in color are common. The core is fairly uniform except for the interval from 35–72 cm in Section 2 which is highly mottled. A zoophycus is at 103–105 cm in Section 1. A carbonate nodule (light gray [2,5Y 7/2]), which is formed around a burrow is at 70 cm in Section 2.

SMEAR SLIDE SUMMARY

	1-4	1-90	2-14	2-75
	M	D	M	D
Pyrite	–	–	10/C	2/R
Other heavy minerals	–	–	–	1/T
Clay minerals	10/C	35/A	33/A	62/A
Volcanic glass (dk)	–	3/R	2/R	5/C
Carbonate unspec.	82/D[a]	15/C	15/C	15/C
Foraminifers	3/R	2/R	–	–
Calcareous nannofossils	–	5/C	5/C	–
Diatoms	–	5/C	10/C	10/C
Radiolarians	5/C	25/A	15/C	20/C
Sponge spicules	–	5/C	5/C	5/C
Silicoflagellates	–	5/C	5/C	–

[a] Microx-alline $CaCO_3$

CARBONATE BOMB:

1-49 cm = 36%	2-79 cm = 5%
1-79 cm = 24%	2-139 cm = 22%
1-109 cm = 28%	3-19 cm = 26%
1-139 cm = 25%	3-49 cm = 33%
2-19 cm = 24%	3-79 cm = 25%
2-49 cm = 22%	

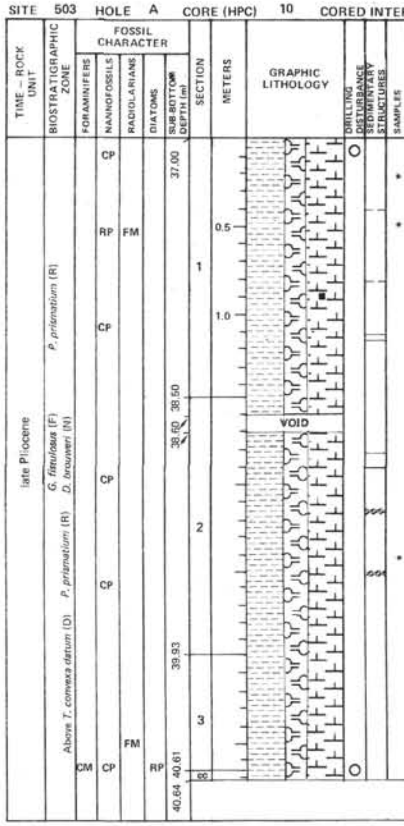
CLAY MINERALOGY (<2 μm): 2-73 cm

Smectite 92%
Chlorite &
Kaolinite 8%

CARBON-CARBONATE: 9, CC
% Carbonate 60
% Organic carbon 0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 10 CORED INTERVAL 37.0–41.4 m



LITHOLOGIC DESCRIPTION

Cyclic alternation of SILICEOUS-BEARING MARL, which is grayish green (5G 6/2) in color, and SILICEOUS MARL, which is dark greenish gray (5G 4/1) in color. Gradations in color and composition between the endtypes are common. Mottling is subtle. The contacts at 70 and 103 cm in Section 2 are highly burrowed. Beds of pyrite enrichment, grayish black (N2) in color, are at 114–117 cm in Section 1 and 33–40 cm in Section 2. A large carbonate nodule formed around a burrow is at 85–90 cm in Section 1.

SMEAR SLIDE SUMMABY

	1-20	2-90	1-50
	D	D	M
Clay minerals	35/A	37/A	–
Volcanic glass (lt)	–	8/C	2/R
Carbonate unspec.	25/A	20/C	98/D
Foraminifers	5/C	–	–
Calcareous nannofossils	15/C	10/C	–
Diatoms	5/C	10/C	–
Radiolarians	10/C	10/C	–
Sponge spicules	5/C	–	–
Silicoflagellates	–	5/C	–

CARBONATE BOMB:

1-19 cm = 55%	2-49 cm = 35%
1-49 cm = 46%	2-79 cm = 20%
1-79 cm = 43%	2-109 cm = 55%
1-109 cm = 26%	2-139 cm = 48%
1-139 cm = 23%	3-19 cm = 42%
2-19 cm = 47%	3-49 cm = 50%

CARBON-CARBONATE: 10, CC
% Carbonate 35
% Organic carbon 0.5

SITE 503 HOLE A CORE (HPC) 11 CORED INTERVAL 41.4–45.8 m

TIME – ROCK UNIT: late Pliocene

BIOSTRATIGRAPHIC ZONE: P. prismatium (R); G. fistulosus (F); D. brouweri (N); T. convexa group (D)

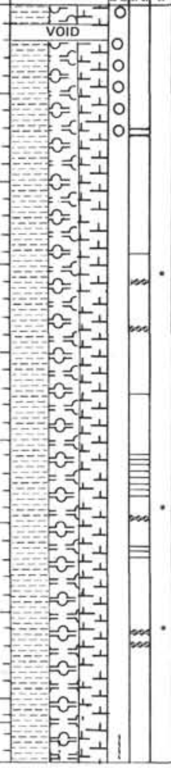
FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS): FM; FP; FM; FP; RP; CM CM CM

SUB-BOTTOM DEPTH (m): 41.40; 41.50; 42.83; 44.33; T. convexa group (D); 45.46; 45.61

SECTION: 1; 2; 3; CC

METERS: 0.5; 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

5G 7/1
5G 2/1
5G 7/1 to 5G 6/1
5G 4/1
5G 6/1 to 5G 4/1 at base
5G 6/1
5G 4/1 and 5G 2/1
5G 8/1
5G 6/1, 5G 4/1, and 5G 2/1
5G 8/1, 6/1
5B 7/1
5G 8/1
5G 6/1

LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS MARL, ranging in color from light greenish gray (5G 8/1) to dark greenish gray (5G 4/1) in color. Gradations between endtypes in color are common. Beds and zones enriched in pyrite are greenish black (5G 2/1). Pyritized burrows are common. The interval from 113–132 cm in Section 2 shows faint light colored (1 mm) layers spaced about 1 cm apart. Mottling and burrowing are common throughout the core.

SMEAR SLIDE SUMMARY

	2-2	2-140	3-64
	D	D	M
Pyrite	–	–	2/R
Clay minerals	39/A	34/A	23/C
Volcanic glass (lt)	1/T	–	–
Volcanic glass (dk)	–	1/T	–
Carbonate unspec.	20/C	15/C	15/C
Foraminifers	–	5/C	15/C
Calcareous nannofossils	10/C	15/C	15/C
Diatoms	15/C	15/C	10/C
Radiolarians	16/C	10/C	10/C
Sponge spicules	–	5/C	5/C
Silicoflagellates	–	–	5/C

CARBONATE BOMB:

1-19 cm = 46%	2-79 cm = 35%
1-49 cm = 35%	2-109 cm = 43%
1-79 cm = 38%	2-139 cm = 63%
1-109 cm = 41%	3-19 cm = 60%
1-139 cm = 31%	3-49 cm = 42%
2-19 cm = 31%	3-79 cm = 66%
2-49 cm = 30%	3-109 cm = 69%

CARBON-CARBONATE: 11, CC
% Carbonate 31
% Organic carbon 0.3

SITE 503 HOLE A CORE (HPC) 12 CORED INTERVAL 45.8–50.2 m

TIME – ROCK UNIT: late Pliocene

BIOSTRATIGRAPHIC ZONE: D. brouweri (N); P. prismatium (R); D. pentaradiatus (N); Above N. jouseae datum (D)

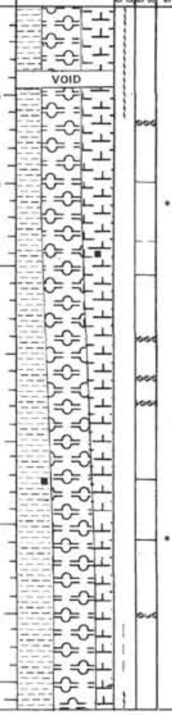
FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS): FM RM; FM; CM; CM FM; CM CM CG

SUB-BOTTOM DEPTH (m): 45.80; 46.14; 47.20; 48.70; 49.59; 49.72

SECTION: 1; 2; 3; CC

METERS: 0.5; 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

5G 4/1 to 5G 2/1
5G 6/1 and 5G 4/1
5G 2/1
5G 4/1
5G 6/1 and 5G 8/1
5G 2/1 and 5G 4/1
5G 6/1
5G 2/1
5G 4/1 to 5G 8/1
5G 6/1 and N7
5G 4/1 and 5G 6/1

LITHOLOGIC DESCRIPTION

Cyclic alternations of CALCAREOUS SILICEOUS OOZE, which is greenish gray (5G 6/1) and dark greenish gray (5G 4/1) in color, and CALCAREOUS-BEARING SILICEOUS OOZE, which is greenish black (5G 2/1) to dark greenish gray in color. Gradations between endtypes in color and composition are common. Burrows and color mottling are common. A thin gray (N7) bed at 95–96 cm shows plastic deformation. The greenish black (5G 2/1) sediment commonly shows enrichment in pyrite. Carbonate nodules, light gray (2.5Y 7/2) in color and formed around burrows, are at 35–42 and 141–144 cm in Section 1 and 122–125 cm in Section 2.

SMEAR SLIDE SUMMARY

	1-110	3-10
	D	D
Other heavy minerals	1/T	–
Clay minerals	27/A	35/A
Volcanic glass (dk)	5/C	5/C
Carbonate unspec.	15/C	15/C
Foraminifers	2/R	–
Calcareous nannofossils	10/C	5/C
Diatoms	15/C	15/C
Radiolarians	15/C	15/C
Sponge spicules	5/C	5/C
Silicoflagellates	5/C	5/C

CARBONATE BOMB:

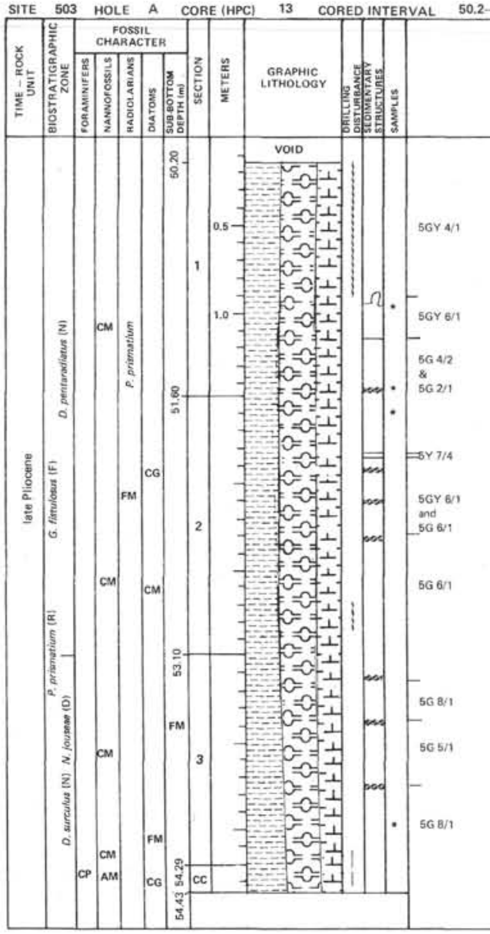
1-49 cm = 12%	2-79 cm = 30%
1-79 cm = 24%	2-109 cm = 15%
1-109 cm = 19%	2-139 cm = 20%
1-139 cm = 16%	3-19 cm = 6%
2-19 cm = 11%	3-49 cm = 38%
2-49 cm = 22%	3-79 cm = 27%

CLAY MINERALOGY ($<2\ \mu m$): 2-73 cm
Smectite 95%
Chlorite & Kaolinite 5%

CARBON-CARBONATE: 12, CC
% Carbonate 50
% Organic carbon 0.3

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 13 CORED INTERVAL 50.2–54.6 m



LITHOLOGIC DESCRIPTION

Cycles of CALCAREOUS SILICEOUS OOZE, ranging from dark greenish gray (5G 4/1) to light greenish gray (5G 8/1) in color. Gradations between the endtypes of colors are common. Burrowing and mottling are common with many pyritized burrows. Dark spots, zones, and bands enriched in pyrite are common.

SMEAR SLIDE SUMMARY

	1-98	1-142	2-10	3-100
	D	M	D	D
Pyrite	2/R	5/C	2/R	1/T
Clay minerals	34/A	34/A	30/A	35/A
Volcanic glass (lt)	1/T	–	–	–
Volcanic glass (dk)	–	–	3/R	–
Carbonate unspec.	12/C	10/C	10/C	15/C
Foraminifers	1/T	–	5/C	2/R
Calcareous nannofossils	15/C	10/C	15/C	10/C
Diatoms	10/C	15/C	10/C	15/C
Radiolarians	15/C	15/C	15/C	15/C
Sponge spicules	5/C	5/C	5/C	2/R
Silicoflagellates	5/C	5/C	5/C	5/C

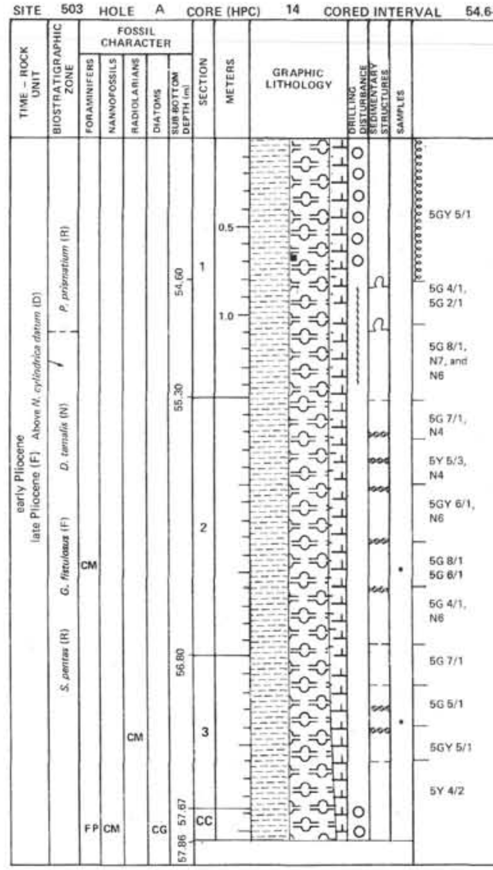
CARBONATE BOMB:

1-109 cm = 46%	2-139 cm = 29%
1-139 cm = 19%	3-19 cm = 41%
2-19 cm = 21%	3-49 cm = 38%
2-49 cm = 30%	3-79 cm = 50%
2-79 cm = 39%	3-109 cm = 47%
2-109 cm = 28%	

CARBON-CARBONATE: 13, CC

% Carbonate	37
% Organic carbon	0.2

SITE 503 HOLE A CORE (HPC) 14 CORED INTERVAL 54.6–59.0 m



LITHOLOGIC DESCRIPTION

Cycles of CALCAREOUS SILICEOUS OOZE, which is light greenish gray (5G 8/1) in color, and CALCAREOUS-BEARING SILICEOUS OOZE, which is greenish gray (5G 5/1) in color. Gradations between endtypes in color and composition are common. The first section is highly disturbed. Burrowing and mottling are common as are zones and burrows enriched in pyrite. A carbonate nodule is at 70 cm in Section 1, which is probably downhole contamination. A zoophycus is at 30 cm in Section 3.

SMEAR SLIDE SUMMARY

	2-100	3-40
	D	D
Pyrite	–	1/T
Clay minerals	35/A	33/A
Volcanic glass (dk)	–	1/T
Carbonate unspec.	10/C	5/C
Foraminifers	2/R	–
Calcareous nannofossils	15/C	5/C
Diatoms	15/C	20/C
Radiolarians	15/C	20/C
Sponge spicules	2/R	10/C
Fish debris	1/T	–
Silicoflagellates	5/C	5/C

CARBONATE BOMB:

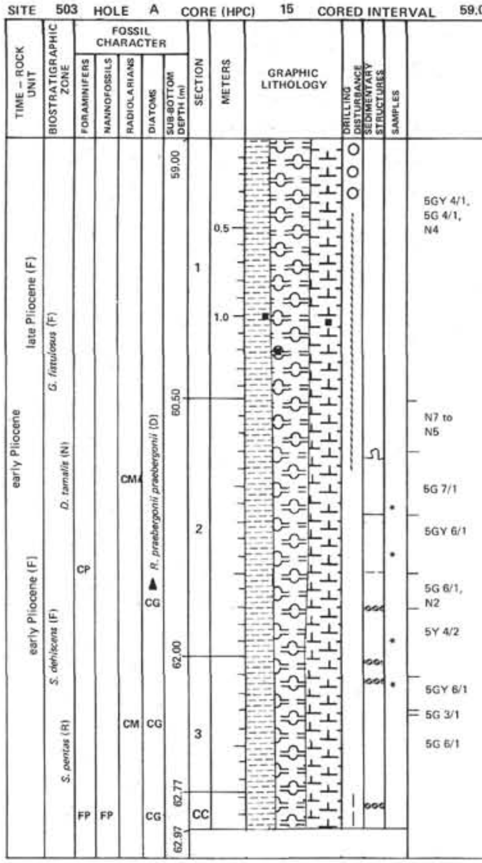
2-19 cm = 43%	2-139 cm = 25%
2-49 cm = 33%	3-19 cm = 23%
2-79 cm = 36%	3-49 cm = 20%
2-109 cm = 48%	3-79 cm = 17%

CARBON-CARBONATE: 14, CC

% Carbonate	36
% Organic carbon	0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 15 CORED INTERVAL 59.0–63.4 m



LITHOLOGIC DESCRIPTION

Cycles of CALCAREOUS SILICEOUS OOZE, which is greenish gray (5GY 6/1) in color, and SILICEOUS MARL, which is grayish olive (5G 4/2) in color. Gradations between endtypes in color and composition are common. Mottling and burrowing are common. Zones and burrows showing enrichment in pyrite, grayish black (N2) and greenish black (5G 3/1) in color, are common. Carbonate nodules (light gray [2.5Y 7/2]) formed around burrows are found in the disturbed sections at 100–120 cm in Section 1 and 50 cm in Section 2.

SMEAR SLIDE SUMMARY

	2-62	2-90	2-140	3-20
	M	D	D	M
Pyrite	–	1/T	1/T	5/C
Clay minerals	–	30/A	25/A	23/C
Volcanic glass (dk)	–	–	2/R	2/R
Carbonate unspec.	100/D	15/C	15/C	15/C
Foraminifers	–	3/R	2/R	–
Calcareous nannofossils	–	15/C	20/C	20/C
Diatoms	–	10/C	15/C	15/C
Radiolarians	–	15/C	15/C	15/C
Sponge spicules	–	5/C	5/C	5/C
Fish debris	–	1/T	–	–
Silicoflagellates	–	5/C	–	–

CARBONATE BOMB:

2-79 cm = 44% 3-19 cm = 51%
2-109 cm = 41% 3-49 cm = 32%
2-139 cm = 13%

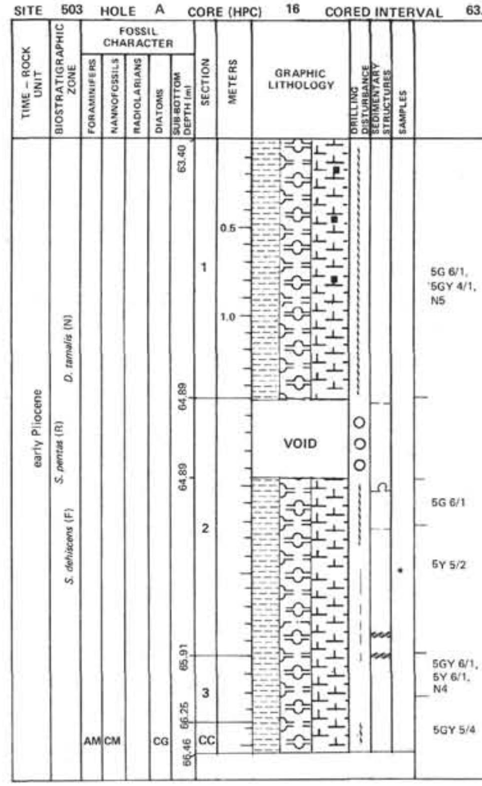
CLAY MINERALOGY (<2 μm): 2-71 cm

Smectite	97%
Chlorite & Kaolinite	3%

CARBON-CARBONATE: 15, CC

% Carbonate	28
% Organic carbon	0.3

SITE 503 HOLE A CORE (HPC) 16 CORED INTERVAL 63.4–67.8 m



LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS NANNO MARL, ranging from dark greenish gray (5GY 4/1) to greenish gray (5G 6/1, 5GY 6/1) in color. Carbonate nodules at 16, 46, and 82 cm in Section 1, are light gray (2.5Y 7/2) in color. The sediment is burrowed and mottled in the less disturbed sections. Zones of pyrite enrichment are common.

SMEAR SLIDE SUMMARY

	2-100
	D
Pyrite	1/T
Clay minerals	28/A
Volcanic glass (dk)	1/T
Carbonate unspec.	20/C
Calcareous nannofossils	20/C
Diatoms	15/C
Radiolarians	10/C
Sponge spicules	5/C

CARBONATE BOMB:

2-79 cm = 38%
2-109 cm = 51%
2-139 cm = 53%
3-19 cm = 44%

CARBON-CARBONATE: 16, CC

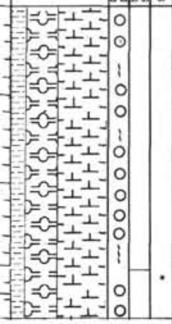
% Carbonate	43
% Organic carbon	0.5

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 17 CORED INTERVAL 67.8–72.2 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	*S. dehiscens* (F); *D. tamalis* (N); *S. pentas* (R)	CM	CM		CM	67.80; 68.95; 69.10; 69.25	1; 2; CC	0.5; 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5Y 4/3, 5G 7/1, N5

5Y 5/1

5G 8/1

SILICEOUS MARL, fairly uniform without burrows or mottles.

SMEAR SLIDE SUMMARY

	2-10
	D
Clay minerals	15/C
Carbonate unspec.	25/A
Foraminifers	5/C
Calcareous nannofossils	25/A
Diatoms	15/C
Radiolarians	10/C
Sponge spicules	5/C

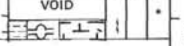
CARBON-CARBONATE:	17, CC
% Carbonate	62
% Organic carbon	0.2

SITE 503 HOLE A CORE (HPC) 18 CORED INTERVAL 72.2–76.6 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	*S. dehiscens* (F); *D. tamalis* (N); *S. pentas* (R)	FP	CM		CG	72.20; 72.26	CC	

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

VOID



LITHOLOGIC DESCRIPTION

5Y 5/2, 5G 5/1

SILICEOUS NANNO MARL greenish gray (5G 5/1) in color.

SMEAR SLIDE SUMMARY

	CC, 10
	D
Pyrite	1/T
Clay minerals	17/C
Volcanic glass (dk)	2/R
Carbonate unspec.	25/A
Calcareous nannofossils	25/A
Diatoms	15/C
Radiolarians	10/C
Sponge spicules	5/C

CARBON-CARBONATE:	18, CC
% Carbonate	33
% Organic carbon	0.4

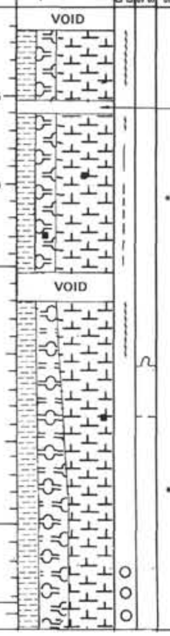
SITE 503 HOLE A CORE (HPC) 19 CORED INTERVAL 76.6–81.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	*S. pentas* (R); *S. dehiscens* (F); *D. asymmetricus/R. pseudoumbilica* (N); ▲ *T. convexa convexa* (D)	FP; FP	FP	CM	FM; CM; CG	76.60; 77.00; 77.91; 77.95; 79.27; 79.71; 79.81	1; 2; 3; CC	0.5; 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

VOID

VOID



LITHOLOGIC DESCRIPTION

VOID

5G 6/1

5G 8/1

N5, N4, 5G 4/1

N7, N6, N5, 5G 4/1

5G 6/1

N3, 5G 4/1

5G 2/1, 5G 4/1

Cycles of SILICEOUS-BEARING NANNO MARL ranging in color from light greenish gray (5G 8/1) to dark greenish gray (5G 4/1). Areas enriched in pyrite, dark gray (N3) and greenish black (5G 2/1) in color, are common. Mottling is common in the undisturbed sections. Carbonate nodules, formed around burrows are at 99 and 135 cm in Section 1, and 93 cm in Section 2.

SMEAR SLIDE SUMMARY

	1-110	2-130
	D	D
Clay minerals	17/C	22/C
Volcanic glass (dk)	–	3/R
Carbonate unspec.	25/A	15/C
Foraminifers	3/R	–
Calcareous nannofossils	35/A	35/A
Diatoms	10/C	15/C
Radiolarians	5/C	5/C
Sponge spicules	5/C	5/C

CARBONATE BOMB:

1-79 cm = 42%	2-79 cm = 35%
1-109 cm = 37%	2-109 cm = 20%
1-139 cm = 35%	2-139 cm = 4%

CLAY MINERALOGY (<2 μm): 2-71 cm

Smectite	95%
Chlorite & Kaolinite	5%

CARBON-CARBONATE:	19, CC	19, CC
% Carbonate	31	32
% Organic carbon	0.3	0.1

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 20 CORED INTERVAL 81.0–85.4 m

TIME – ROCK UNIT: early Pliocene

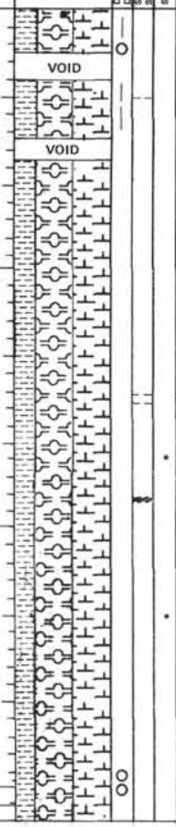
BIOSTRATIGRAPHIC ZONE: Above N. cylindrica datum (D); D. asymmetricus/R. pseudoumbilica (N); S. dehiscens (F); S. pentas (R)

FOSSIL CHARACTER: FORAMINIFERS FP, FP; NANNOFOSSILS FP; RADIOLARIANS CM, CM, CM; DIATOMS CG

SUB-BOTTOM DEPTH (m): 81.00, 81.25, 81.60, 82.30, 83.84, 85.28, 85.35, 85.36

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0



5G 4/1
5GY 4/1, 5G 2/1
5G 4/1
5G 2/1
5G 3/1, 5G 2/1
5Y 8/1
5GY 5/1

LITHOLOGIC DESCRIPTION

Cyclic alternations of SILICEOUS MARL, which is greenish black (5G 2/1) and very dark greenish gray (5G 3/1) in color, and SILICEOUS NANNO OOZE, which is light yellowish gray in color. Gradations between endtypes in color and composition are common. Sediments are mostly uniform, i.e. few burrows or mottles. A zone of pyrite enirchment is at 70–72 cm in Section 2. A carbonate nodule is at 2 cm in Section 1 – probably downhole contamination.

SMEAR SLIDE SUMMARY

	2-110 D	3-50 D
Pyrite	2/R	–
Clay minerals	25/A	5/C
Volcanic glass (dk)	2/R	–
Carbonate unspec.	15/C	20/C
Foraminifers	1/T	–
Calcareous nannofossils	20/C	45/A
Diatoms	15/C	10/C
Radiolarians	10/C	5/C
Sponge spicules	5/C	10/C
Silicoflagellates	5/C	5/C

CARBONATE BOMB:

1-19 cm = 14%	2-109 cm = 1%
1-49 cm = 18%	2-139 cm = 53%
1-109 cm = 5%	3-19 cm = 69%
1-139 cm = 3%	3-49 cm = 65%
2-19 cm = 13%	3-79 cm = 65%
2-49 cm = 8%	3-109 cm = 66%
2-79 cm = 26%	3-139 cm = 26%

CLAY MINERALOGY (<2 μm): 2-71 cm

Smectite	85%
Illite	9%
Chlorite & Kaolinite	6%

CARBON-CARBONATE: 20, CC

% Carbonate	33
% Organic carbon	0.1

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 21 CORED INTERVAL 85.4–89.8 m

TIME – ROCK UNIT: early Pliocene

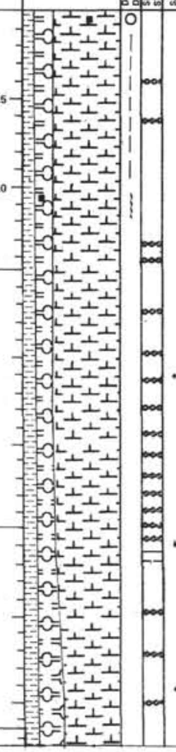
BIOSTRATIGRAPHIC ZONE: Above N. cylindrica datum (D); D. asymmetricus/R. pseudoumbilica (N); G. tumida (F); S. pentas (R)

FOSSIL CHARACTER: FORAMINIFERS FP, FP; NANNOFOSSILS CM; RADIOLARIANS FM, CM; DIATOMS FM

SUB-BOTTOM DEPTH (m): 85.40, 86.90, 88.41, 89.55, 89.60

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0



5G 4/1
5G 6/1
5G 6/1
5G 8/1
5G 6/1
5G 7/1
5G 8/1
5G 6/1
5G 7/1
N2, 5B 7/1, 5B 5/1, 5G 8/1
5Y 8/2
5G 6/1
5G 5/1
5G 6/1, 5G 7/1
5G 5/1

LITHOLOGIC DESCRIPTION

SILICEOUS-BEARING NANNO OOZE showing cyclic color variations ranging from light greenish gray (5G 8/1) to dark greenish gray (5G 4/1). Burrowing of color boundaries is common. Many spots of pyrite enrichment are present. Carbonate nodules are at 7 and 106 cm in the disturbed part of Section 1.

SMEAR SLIDE SUMMARY

	2-60 D	3-10 D	3-95 D
Pyrite	–	3/R	–
Clay minerals	15/C	17/C	18/C
Volcanic glass (dk)	1/T	–	–
Carbonate unspec.	25/A	20/C	20/C
Foraminifers	2/R	1/T	3/C
Calcareous nannofossils	40/A	40/A	35/A
Diatoms	2/R	5/C	10/C
Radiolarians	10/C	10/C	10/C
Sponge spicules	5/C	2/R	2/R
Silicoflagellates	–	2/R	–

CARBONATE BOMB:

1-19 cm = 52%	2-19 cm = 39%	3-19 cm = 51%
1-49 cm = 52%	2-49 cm = 53%	3-49 cm = 50%
1-79 cm = 39%	2-79 cm = 47%	3-79 cm = 28%
1-109 cm = 49%	2-109 cm = 46%	3-109 cm = 45%
1-139 cm = 53%	2-139 cm = 72%	

CARBON-CARBONATE: 21, CC

% Carbonate	50
% Organic carbon	0.1

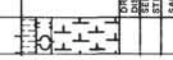
SITE 503 HOLE A CORE (HPC) 22 CORED INTERVAL 89.8–94.2 m

TIME – ROCK UNIT: early Pliocene

BIOSTRATIGRAPHIC ZONE: Above N. cylindrica datum (D); G. tumida (F); S. pentas (R); D. asymmetricus/R. pseudoumbilica (N)

FOSSIL CHARACTER: FORAMINIFERS RP; NANNOFOSSILS CM; DIATOMS FM

SECTION: CC



LITHOLOGIC DESCRIPTION

No core recovery. (Biostratigraphy based upon sediment smeared on core liner.)

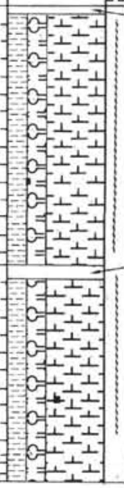
CARBON-CARBONATE: 22, CC

% Carbonate	50
% Organic carbon	0.9

SITE 503 HOLE A CORE (HPC) 23 CORED INTERVAL 94.2–98.6 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	*S. pentas* (R); *G. tumida* (F); *D. asymmetricus*/*R. pseudoumbilica* (N); Above *N. cylindrica* datum (D)	FP	CM		CM	94.20; 95.68; 96.74; 96.86	1, 2, CC	0.5, 1.0

GRAPHIC LITHOLOGY



VOID

5G 6/1

VOID

5G 6/1,
5G 7/1,
5Y 5/1

5G 6/1
N4, 5Y 5/1
5Y 5/1

LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS-BEARING NANNO MARL ranging from olive gray (5Y 5/1) to light greenish gray (5G 7/1) in color. The core is highly disturbed with carbonate nodules at 100 cm in Section 1 and 76 cm in Section 2.

SMEAR SLIDE SUMMARY

	2-107 D
Pyrite	2/R
Clay minerals	15/C
Carbonate unspec.	10/C
Foraminifers	3/R
Calcareous nannofossils	45/A
Diatoms	15/C
Radiolarians	5/C
Sponge spicules	3/R
Silicoflagellates	2/R

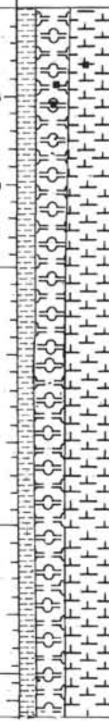
CARBON-CARBONATE: 23, CC
% Carbonate 43
% Organic carbon 0.4

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 24 CORED INTERVAL 98.6–103.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	*S. pentas* (R); *G. tumida* (F); *R. pseudoumbilica*/*D. asymmetricus* (N); Above *N. cylindrica* datum (D)	CM	CM	RM, FM, CM	FM	98.60; 100.11; 101.63; 102.48; 102.70	1, 2, 3, CC	0.5, 1.0

GRAPHIC LITHOLOGY



5GY 6/1,
5G 7/1,
N6

5G 7/1

5Y 5/1,
5Y 8/3

5G 7/1

5G 6/3,
5G 7/1,
10YR 7/2

5GY 4/1,
5Y 4/3

5G 8/1

5Y 4/2,
5Y 5/3

5G 7/1

5Y 6/2,
5G 6/3,
5GY 4/1,
5Y 4/3,
N6, N4, N5

LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS NANNO MARL, ranging in color from light greenish gray (5G 8/1) and pale yellow (5Y 8/3) to dark greenish gray (5GY 4/1) and olive (5Y 4/3). Mottles and burrows are common except for the laminated interval from 127–135 cm in Section 2. Areas of pyrite enrichment are common. Carbonate nodules are found in the disturbed section at the top of the core.

SMEAR SLIDE SUMMARY

	2-35 M	2-40 D	2-110 D	2-128 M
Pyrite	6/C	–	–	3/R
Clay minerals	7/C	18/C	13/C	8/C
Volcanic glass (dk)	2/R	–	–	1/T
Glauconite	10/C	–	–	–
Carbonate unspec.	10/C	10/C	10/C	10/C
Foraminifers	5/C	–	5/C	15/C
Calcareous nannofossils	40/A	40/A	45/A	30/A
Diatoms	10/C	15/C	10/C	10/C
Radiolarians	5/C	10/C	10/C	10/C
Sponge spicules	5/C	5/C	5/C	5/C
Silicoflagellates	–	2/R	2/R	3/R

CARBONATE BOMB:

1-109 cm = 44%	2-109 cm = 70%
1-139 cm = 42%	2-139 cm = 31%
2-19 cm = 47%	3-19 cm = 53%
2-49 cm = 14%	3-49 cm = 52%
2-79 cm = 63%	3-79 cm = 45%

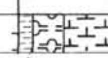
CLAY MINERALOGY (<2 μm): 2-133 cm
Smectite 89%
Illite 5%
Chlorite & Kaolinite 6%

CARBON-CARBONATE: 24, CC
% Carbonate 61
% Organic carbon 0.3

SITE 503 HOLE A CORE (HPC) 25 CORED INTERVAL 103.0–107.4 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	*S. pentas* (R); *G. tumida* (F); *G. rugosus* (N); *N. cylindrica* (D)	FP	AG		FM		CC	

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

No core recovered. (Biostratigraphy based upon sediment smeared on Core-Catcher.)

CARBON-CARBONATE: 25, CC
% Carbonate 79
% Organic carbon 0.3

SITE 503 HOLE A CORE (HPC) 26 CORED INTERVAL 107.4–111.8 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
early Pliocene	S. pentas (R); G. tumida (F); C. acutus (N); Above N. cylindrica datum (D)	RP	AG		CG	CC						No core recovered. (Biostratigraphy based upon sediment smeared on Core-Catcher.)

SITE 503 HOLE A CORE (HPC) 27 CORED INTERVAL 111.8–116.2 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES
early Pliocene	S. pentas (R); G. tumida (F); C. acutus (N); N. jouseae (D)	FP	AM		CM	111.80; 112.65; 112.65; 112.73	1; CC	0.5; 1.0	VOID			•

N7, N8, N5, N6, N4, 5Y 7/3

SILICEOUS NANNO MARL, highly disturbed, light gray (N7 and N8) to medium dark gray (N4). A carbonate nodule is at 15 cm.

SMEAR SLIDE SUMMARY

	1-113 D
Clay minerals	16/C
Carbonate unspec.	10/C
Foraminifers	2/R
Calcareous nannofossils	45/A
Diatoms	15/C
Radiolarians	10/C
Sponge spicules	5/C
Silicoflagellates	2/R

CARBON-CARBONATE: 27, CC

% Carbonate	66
% Organic carbon	0.4

SITE 503 HOLE A CORE (HPC) 28 CORED INTERVAL 116.2–120.6 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
early Pliocene	S. pentas (R); G. tumida (F); C. acutus (N); Above T. miocenica datum (D)	FP	AM		CG		CC						No core recovered. (Biostratigraphy based upon some sediment found in the Core-Catcher.)

SITE 503 HOLE A CORE (HPC) 29 CORED INTERVAL 120.6–125.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES
early Pliocene	S. pentas (R); A. primus (N); G. tumida (F); Above T. miocenica datum (D)	FM	CM, CM, CM, CM, CM		CM, CM, CG, CG, CG, CM	120.60; 122.10; 123.61; 124.65; 124.77	1; 2; 3; CC	0.5; 1.0				

5G 8/1, N8, N7

5G 4/1, 5G 2/1, 5Y 5/2, N9

5Y 8/2, 5G 8/1, N7

5G 7/1, 5G 8/1

5GY 8/1

5G 5/1, 5Y 6/3, 5Y 6/2, N5, N7

5Y 7/3, 5Y 6/2, 5G 7/1

5G 4/1, 5G 2/1, 5Y 6/3, N7

N7, 5Y 8/3

N6, N5

5G 6/1, 5/1, 5GY 5/1

5G 4/1, 5G 2/1, 5Y 6/3, N7, 5Y 8/1

5Y 7/3, 5G 7/1, N7

5G 7/1

N4, N5, N7

Cyclic alternation of SILICEOUS NANNO MARL TO SILICEOUS NANNO OOZE ranging in color from light greenish gray (5G 8/1) and yellowish gray (5Y 8/2) to greenish black (5G 2/1) and dark greenish gray (5G 4/1) in color. Gradations in color between the endtypes are common. Burrowing and color mottling are common. A zoophycus burrow is at 29 cm in Section 3. A HPC "collapse" coring artifact extends from 116 cm in Section 1 to 5 cm in Section 2. A grayish blue green (5BG 5/2) enrichment in montmorillonite is at 87–90 cm in Section 3.

SMEAR SLIDE SUMMARY

	1-45 D	2-70 D	3-88 M
Clay minerals	13/C	10/C	23/C
Volcanic glass (dk)	–	1/T	–
Carbonate unspec.	10/C	15/C	15/C
Foraminifers	2/R	2/R	–
Calcareous nannofossils	45/A	45/A	40/A
Diatoms	12/C	13/C	10/C
Radiolarians	12/C	10/C	10/C
Sponge spicules	3/R	2/R	3/R
Silicoflagellates	3/R	2/R	–

CARBONATE BOMB:

1-19 cm = 64%	2-79 cm = 63%
1-49 cm = 17%	2-109 cm = 35%
1-79 cm = 52%	2-139 cm = 60%
1-109 cm = 35%	3-19 cm = 37%
1-139 cm = 44%	3-49 cm = 44%
2-19 cm = 35%	3-79 cm = 63%
2-49 cm = 39%	

CLAY MINERALOGY (<2 µm): 2-71 cm

Smectite	97%
Chlorite & Kaolinite	3%

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 30 CORED INTERVAL 125.0–129.4 m

TIME – ROCK UNIT: early Pliocene?; late Miocene early Pliocene (F)

BIOSTRATIGRAPHIC ZONE: *T. miocenica* (D); *G. tumida* (F) *A. primus* (N); *S. pentas* (R)

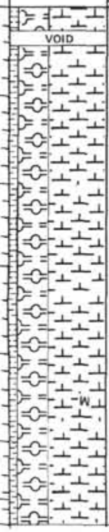
FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS): CM CG; CG; FM; CM; CM; RM AG CM CM

SUB-BOTTOM DEPTH (m): 125.00, 125.13, 126.33, 127.68, 127.86

SECTION: 1, 2, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

LITHOLOGIC DESCRIPTION

5G 6/1, 5G 7/1, 5Y 8/2, N4

5G 8/1, 5Y 8/1

5G 7/1, 5GY 6/1

5G 6/1, 5Y 5/3

N7, N8, 5G 8/1

N8

Cycles of SILICEOUS NANNO OOZE ranging in color from yellowish gray (5Y 8/1) and light greenish gray(5G 8/1) to olive (5Y 5/3). Burrowing and mottling are common from the top of the core to 40 cm in Section 2. Below this boundary the sediment is highly uniform. Pyrite enriched zones and burrows are common. A possible piece of wood is at 66–73 cm in Section 2.

SMEAR SLIDE SUMMARY

	2-80
	D
Pyrite	2/R
Clay minerals	10/C
Volcanic glass (dk)	1/T
Carbonate unspec.	10/C
Foraminifers	2/R
Calcareous nannofossils	45/A
Diatoms	12/C
Radiolarians	12/C
Sponge spicules	4/R
Silicoflagellates	2/R

CARBONATE BOMB:

1-19 cm = 36%	2-19 cm = 66%
1-49 cm = 48%	2-49 cm = 65%
1-79 cm = 52%	2-79 cm = 67%
1-109 cm = 62%	2-109 cm = 69%
1-139 cm = 38%	

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 31 CORED INTERVAL 129.4–133.8 m

TIME – ROCK UNIT: early Pliocene (F)

BIOSTRATIGRAPHIC ZONE: Above *N. miocenica* datum (D); *A. primus* (N); *G. tumida* (F); *S. pentas* (R)

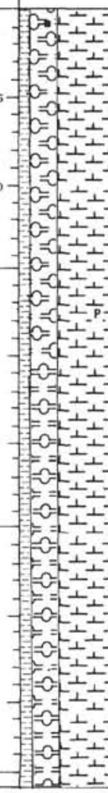
FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS): CM CG; CM; CM; FP; CM; CM FM; CM; FM CM CM

SUB-BOTTOM DEPTH (m): 129.40, 130.85, 132.35, 133.74, 133.87

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

LITHOLOGIC DESCRIPTION

5G 6/1, 5G 7/1, 5G 8/1

5Y 5/3, 5G 4/1, N3

5G 8/1, N8, 5Y 6/3, N7

5G 8/1, 5G 6/3, 5Y 6/3, N2, N4

5Y 6/3, N2, 5G 6/1

N7, 5G 7/1

5G 8/1, 5Y 8/3, N7

5G 7/1, N3

N2, 5Y 6/3, 5G 6/1

N7, 5G 7/1

5G 8/1, 5Y 8/3

N2, 5Y 6/3, 5G 6/1, N6

N7, 5G 7/1

5G 8/1, 5G 6/1

Cyclic alternation of SILICEOUS NANNO OOZE AND SILICEOUS NANNO MARL ranging in color from pale olive (5Y 6/3) and greenish gray (5G 6/1) to light greenish gray (5G 8/1) and very light gray (N8). Highly burrowed and mottled throughout. Individual burrows and zones of pyrite enrichment are common. A carbonate nodule is at 5 cm in the first section.

SMEAR SLIDE SUMMARY

	2-30[a]	2-30	2-85	2-120
	M	D	D	D
Pyrite	5/R	–	–	2/R
Clay minerals	13/C	8/C	16/C	15/C
Volcanic glass (dk)	–	–	1/T	1/T
Carbonate unspec.	10/C	10/C	10/C	10/C
Foraminifers	–	2/R	3/R	2/R
Calcareous nannofossils	45/A	50/A	45/A	45/A
Diatoms	10/C	10/C	10/C	10/C
Radiolarians	10/C	10/R	10/C	10/C
Sponge spicules	5/C	5/C	2/R	3/R
Silicoflagellates	2/R	5/C	3/R	2/R

[a] Black nodule

CARBONATE BOMB:

1-79 cm = 40%	2-139 cm = 52%
1-109 cm = 30%	3-19 cm = 42%
1-139 cm = 66%	3-49 cm = 44%
2-19 cm = 53%	3-79 cm = 54%
2-49 cm = 63%	3-109 cm = 52%
2-79 cm = 37%	3-139 cm = 60%
2-109 cm = 57%	

CLAY MINERALOGY ($<2\ \mu m$): 2-71 cm

Smectite	98%
Chlorite & Kaolinite	2%

SITE 503 HOLE A CORE (HPC) 32 CORED INTERVAL 133.8–138.2 m

TIME – ROCK UNIT: early Pliocene

BIOSTRATIGRAPHIC ZONE: Above *N. miocenica* datum (D); *G. tumida* (F); *A. primus* (N)

FOSSIL CHARACTER: Foraminifers FM; Nannofossils CM; Diatoms FM

SUB-BOTTOM DEPTH (m): 133.80, 134.42, 134.50

SECTION: 1, CC

METERS: 0.5

GRAPHIC LITHOLOGY: VOID; VOID

N7

N7, 5Y 6/3

N7

LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS NANNO MARL raning in color from light gray (N7) to pale olive (5Y 6/3). Mottling is present. A carbonate nodule around a burrow is at 33 cm in the disturbed section.

SMEAR SLIDE SUMMARY

	1-60
	D
Pyrite	2/R
Clay minerals	13/C
Carbonate unspec.	10/C
Foraminifers	5/C
Calcareous nannofossils	40/A
Diatoms	10/C
Radiolarians	10/C
Sponge spicules	5/R
Silicoflagellates	5/R

CARBON-CARBONATE: 32, CC

% Carbonate	53
% Organic carbon	0.3

SITE 503 HOLE A CORE (HPC) 33 CORED INTERVAL 138.2–142.6 m

TIME – ROCK UNIT: early Pliocene

BIOSTRATIGRAPHIC ZONE: *S. pentas*(?) (R); *G. tumida* (F); *A. primus* (N); Above *N. Miocenica* datum (D); *T. miocenica*

FOSSIL CHARACTER: Foraminifers FP; Nannofossils CM; Diatoms CG

SUB-BOTTOM DEPTH (m): 138.20, 138.55, 138.61, 139.27, 139.38

SECTION: 1, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID; VOID; VOID

VOID

5GY 4/1, N5

N6

N7

N8, N7, N6

N4, N5, N8

5G 8/1, N2, 5G 8/1

LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS NANNO MARL showing various shades of gray. Carbonate nodules are at 105–115 and 132 cm in Section 1.

CARBON-CARBONATE: 33, CC

% Carbonate	31
% Organic carbon	0.5

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 34 CORED INTERVAL 142.6–147.0 m

TIME – ROCK UNIT: late Miocene

BIOSTRATIGRAPHIC ZONE: Above *N. miocenica* datum (D); *A. acutiloba* (D); *A. primus* (N); *N. cylindrica* (D); *G. plesiotumida* (F); *S. peregrina* (?) (R)

FOSSIL CHARACTER: Foraminifers FM; Nannofossils CM, CM, CM; Diatoms CM, AG, CG, CM

SUB-BOTTOM DEPTH (m): 142.60, 143.16, 143.64, 143.83, 145.34, 145.99, 146.16

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID; VOID

5GY 8/1, N5

Disturbed

5GY 6/1, 5GY 8/1, 5G 4/1, 5Y 7/3, 6/3, 5Y 4/3

5G 8/1, N7, 5Y 8/1, 8/3

5G 8/1, 7/3

5Y 5/4, 5Y 7/3, 5Y 3/2, 5G 8/1

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

5G 7/1, 5Y 7/4, 5Y 6/3

5G 6/1, 5Y 6/4, N5

5G 7/1, 5Y 7/4

LITHOLOGIC DESCRIPTION

Cyclic alternation of CALCAREOUS-BEARING DIATOM OOZE, dominantly clive (5Y 5/4) in color, and light greenish gray (5GY 8/1) SILICEOUS NANNO MARL. Gradations in color and composition between endtypes is common. Section one is very disturbed throughout. The sediment is highly burrowed and mottled throughout.

SMEAR SLIDE SUMMARY

	2-110	3-55
	D	D
Pyrite	1/T	1/T
Clay minerals	19/C	14/C
Volcanic glass (dk)	–	1/T
Carbonate unspec.	7/C	5/C
Foraminifers	–	2/R
Calcareous nannofossils	8/C	40/A
Diatoms	50/A	20/C
Radiolarians	7/C	10/C
Sponge spicules	6/C	5/C
Silicoflagellates	3/R	2/R

CARBONATE BOMB:

2-19 cm = 48%	2-139 cm = 41%
2-49 cm = 66%	3-19 cm = 51%
2-79 cm = 58%	3-49 cm = 41%
2-109 cm = 2%	

CLAY MINERALOGY (<2 μm): 2-71 cm

Smectite	99%
Chlorite & Kaolinite	1%

SITE 503 HOLE A CORE (HPC) 35 CORED INTERVAL 147.0–151.4 m

TIME – ROCK UNIT: late Miocene

BIOSTRATIGRAPHIC ZONE: *G. plesiotumida* (F); *A. primus* (N); Above *N. miocenica* datum (D); *S. peregrina* (R)

FOSSIL CHARACTER: Foraminifers FM; Nannofossils CM; Diatoms CM

SUB-BOTTOM DEPTH (m): 147.00, 147.67, 147.77

SECTION: 1, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID; VOID

5G 7/1, 5G 6/1, 5GY 6/1, 5Y 6/3

5GY 6/1

LITHOLOGIC DESCRIPTION

SILICEOUS NANNO MARL dominantly greenish gray (5G 6/1 and 5GY 6/1) in color.

SMEAR SLIDE SUMMARY

	1-70
	D
Pyrite	3/R
Clay minerals	18/C
Carbonate unspec.	10/C
Foraminifers	4/R
Calcareous nannofossils	35/A
Diatoms	20/C
Radiolarians	5/C
Sponge spicules	2/R
Fish debris	1/T
Silicoflagellates	2/R

CARBON-CARBONATE: 35-1

% Carbonate	38
% Organic carbon	0.4

SITE 503 HOLE A CORE (HPC) 36 CORED INTERVAL 151.4–155.8 m

TIME-ROCK UNIT: late Miocene

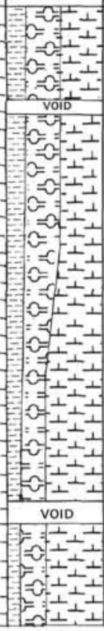
BIOSTRATIGRAPHIC ZONE: *A. primus* (N) Above *N. miocenica* datum (D); *G. plesiotumida* (F); *S. peregrina* (R)

FOSSIL CHARACTER (Foraminifers / Nannofossils / Radiolarians / Diatoms): CM CM; CM; FM CG; CG; AG; CM CM AG

SUB-BOTTOM DEPTH (m): 151.40, 151.92, 152.83, 154.19, 154.59, 154.78

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0



5G 8/1, 5Y 8/2, 5G 6/1, 5Y 6/3

5G 6/1, 5G 5/1, 5Y 6/3

5G 8/1, 5Y 8/2, 5G 6/1, N3, N7

5GY 8/1, N8

LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS NANNO MARL, ranging in color from light greenish gray (5G 8/1) and yellowish gray (5Y 8/1) to greenish gray (5G 6/1 and 5G 5/1). Burrows, mottles, and spots of pyrite enrichment are common.

SMEAR SLIDE SUMMARY

	1-140 D	2-60 D	2-80 D
Pyrite	1/T	5/C	–
Clay minerals	19/C	15/C	12/C
Volcanic glass (dk)	–	–	1/T
Carbonate unspec.	10/C	10/C	10/C
Foraminifers	–	5/C	2/R
Calcareous nannofossils	35/A	40/A	40/A
Diatoms	20/C	15/C	20/C
Radiolarians	8/C	2/R	8/C
Sponge spicules	5/C	5/C	2/R
Silicoflagellates	2/R	3/R	5/C

CARBONATE BOMB:

1-19 cm = 65%	2-19 cm = 65%
1-79 cm = 63%	2-49 cm = 60%
1-109 cm = 31%	2-79 cm = 62%
1-139 cm = 49%	2-109 cm = 63%
1-149 cm = 69%	3-19 cm = 56%

CLAY MINERALOGY (<2 μm): 2-71 cm

Smectite 100%

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 37 CORED INTERVAL 155.8–160.2 m

TIME-ROCK UNIT: late Miocene

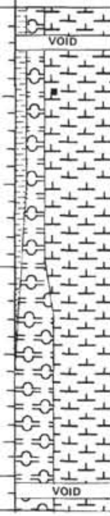
BIOSTRATIGRAPHIC ZONE: *S. peregrina* (R); *A. primus* (N); *G. plesiotumida* (F); *N. miocenica* (D)

FOSSIL CHARACTER (Foraminifers / Nannofossils / Radiolarians / Diatoms): FM CG; CG; CM AG; CG; CM AM CG

SUB-BOTTOM DEPTH (m): 155.80, 155.95, 157.24, 158.44, 158.51

SECTION: 1, 2, CC

METERS: 0.5, 1.0



5Y 8/1, 5G 8/1, 5G 7/3, 5Y 8/3, 5G 7/1

5Y 6/2, 5G 6/1, N3

5G 8/1, 5Y 8/3, 5G 8/3, 5Y 7/4, 5Y 8/1, N6

5Y 8/1, 5G 8/1

LITHOLOGIC DESCRIPTION

Cyclic alternation of SILICEOUS-BEARING NANNO OOZE, dominantly yellowish gray (5Y 8/1) and light greenish gray (5G 8/1) in color and SILICEOUS NANNO OOZE, dominantly light olive gray (5Y 6/2) and greenish gray (5G 6/1) in color. Gradations in composition and color between the endtypes are common. Burrows and mottles are common. Many spots, zones, and burrows show pyrite enrichment. A carbonate nodule is at 50 cm in Section 1.

SMEAR SLIDE SUMMARY

	1-150 D	2-25 D
Clay minerls	13/C	5/C
Carbonate unspec.	10/C	10/C
Foraminifers	5/C	2/R
Calcareous nannofossils	55/A	50/A
Diatoms	10/C	20/C
Radiolarians	5/C	7/C
Sponge spicules	–	3/R
Silicoflagellates	2/R	3/R

CARBONATE BOMB:

1-49 cm = 66%	2-19 cm = 41%
1-79 cm = 68%	2-49 cm = 62%
1-109 cm = 77%	2-79 cm = 65%
1-139 cm = 74%	2-109 cm = 71%

CARBON-CARBONATE: 37, CC

% Carbonate 71

% Organic carbon 0.3

SITE 503 HOLE A CORE (HPC) 38 CORED INTERVAL 160.2–164.6 m

TIME-ROCK UNIT: late Miocene

BIOSTRATIGRAPHIC ZONE: *G. plesiotumida* (F) *S. peregrina* (R) *A. primus* (N) *T. praeconvexa* (D) *N. miocenica elongata*

FOSSIL CHARACTER: CM CM CG

SUB-BOTTOM DEPTH (m): 160.20, 160.70

SECTION: CC

LITHOLOGIC DESCRIPTION

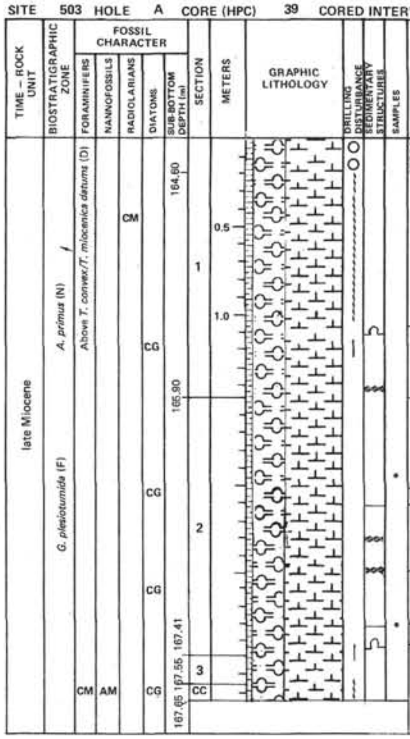
SILICEOUS NANNO MARL.

CARBON-CARBONATE: 38, CC

% Carbonate 65

% Organic carbon 0.3

SITE 503 HOLE A CORE (HPC) 39 CORED INTERVAL 164.6–169.0 m



5G 8/1, N7, N4, 5G 6/1, 5Y 7/3
5GY 8/1, 6/1, 5Y 7/3, N6
5G 7/1, 5Y 7/3
5Y 6/3
5G 7/1, N5
5G 7/1, 5Y 6/3, 5G 6/1
5Y 7/2, 5G 6/1, 5G 4/1, 5Y 4/3, N5
5G 7/1
5G 7/1, 5G 7/3, N5, N6, N7

LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS NANNO MARL, ranging from light grayish green (5G 8/1) to pale olive (5Y 6/3) in color. Gradations between endtypes in color are common. Slightly mottled to 50 cm in Section 1; highly burrowed and mottled below. Zones and burrows of pyrite enrichment are common.

SMEAR SLIDE SUMMARY

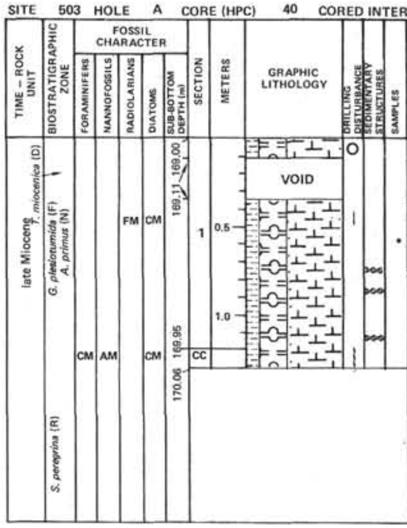
	2-45	2-135
	D	D
Pyrite	2/R	2/R
Clay minerals	10/C	15/C
Volcanic glass (dk)	3/R	–
Carbonate unspec.	10/C	7/C
Foraminifers	2/R	3/R
Calcareous nannofossils	45/A	40/A
Diatoms	15/C	15/C
Radiolarians	7/C	10/C
Sponge spicules	3/R	3/R
Silicoflagellates	3/R	5/C

CARBONATE BOMB:

1-109 cm = 73%
1-139 cm = 60%
2-19 cm = 63%
2-49 cm = 62%
2-79 cm = 58%
2-109 cm = 43%
2-139 cm = 48%

CARBON-CARBONATE: 39, CC
% Carbonate 52
% Organic carbon 0.3

SITE 503 HOLE A CORE (HPC) 40 CORED INTERVAL 169.0–173.4 m



5GY 6/1
5G 6/1, 5GY 6/1, 5Y 6/3, 5Y 7/4, N7, N5

LITHOLOGIC DESCRIPTION

Dominantly dark greenish gray (5GY 6/1 and 5G 6/1) SILICEOUS NANNO OOZE. Burrowing and mottling are common. There are many zones of pyrite enrichment.

SMEAR SLIDE SUMMARY

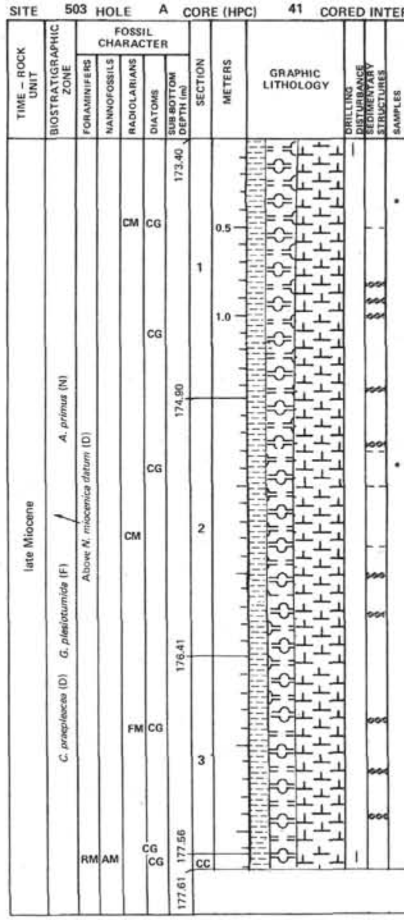
	1-60
	D
Clay minerals	12/C
Carbonate uspec.	10/C
Foraminifers	5/C
Calcareous nannofossils	45/A
Diatoms	12/C
Radiolarians	10/C
Sponge spicules	3/R
Silicoflagellates	3/R

CARBONATE BOMB:

1-49 cm = 64%
1-79 cm = 48%
1-109 cm = 54%

CARBON-CARBONATE: 40, CC
% Carbonate 55
% Organic carbon 0.4

SITE 503 HOLE A CORE (HPC) 41 CORED INTERVAL 173.4–177.8 m



5G 6/1, 5G 5/1, 2.5Y 6/4, N4
5G 7/1, 5Y 7/3, 5G 6/1, N3, 2.5Y 7/2, 2.5Y 5/2
5G 7/1, 5Y 7/3
5G 5/1, 5G 6/1, 5Y 5/3, N2, 5Y 7/3
5G 7/1, 5Y 7/3, 5G 6/1, N3, 2.5Y 7/2
5G 6/3, 5GY 6/1, 2.5Y 6/3
5G 7/1, 5Y 7/3, 5G 6/1, N3, 2.5Y 7/2, 2.5Y 5/2
5G 8/1

LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS NANNO MARL, ranging in color from greenish gray (5G 5/1, 5G 6/1) to light greenish gray (5G 8/1). Gradations between endtypes in color are common. Highly burrowed and mottled throughout. Spots and burrows with pyrite enrichment are common.

SMEAR SLIDE SUMMARY

	1-35	2-40
	D	D
Pyrite	1/T	–
Clay minerals	19/C	14/C
Volcanic glass (dk)	2/R	1/T
Carbonate unspec.	10/C	10/C
Foraminifers	3/R	1/T
Calcareous nannofossils	35/A	45/A
Diatoms	10/C	10/C
Radiolarians	8/C	10/C
Sponge spicules	4/R	5/C
Silicoflagellates	8/C	4/R

CARBONATE BOMB:

1-19 cm = 31%	2-19 cm = 59%	3-19 cm = 49%
1-49 cm = 32%	2-49 cm = 52%	3-49 cm = 56%
1-79 cm = 41%	2-79 cm = 28%	3-79 cm = 52%
1-109 cm = 30%	2-109 cm = 59%	3-109 cm = 63%
1-139 cm = 44%	2-139 cm = 41%	

CLAY MINERALOGY (<2 μm): 2-71 cm
Smectite 100%

CARBON-CARBONATE: 41, CC
% Carbonate 62
% Organic carbon 0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 42 CORED INTERVAL 177.8–182.2 m

TIME – ROCK UNIT | BIOSTRATIGRAPHIC ZONE | FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS) | SUB-BOTTOM DEPTH (m) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION

late Miocene

S. peregrina (R) G. plesiotumida (F) Above N. miocenica datum (D) A. primus (N) T. miocenica (D)

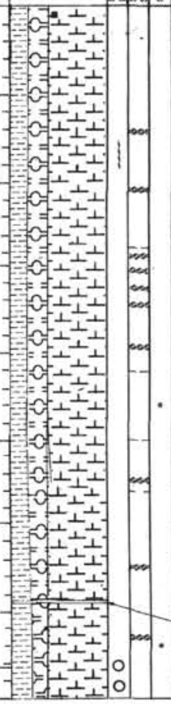
CM CG CG CM CG CG FM

RM FP AG

177.80 179.31 180.82 181.23 181.64 181.79

1 2 3 CC

0.5 1.0



5G 8/1

5Y 8/1, 5G 6/1, 5Y 6/4, 5G 8/1, N6

5G 5/1, 5G 6/1, 5Y 6/3, 5Y 7/3, N4

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

5G 6/1, 5Y 7/3, 5Y 7/1

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

5Y 8/3, 2.5Y 6/2, 5GY 8/1

5G 6/1, 5G 5/1, 5Y 6/3, N5

VOID

5G 4/1, 5Y 4/1, N7, 2.5Y 7/2

5G 8/1

Cyclic alternation of SILICEOUS-BEARING NANNO OOZE, which is light greenish gray (5G 8/1, 5GY 8/1) and pale yellow (5Y 8/3) in color, and SILICEOUS NANNO MARL which is dark greenish gray (5G 4/1) and olive (5Y 4/1) in color. Gradations in color and composition between endtypes are common. Highly burrowed and mottled throughout. Spot and burrow enriched in pyrite are common, and are medium gray (N5) and medium dark gray (N4) in color.

SMEAR SLIDE SUMMARY

	2-80	3-70
	D	D
Pyrite	1/T	1/T
Clay minerals	18/C	20/C
Volcanic glass (lt)	–	1/T
Carbonate unspec.	10/C	10/C
Foraminifers	1/T	–
Calcareous nannofossils	50/A	35/A
Diatoms	10/C	15/C
Radiolarians	5/C	10/C
Silicoflagellates	5/C	8/C

CARBONATE BOMB:

1-19 cm = 63%	2-19 cm = 42%	3-19 cm = 62%
1-49 cm = 55%	2-49 cm = 44%	3-49 cm = 55%
1-79 cm = 47%	2-79 cm = 57%	
1-109 cm = 48%	2-109 cm = 47%	
1-139 cm = 34%	2-139 cm = 68%	

CARBON-CARBONATE: 42, CC
% Carbonate 18
% Organic carbon 0.4

SITE 503 HOLE A CORE (HPC) 43 CORED INTERVAL 182.2–186.6 m.

TIME – ROCK UNIT | BIOSTRATIGRAPHIC ZONE | FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS) | SUB-BOTTOM DEPTH (m) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION

late Miocene

S. peregrina (R) G. plesiotumida (F) A. primus (N) Above N. miocenica datum (D)

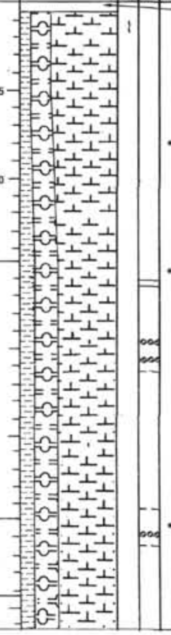
CM CG CG FM CG CG CG

FM CM AG

182.20 183.65 185.16 185.59 185.74

1 2 3 CC

0.5 1.0



VOID

5GY 6/1

5GY 6/1, 5G 6/3, N5, 5Y 8/3, 5Y 6/3, 2.5Y 6/3

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

5Y 8/1, 5GY 8/1

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

5Y 6/2, 5G 5/2, 5Y 6/3

Cycles of SILICEOUS-BEARING NANNO OOZE, ranging in color from dominantly grayish green (5Y 5/2 and 5G 6/2) and greenish gray (5GY 6/1) to dominantly light greenish gray (5G 8/1 and 5GY 8/1) and pale yellow (5Y 8/3). Gradations between endtypes in color are common. The sediment is very uniform from the top of the core to 10 cm in Section 2; below this boundary it is highly burrowed and mottled. Spots of pyrite enrichment are common, and are dark gray (N3) in color.

SMEAR SLIDE SUMMARY

	1-80	2-3	3-7
	D	D	D
Pyrite	2/R	–	2/R
Clay minerals	8/C	14/C	15/C
Volcanic glass (dk)	–	1/T	–
Carbonate unspec.	15/C	10/C	10/C
Foraminifers	3/R	5/C	1/T
Calcareous nannofossils	50/A	45/A	50/A
Diatoms	10/C	12/C	10/C
Radiolarians	4/R	7/C	4/R
Silicoflagellates	8/C	6/C	8/C

CARBONATE BOMB:

1-19 cm = 53%	2-49 cm = 40%
1-49 cm = 51%	2-79 cm = 42%
1-79 cm = 53%	2-109 cm = 43%
1-109 cm = 51%	2-139 cm = 48%
1-139 cm = 51%	3-19 cm = 54%
2-19 cm = 41%	

CARBON-CARBONATE: 43, CC
% Carbonate 42
% Organic carbon 0.4

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 44 CORED INTERVAL 186.6–191.0 m

TIME – ROCK UNIT: late Miocene

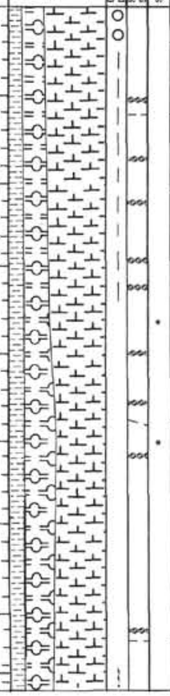
BIOSTRATIGRAPHIC ZONE: Above *N. miocenica* datum (D); *A. primus* (N); *S. peregrina* (R); *G. plesiotumida* (F); *T. convex aspinosa* (D)

FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS): CG, CM, CG, FM, FM, CM, CM, AG

SUB-BOTTOM DEPTH (m): 186.60, 188.41, 189.61, 190.46, 190.57

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0



LITHOLOGIC DESCRIPTION

5Y 8/1

5Y 8/1, 5G 8/1, 5G 7/1, 5Y 7/2

5Y 6/1, 5GY 6/1, 5Y 6/3, 5Y 5/3

5GY 8/1, 5G 8/1, 5G 6/3, 5Y 4/1

5Y 8/3, 5Y 7/2, 5G 7/1, 5Y 6/3, 5G 6/1, N3

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

5Y 6/2, 5G 6/1, N5

Cyclic alternation of SILICEOUS NANNO OOZE AND SILICEOUS NANNO MARL ranging in color from yellowish gray (5Y 8/1) and greenish gray (5G 8/1 and 5GY 8/1) to light olive gray (5Y 6/1) and greenish gray (5G 6/1). Gradations in color are common. The sediment is highly burrowed and mottled throughout. Color changes are subtle. Spots and streaks of pyrite enrichment are common. A "collapsed" deformation structure related to HPC coring is in the center of the core from 20 cm in Section 1 to 50 cm in Section 2.

SMEAR SLIDE SUMMARY

	2-30	2-100
	D	D
Pyrite	2/R	3/R
Clay minerals	10/C	15/C
Carbonate unspec.	10/C	10/C
Foraminifers	—	2/R
Calcareous nannofossils	50/A	40/A
Diatoms	18/C	20/C
Radiolarians	5/C	3/R
Silicoflagellates	5/C	7/C

CARBONATE BOMB:

1-19 cm = 56%	2-19 cm = 33%	3-19 cm = 52%
1-49 cm = 38%	2-49 cm = 43%	3-49 cm = 56%
1-79 cm = 40%	2-79 cm = 41%	3-79 cm = 35%
1-109 cm = 53%	2-109 cm = 47%	
1-139 cm = 52%	2-139 cm = 53%	

CARBON-CARBONATE: 44, CC

% Carbonate	37
% Organic carbon	0.4

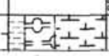
SITE 503 HOLE A CORE (HPC) 45 CORED INTERVAL 191.0–195.4 m

TIME – ROCK UNIT: late Miocene

BIOSTRATIGRAPHIC ZONE: *A. primus* (N); Above *N. miocenica* datum (D)

FOSSIL CHARACTER: AM, CG

SECTION: CC



LITHOLOGIC DESCRIPTION

No core recovered. (Biostratigraphy based upon sediment streaks from Core-Catcher.)

SITE 503 HOLE A CORE (HPC) 46 CORED INTERVAL 195.4–199.8 m

TIME – ROCK UNIT: late Miocene

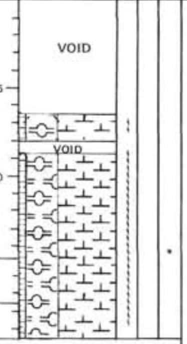
BIOSTRATIGRAPHIC ZONE: Above *N. miocenica* datum (D); *A. primus* (N); *G. plesiotumida* (F); *S. peregrina*(?) (R); *T. praeconvexa* (D)

FOSSIL CHARACTER: FM, CM, CM

SUB-BOTTOM DEPTH (m): 195.40, 195.55, 196.17, 196.42, 196.55

SECTION: 1, 2, CC

METERS: 0.5, 1.0



LITHOLOGIC DESCRIPTION

N7, N6, 5Y 6/3

SILICEOUS NANNO OOZE. There is subtle color variation with some spots of pyrite enrichment.

SMEAR SLIDE SUMMARY

	1-140
	D
Pyrite	1/T
Clay minerals	11/C
Carbonate unspec.	10/C
Foraminifers	2/R
Calcareous nannofossils	50/A
Diatoms	18/C
Radiolarians	5/C
Silicoflagellates	3/R

SITE 503 HOLE A CORE (HPC) 47 CORED INTERVAL 199.8–204.2 m

TIME – ROCK UNIT: late Miocene

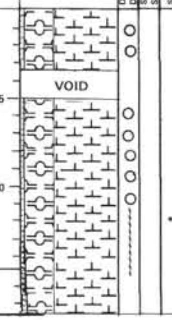
BIOSTRATIGRAPHIC ZONE: Above *N. miocenica* datum (D); *A. primus* (N); *G. plesiotumida* (F); *N. porteri* (D); *S. peregrina*(?) (R)

FOSSIL CHARACTER: CM, AM, CM

SUB-BOTTOM DEPTH (m): 199.80, 200.02, 200.81, 201.07

SECTION: 1, CC

METERS: 0.5, 1.0



LITHOLOGIC DESCRIPTION

N8, N7

SILICEOUS NANNO OOZE in various shades of gray (N6, N7). Uniform in color except for a spot of pyrite enriched at 15–20 cm in Section 2, grayish black (N2) in color.

SMEAR SLIDE SUMMARY

	1-120
	D
Pyrite	2/R
Clay minerals	8/C
Carbonate unspec.	10/C
Foraminfiers	2/R
Calcareous nannofossils	50/A
Diatoms	20/C
Radiolarians	5/C
Silicoflagellates	3/R

CARBON-CARBONATE: 47, CC

% Carbonate	66
% Organic carbon	0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 48 CORED INTERVAL 204.2–208.6 m

TIME – ROCK UNIT: late Miocene

BIOSTRATIGRAPHIC ZONE: G. plesiotumida (F); A. primus (N); S. peregrina(?) (R); Above N. miocenica datum (D); D. penultima(?) (D)

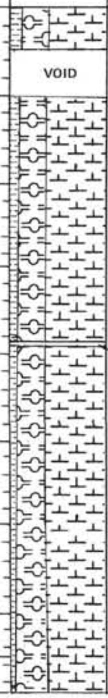
FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS): CM; CM; CM CM CM

SUB-BOTTOM DEPTH (m): 204.20, 204.42, 206.40, 206.86, 206.90, 207.65, 207.85

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE, SEDIMENTARY STRUCTURES, SAMPLES

LITHOLOGIC DESCRIPTION

5G 8/1, 10YR 8/3

5G 8/1, 5Y 8/1, 5GY 8/1, N5, N3, 5G 7/3

5Y 8/1, 5GY 8/1, 5G 8/1, N5, N3, 5G 6/3, 5Y 5/3

VOID

5G 7/1, 5Y 7/1, 5Y 8/2, N5, 5Y 8/1

5G 8/1, 5Y 8/1, N7, 5GY 8/1, 5G 7/3

Cycles of SILICEOUS NANNO OOZE showing subtle color variation downcore ranging from light greenish gray (5G 8/1, 5GY 8/1) and yellowish gray (5Y 8/1) to light greenish gray (5G 7/1) and yellowish gray (5Y 7/1). Areas of pyrite enrichment are common yielding darker shades to the basic colors. Burrowing and mottling are common throughout.

SMEAR SLIDE SUMMARY

	2-80
	D
Clay minerals	13/C
Carbonate unspec.	10/C
Foraminifers	2/R
Calcareous nannofossils	50/A
Diatoms	15/C
Radiolarians	5/C
Silicoflagellates	5/C

CARBONATE BOMB:

1-109 cm = 77%	2-79 cm = 73%
1-79 cm = 75%	2-109 cm = 73%
1-139 cm = 79%	2-139 cm = 66%
2-19 cm = 78%	3-19 cm = 75%
2-49 cm = 75%	3-49 cm = 74%

CLAY MINERALOGY (<2 μm): 2-74 cm

Smectite 100%

CARBON-CARBONATE: 48, CC

% Carbonate 75

% Organic carbon 0.2

SITE 503 HOLE A CORE (HPC) 49 CORED INTERVAL 208.6–213.0 m

TIME – ROCK UNIT: late Miocene

BIOSTRATIGRAPHIC ZONE: D. berggreni (N); G. plesiotumida (F); D. penultima (R); N. miocenica (D)

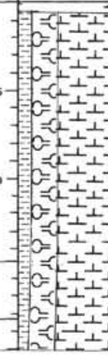
FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS): CM; FM CM CG

SUB-BOTTOM DEPTH (m): 208.60, 210.06, 210.39, 210.56

SECTION: 1, 2, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE, SEDIMENTARY STRUCTURES, SAMPLES

LITHOLOGIC DESCRIPTION

VOID

5G 8/1, 5Y 8/1, 5G 7/1, 5G 6/3, N7, N6, 5Y 7/3

5G 7/1, 5G 6/3, 5Y 8/3, 4/1, N7

5G 6/1, 8/1, 5Y 6/2, 5G 7/1, N5

Cycles of SILICEOUS-BEARING NANNO OOZE which darkens toward the base of the core. Colors vary from light greenish gray (5G 8/1) and yellowish gray (5Y 8/1) to dark greenish gray (5G 4/1) and greenish gray (5G 6/1). Numerous spots and streaks of pyrite enrichment occur which are medium gray (N5) to dark gray (N3) in color. Highly burrowed and mottled.

SMEAR SLIDE SUMMARY

	1-125	CC, 12
	D	D
Pyrite	1/T	2/R
Clay minerals	15/C	12/C
Volcanic glass (lt)	1/T	–
Carbonate unspec.	10/C	10/C
Foraminifers	–	1/T
Calcareous nannofossils	50/A	50/A
Diatoms	15/C	15/C
Radiolarians	5/C	3/R
Silicoflagellates	3/R	2/R

CARBONATE BOMB:

1-49 cm = 72%	1-139 cm = 78%
1-79 cm = 69%	2-19 cm = 67%
1-109 cm = 73%	

CARBON-CARBONATE: 49, CC

% Carbonate 67

% Organic carbon 0.3

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 50 CORED INTERVAL 213.0–217.4 m

TIME – ROCK UNIT: late Miocene

BIOSTRATIGRAPHIC ZONE: D. berggreni (N); D. penultima (R); G. plesiotumida (F); C. paleacea (D)

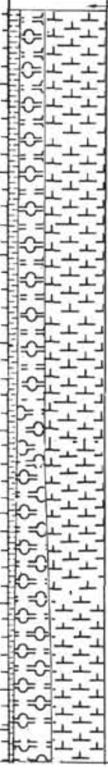
FOSSIL CHARACTER: FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS — CG; CG; CM; CM; CG; RM CM AG; CC

SUB-BOTTOM DEPTH (m): 213.00; 214.40; 215.90; 217.14; 217.35

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

LITHOLOGIC DESCRIPTION

VOID

5GY 8/1, 5Y 8/3, 5G 8/1, 5Y 8/1, 5G 7/3, N4, N5, N7

5G 7/1, 5GY 8/1, 5G 6/1, N7, 5Y 8/1

5Y 8/3, 5Y 7/3, 5G 8/1, 5GY 8/1, 5G 7/1, N7

5G 7/1, 5G 8/1, 5Y 6/3

5Y 6/2, 5Y 5/3, 5Y 5/1, 5G 6/3, 5G 7/1

5G 7/1, 5Y 8/1, 5Y 6/5, 5G 7/2

Cycles of SILICEOUS NANNO OOZE, ranging in color from dominantly light greenish gray (5GY 8/1, 5G 8/1) and pale yellow (5Y 8/3) to dominantly light olive gray (5Y 6/2) and olive (5Y 5/3). The sediment is highly burrowed and mottled throughout. Pyrite spots and streaks are common. Spots enriched in green (5G 4/3) montmorillonite(?) are at 33 and 109 cm in Section 1 and 12 cm in Section 3.

SMEAR SLIDE SUMMARY

	2-115	3-7	3-85
	D	M	D
Pyrite	1/T	2/R	1/T
Clay minerals	10/C	25/A	14/C
Carbonate unspec.	10/C	8/C	10/C
Foraminifers	1/T	–	–
Calcareous nannofossils	50/A	35/A	50/A
Diatoms	15/C	15/C	15/C
Radiolarians	8/C	12/C	7/C
Sponge spicules	2/R	–	–
Silicoflagellates	3/R	3/R	3/R

CARBONATE BOMB:

1-19 cm = 50%	2-19 cm = 50%	3-19 cm = 55%
1-49 cm = 53%	2-49 cm = 58%	3-49 cm = 38%
1-79 cm = 62%	2-79 cm = 56%	3-79 cm = 39%
1-109 cm = 67%	2-109 cm = 65%	3-109 cm = 44%
1-139 cm = 48%	2-139 cm = 59%	

CARBON-CARBONATE:	50, CC
% Carbonate	23
% Organic carbon	0.3

SITE 503 HOLE A CORE (HPC) 51 CORED INTERVAL 217.4–221.8 m

TIME – ROCK UNIT: late Miocene

BIOSTRATIGRAPHIC ZONE: D. berggreni (N); G. plesiotumida (F); D. penultima (R)

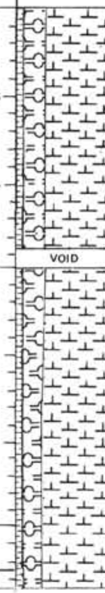
FOSSIL CHARACTER: FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS — CM; CM; RM CM AG

SUB-BOTTOM DEPTH (m): 217.40; 218.78; 220.28; 220.52; 220.63

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

LITHOLOGIC DESCRIPTION

N6, 5G 6/1, 5Y 6/1, 5G 7/1, 5Y 5/3

5G 8/1, 5G 7/1, 5Y 8/1, 5Y 8/3, 5G 6/1, 5Y 6/3

5G 7/1, 2.5Y 6/2, 5G 6/1, N7, 5Y 4/1

5G 4/2, 5Y 4/3, 5G 6/1, N7, N5

5G 8/1, 5GY 8/1, 5Y 8/1, 5G 7/1, 5G 6/1

5G 6/1, 2.5Y 6/3, N4

5G 4/3, 5Y 5/4, 5Y 7/3, N3

Cycles of SILICEOUS NANNO OOZE, ranging in color from dominantly light greenish gray (5G 8/1, 5G 7/1, and 5GY 8/1) and yellowish gray (5Y 8/1) to dark grayish green (5G 4/2) and olive (5Y 4/3). The sediment is highly burrowed and mottled throughout. Pyrite enrichments are common as well as green (5G 4/3) montmorillonite(?) enrichments.

SMEAR SLIDE SUMMARY

	2-20	2-60	3-16
	D	D	M
Pyrite	1/T	1/T	–
Clay minerals	8/C	6/C	22/C
Volcanic glass (dk)	1/T	–	–
Carbonate unspec.	10/C	10/C	10/C
Foraminifers	–	3/R	1/T
Calcareous nannofossils	50/A	50/A	40/A
Diatoms	15/C	15/C	15/C
Radiolarians	10/C	8/C	8/C
Sponge spicules	5/C	5/C	4/R
Silicoflagellates	–	2/R	–

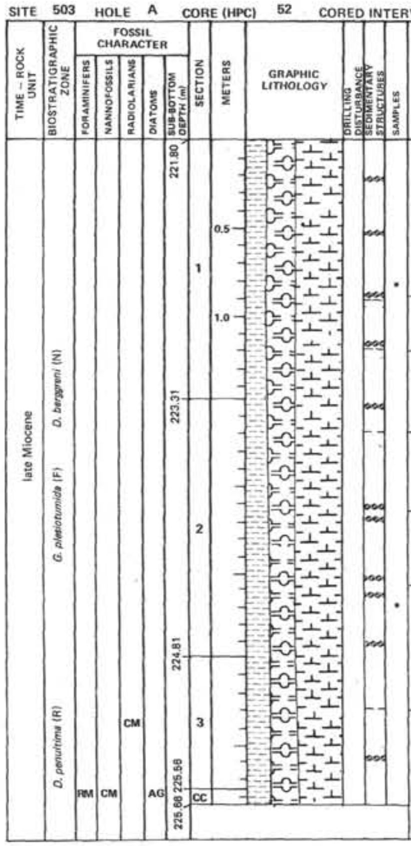
CARBONATE BOMB:

1-49 cm = 67%	2-49 cm = 64%
1-79 cm = 58%	2-79 cm = 54%
1-109 cm = 63%	2-109 cm = 56%
2-19 cm = 23%	2-139 cm = 51%

CARBON-CARBONATE:	51, CC	51, CC
% Carbonate	29	54
% Organic carbon	0.4	0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 52 CORED INTERVAL 221.8–226.2 m



LITHOLOGIC DESCRIPTION

5G 8/1, 5Y 8/1, 5G 6/1, 5Y 7/3, 5G 6/3, N2, 5GY 6/1

5Y 8/1, 5G 8/1, 5G 6/1

5GY 8/1, 5G 6/1, 5Y 6/2, 5G 7/1

5G 8/1, 5Y 8/1, 5GY 8/1

5G 5/1, 5G 6/2, 7/2, 5Y 6/1, N3, N5, 5G 7/4

5G 8/1, 5Y 8/1, 5GY 8/1, 5G 7/1

5G 6/1, 5G 7/1, 5Y 6/1, N6, N4

Cycles of SILICEOUS NANNO MARL, ranging in color from light greenish gray (5G 8/1, 5GY 8/1) and yellowish gray (5Y 8/1) to greenish gray (5G 5/1, 5G 6/1, and 5GY 6/1). Spots and streaks enriched in pyrite are common. Some burrows have reaction rims of pyrite. Highly burrowed and mottled.

SMEAR SLIDE SUMMARY

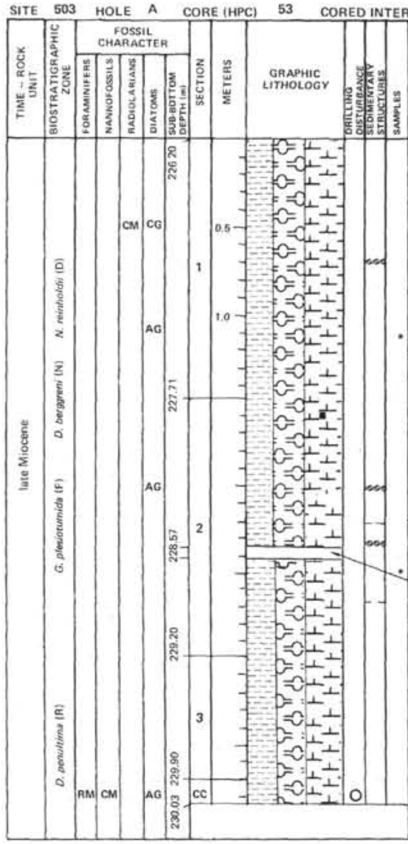
	1-80	2-120
	D	D
Pyrite	1/T	1/T
Clay minerals	21/C	22/C
Carbonate unspec.	10/C	10/C
Foraminifers	3/R	2/R
Calcaeous nannofossils	35/A	40/A
Diatoms	15/C	15/C
Radiolarians	10/C	5/C
Sponge spicules	2/R	–
Silicoflagellates	3/R	5/C

CARBONATE BOMB:

1-19 cm = 58%	2-49 cm = 64%
1-49 cm = 47%	2-79 cm = 44%
1-79 cm = 56%	2-109 cm = 58%
1-109 cm = 50%	2-139 cm = 75%
1-139 cm = 50%	3-19 cm = 71%
2-19 cm = 56%	3-49 cm = 55%

CARBON-CARBONATE:	52, CC
% Carbonate	26
% Organic carbon	0.4

SITE 503 HOLE A CORE (HPC) 53 CORED INTERVAL 226.2–230.6 m



LITHOLOGIC DESCRIPTION

5Y 8/1, 5G 8/1, 5G 6/2, 5Y 7/3,

5G 6/1, 5Y 6/3, N6, 2.5Y 6/3

5G 4/3, 4/1, 5Y 6/3, 5G 6/1, 5Y 6/1

5G 6/1, 5Y 6/3, 2.5Y 6/3, N5, 5GY 6/1

5G 7/1, 5Y 7/1, N5, N3

VOID

5G 6/1, 5Y 6/1, 5Y 5/3, 5G 4/3, N5

SILICEOUS NANNO MARL, ranging in color from dominantly light greenish gray (5G 8/1) and yellowish gray (5Y 8/1) to greenish gray (5G 6/1) and pale olive (5Y 6/3). Spots, streaks, and zones of pyrite enrichment, dark gray (N3) and medium gray (N5) in color, are common throughout. A carbonate nodule, formed around a burrow, is at 12 cm in Section 2. Entire core highly burrowed and mottled.

SMEAR SLIDE SUMMARY

	1-110	2-100
	D	D
Pyrite	2/R	1/T
Clay minerals	28/C	27/C
Volcanic glass (dk)	1/T	–
Carbonate unspec.	10/C	10/C
Foraminifers	–	2/R
Calcareous nannofossils	30/A	35/A
Diatoms	15/C	12/C
Radiolarians	10/C	10/C
Silicoflagellates	4/R	3/R

CARBONATE BOMB:

1-19 cm = 42%	2-49 cm = 44%
1-49 cm = 44%	2-79 cm = 43%
1-79 cm = 47%	2-109 cm = 38%
1-109 cm = 19%	2-139 cm = 38%
1-139 cm = 37%	3-19 cm = 33%
2-19 cm = 43%	3-49 cm = 33%

CARBON-CARBONATE:	53, CC
% Carbonate	24
% Organic carbon	0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE A CORE (HPC) 54 CORED INTERVAL 230.6–235.0 m

TIME-ROCK UNIT: late Miocene

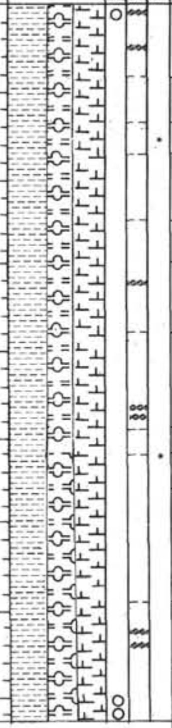
BIOSTRATIGRAPHIC ZONE: G. plesiotumida (F); D. berggreni (N); D. penultima (R)

FOSSIL CHARACTER: CM; CM; CG; RM (Foraminifers), CM (Nannofossils), AG (Diatoms)

SUB-BOTTOM DEPTH (m): 230.60, 232.11, 233.62, 234.62, 234.75

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0



N7, 5G 6/1, 5GY 6/1, 5Y 4/1, 5Y 6/3

5G 5/1, 5Y 8/1, 5G 4/1

5G 2/2, 6/1, 2.5Y 5/3

5G 6/1, 7/1, N7, N5, 5G 4/3

N7, 5G 6/1, 5GY 6/1, 5B 7/1, 5Y 7/3

5G 8/1, 5B 7/1, 5G 6/1, 2.5Y 7/2, 7/3, N5, 5G 5/3

5G 6/2, 2.5Y 4/2, 5GY 6/1, 5GY 7/1

5G 7/1, 5Y 7/1

5Y 7/2, 5Y 8/3, 5Y 8/1, 5G 8/1, 5G 7/1

5G 7/1, 5G 6/1, N3, N6, 5Y 6/3, 5GY 8/1, 5G 6/3

N8, 5G 8/1, 5G 7/3, 2.5Y 5/2, 7/2

5Y 6/1, 4/1, 5G 6/1, 6/3, 5Y 8/1

5GY 6/1

LITHOLOGIC DESCRIPTION

Cyclic alternation of SILICEOUS MARL, which is light gray (5Y 7/1) and light greenish gray (5G 7/1) in color and CALCAREOUS AND SILICEOUS-BEARING CLAY, greenish black (5G 3/2) in color. Gradations in both color and composition between the endtypes are common. Streaks and spots of pyrite enrichment are common, dark gray (N3) in color. Entire core highly burrowed and mottled.

SMEAR SLIDE SUMMARY

	1-77	2-110
	D	D
Pyrite	1/T	1/T
Clay minerals	59/A	34/A
Carbonate unspec.	10/C	10/C
Calcareous nannofossils	5/C	25/A
Diatoms	10/C	15/C
Radiolarians	10/C	10/C
Silicoflagellates	5/C	5/C

CARBONATE BOMB:

1-19 cm = 34%
1-49 cm = 30%
1-79 cm = 10%
1-109 cm = 50%
1-139 cm = 35%
2-19 cm = 53%
2-49 cm = 41%
2-79 cm = 38%
2-109 cm = 59%
2-139 cm = 50%
3-19 cm = 51%
3-49 cm = 47%
3-79 cm = 51%

CLAY MINERALOGY ($<2\,\mu m$): 2-71 cm

Smectite 100%

CARBON-CARBONATE: 54, CC

% Carbonate 50

% Organic carbon 0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 1 CORED INTERVAL 0.0–2.8 m

TIME-ROCK UNIT: late Pleistocene

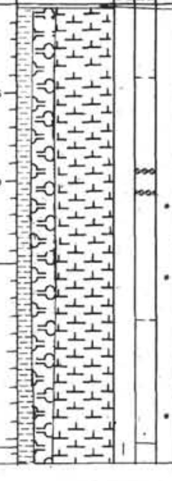
BIOSTRATIGRAPHIC ZONE: P. obliquiloculata (F); C. tuberosa (R); E. huxleyi (N); Above M. elliptica datum (D)

FOSSIL CHARACTER: FM; FM; AM (Foraminifers), CM (Nannofossils), FM (Diatoms)

SUB-BOTTOM DEPTH (m): 0.00, 1.48, 2.54, 2.64

SECTION: 1, 2, CC

METERS: 0.5, 1.0



VOID

10YR 3/2

10YR 5/4, 10YR 6/4

10YR 3/2

10YR 5/4, 10YR 6/4

10YR 6/4, 10YR 4/3, 10YR 3/2

LITHOLOGIC DESCRIPTION

Cyclic alternation of IRON OXIDE AND SILICEOUS-BEARING CALCAREOUS OOZE, which is very dark grayish brown (10YR 3/2) in color and SILICEOUS-BEARING CALCAREOUS OOZE, which is yellowish brown (10YR 5/4) to light yellowish brown (10YR 6/4) in color. Burrowing and mottling are common. Most contacts are burrowed or gradational. Some mottles are pale yellow (5Y 7/3) in color.

SMEAR SLIDE SUMMARY

	1-118	2-10	2-90
	D	D	D
Amorphous iron-oxide	–	10/C	5/C
Clay minerals	15/C	23/C	15/C
Volcanic glass (dk)	2/R	2/R	–
Carbonate unspec.	15/C	20/C	20/C
Foraminifers	8/C	–	10/C
Calcareous nannofossils	40/A	30/A	30/A
Diatoms	10/C	8/C	8/C
Radiolarians	7/C	7/C	7/C
Sponge spicules	2/R	–	3/R
Silicoflagellates	1/T	–	2/R

CARBON-CARBONATE:

	1-1 cm	1, CC
% Carbonate	73	25
% Organic carbon	0.2	0.5

SITE 503 HOLE B CORE (HPC) 2 CORED INTERVAL 2.8–7.2 m

TIME-ROCK UNIT: late Pleistocene

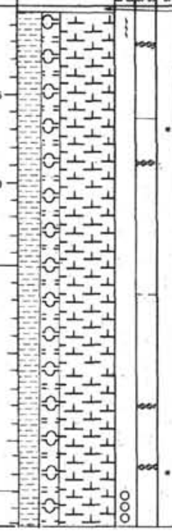
BIOSTRATIGRAPHIC ZONE: P. obliquiloculata (F); G. oceanica (N); A. ypsilon (R); Above M. elliptica datum (D)

FOSSIL CHARACTER: RM; CG; AP (Foraminifers), CM (Nannofossils), RP (Diatoms)

SUB-BOTTOM DEPTH (m): 2.80, 4.29, 5.59, 5.74

SECTION: 1, 2, CC

METERS: 0.5, 1.0



VOID

10YR 3/2

10YR 5/4, 10YR 5/3

10YR 6/4

10YR 4/3, 10YR 3/4, 10YR 6/4

10YR 8/3, 10YR 7/3

10YR 4/3, 10YR 3/4

10YR 3/3, 10YR 7/3

LITHOLOGIC DESCRIPTION

Cyclic alternation of IRON OXIDE AND SILICEOUS-BEARING NANNO MARL, which is very dark grayish brown (10YR 3/2) to dark yellowish brown (10YR 3/4) in color, and SILICEOUS-BEARING NANNO MARL, which is very pale brown (10YR 8/3 and 10YR 7/3) in color. Gradations in color and sediment type are common. Burrowing and mottling are common. Open burrows are present at 112–116 cm, Section 2.

SMEAR SLIDE SUMMARY

	1-70	2-120
	D	D
Amorphous iron-oxide	5/C	10/C
Clay minerals	23/C	25/A
Volcanic glass (dk)	2/R	–
Carbonate unspec.	15/C	15/C
Foraminifers	10/C	10/C
Calcareous nannofossils	25/A	25/A
Diatoms	10/C	10/C
Radiolarians	8/C	3/R
Sponge spicules	2/R	2/R

CLAY MINERALOGY ($<2\,\mu m$): 2-71 cm

Smectite 85%

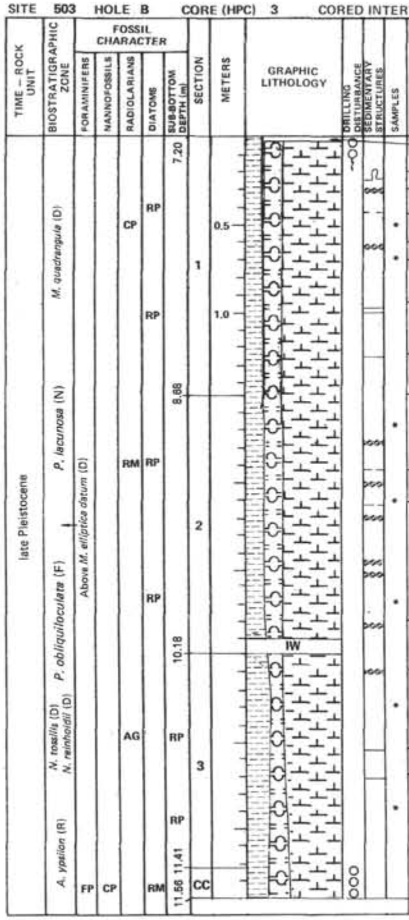
Chlorite & Kaolinite 15%

CARBON-CARBONATE: 2, CC

% Carbonate 70

% Organic carbon 0.1

SITE 503 HOLE B CORE (HPC) 3 CORED INTERVAL 7.2–11.6 m



LITHOLOGIC DESCRIPTION

Cyclic alternation of IRON OXIDE AND SILICEOUS-BEARING CALCAREOUS OOZE which is dark brown (10YR 3/3) in color, and SILICEOUS-BEARING MARL, which is very pale brown (10YR 8/3) to light yellowish brown (10YR 6/4) in color (gradations in color and sediment type are present) overlying color variations of SILICEOUS-BEARING NANNO MARL, dark greenish gray (5G 4/1) to light greenish gray (5G 7/1) in color. Burrowing and mottling are common throughout the core. Open burrows are found at 7, 32, 45–57, 64, 85–105, and 120–135 cm in Section 2. A sharp contact between the oxidized and reduced sections is at 125 cm in Section 1.

SMEAR SLIDE SUMMARY

	1-50	1-70	2-20	2-63	2-120
	D	D	D	M	D
Amorphous iron-oxide	3/R	10/C	–	–	–
Clay minerals	20/C	12/C	22/C	28/A	20/C
Volcanic glass (dk)	2/R	–	3/R	2/R	–
Carbonate unspec.	15/C	20/C	25/A	35/A	15/C
Foraminifers	15/C	20/C	10/C	2/R	10/C
Calcareous nannofossils	30/A	25/A	25/A	20/C	20/C
Diatoms	8/C	8/C	8/C	1/T	3/R
Radiolarians	5/C	5/C	7/C	10/C	10/C
Sponge spicules	2/R	–	–	2/R	2/R
Micrite (CO_3)	–	–	–	–	20/C

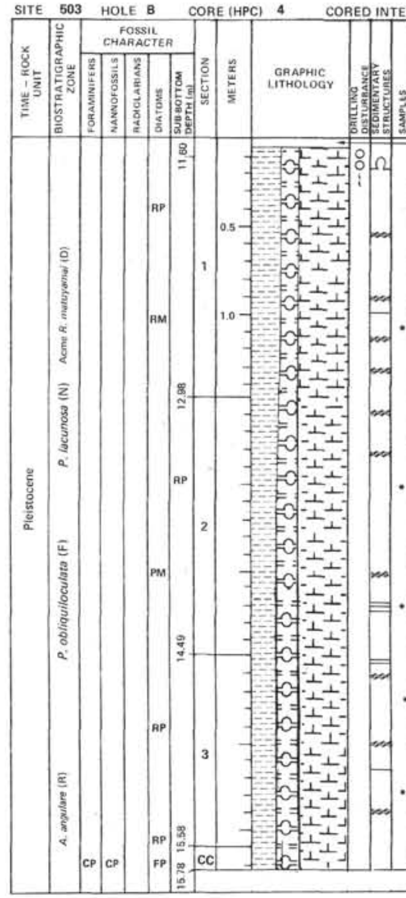
	3-30	3-90
	D	D
Clay minerals	27/A	25/A
Volcanic glass (lt)	–	1/T
Volcanic glass (dk)	2/R	2/R
Carbonate unspec.	20/C	20/C
Foraminifers	1/T	–
Calcareous nannofossils	30/A	30/A
Diatoms	7/C	10/C
Radiolarians	8/C	10/C
Sponge spicules	2/R	–
Silicoflagellates	3/R	2/R

CARBON-CARBONATE: 3, CC

% Carbonate	32
% Organic carbon	0.3

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 4 CORED INTERVAL 11.6–16.0 m



LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS-BEARING CALCAREOUS OOZE, with colors ranging from very dark greenish gray (5G 3/1) to light greenish gray (5G 8/1). Burrowing and color mottling are common throughout. Open burrows are common in the lower half of Section 2 and at 95 cm in Section 3. Some burrows are pyritized. Burrows, semi-indurated with carbonate, occur at 143 cm, Section 1, and 36 cm, Section 2.

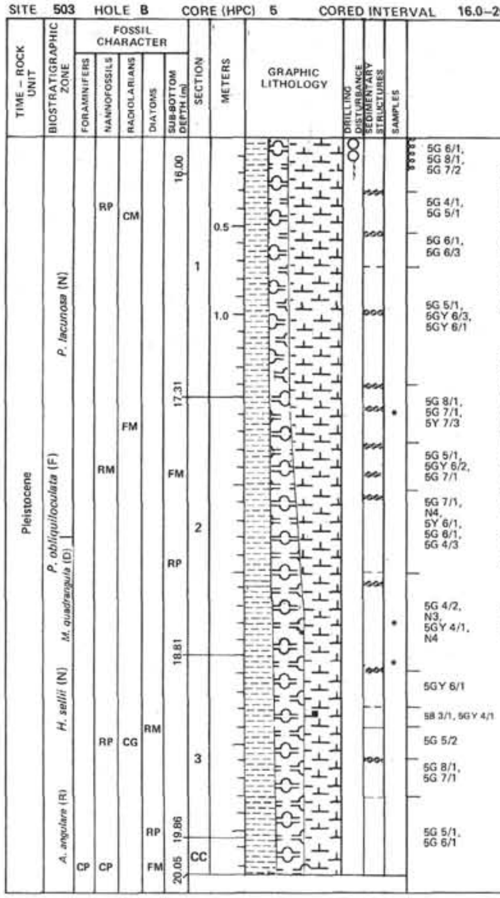
SMEAR SLIDE SUMMARY

	1-110	2-52	2-121	3-30	3-80
	D	M	D	D	D
Pyrite	–	1/T	2/R	–	–
Other heavy minerals	–	–	–	–	1/T
Clay minerals	30/A	24/C	22/C	32/A	25/A
Volcanic glass (dk)	2/R	1/T	2/R	1/T	2/R
Carbonate unspec.	25/A	30/A	30/A	20/C	20/C
Foraminifers	7/C	2/R	4/R	2/R	5/C
Calcareous nannofossils	20/C	10/C	10/C	25/A	20/C
Diatoms	8/C	10/C	12/C	8/C	7/C
Radiolarians	8/C	12/C	8/C	12/C	7/C
Sponge spicules	–	2/R	–	–	2/R
Silicoflagellates	–	1/T	–	–	1/T
Micrite	–	10/C	10/C	–	10/C

CARBON-CARBONATE: 4, CC

% Carbonate	41
% Organic carbon	0.3

SITE 503 HOLE B CORE (HPC) 5 CORED INTERVAL 16.0–20.4 m



Cyclic alternation of SILICEOUS-BEARING MARL, which is light greenish gray (5G 8/1 and 5G 7/1) and dark greenish gray (5G 4/2 and 5G 4/1) in color, and CALCAREOUS SILICEOUS MARL, dark gray (N3) and medium dark gray (N4) in color. Gradations in color and sediment type are common. Burrowing and color mottling are common. A zoophycus burrow is present at 40 cm in Section 2. Pyritized burrows are common. A carbonate nodule, light gray (2.5Y 7/2) in color, which formed around a burrow is at 38 cm in Section 3.

SMEAR SLIDE SUMMARY

	2-10	2-130	3-5
	D	D	D
Pyrite	–	–	4/C
Clay minerals	33/A	38/A	26/A
Volcanic glass (lt)	–	–	1/T
Volcanic glass (dk)	–	2/R	2/R
Carbonate unspec.	20/C	25/A	20/C
Foraminifers	7/C	2/R	–
Calcareous nannofossils	10/C	5/C	5/C
Diatoms	5/C	8/C	12/C
Radiolarians	5/C	8/C	15/C
Sponge spicules	–	1/R	2/R
Silicoflagellates	1/T	1/R	3/R
Micrite	20/C	10/C	10/C

CLAY MINERALOGY (<2 μm): 2-71 cm

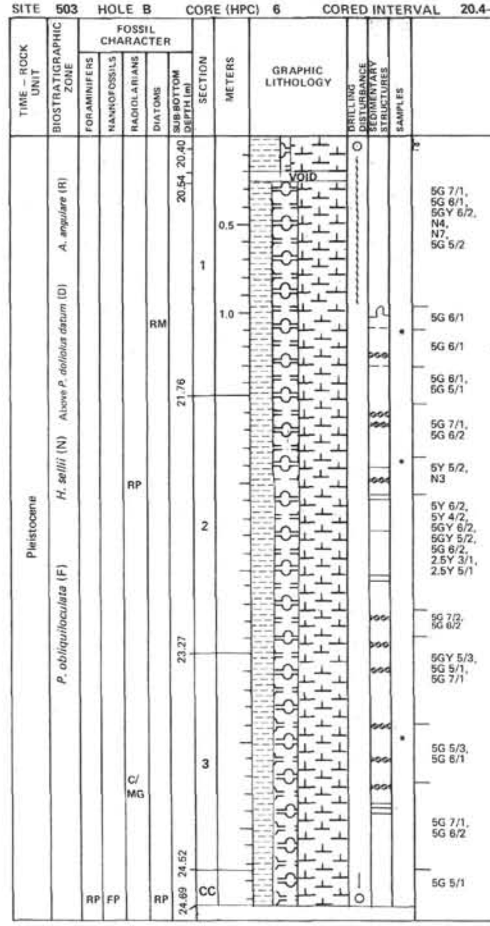
Smectite	98%
Chlorite & Kaolinite	2%

CARBON-CARBONATE: 5, CC

% Carbonate	46
% Organic carbon	0.3

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 6 CORED INTERVAL 20.4–24.8



Cycles of SILICEOUS-BEARING MARL, ranging from grayish green (5G 5/2) to light greenish gray (5G 8/1) in color, with some darker mottles, of very dark gray (2.5Y 3/1). Burrowing and mottling are common. Zoophycus burrows are at 122 cm in Section 1, 143 cm in Section 2, and 8–23 cm in Section 3. Open burrows are at 45–52 and 145–153 cm in Section 2, 25, 56, and 83 cm in Section 3. Pyritized burrows and zones of pyrite enrichment are common.

SMEAR SLIDE SUMMARY

	1-110	2-37	3-50
	D	D	D
Pyrite	–	8/C	2/R
Clay minerals	31/A	22/C	21/C
Volcanic glass (dk)	2/R	2/R	2/R
Carbonate unspec.	25/A	25/A	20/C
Foraminifers	2/R	2/R	–
Calcareous nannofossils	15/C	10/C	20/C
Diatoms	3/R	10/C	12/C
Radiolarians	12/C	10/C	12/C
Silicoflagellates	–	1/T	1/T
Micrite	10/C	10/C	10/C

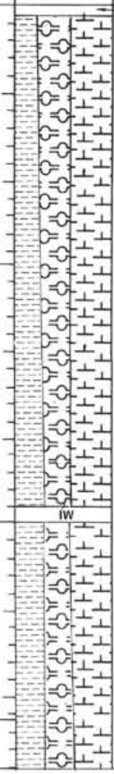
CARBON-CARBONATE: 6, CC

% Carbonate	28
% Organic carbon	0.3

SITE 503 HOLE B CORE (HPC) 7 CORED INTERVAL 24.8–29.2 m

TIME-ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
Pleistocene	G. fistulosus (F); A. angulare (R); C. macintyrei (N); R. praebergonii (D); Above P. doliolus datum (D); R. praebergonii robusta (R)			RP, RP, RP	RP	24.80, 26.24, 27.74	1, 2	0.5, 1.0
late Pliocene	P. prismatium (R)	FM	FP	C/MG	RP	28.89, 29.00	3, CC	

GRAPHIC LITHOLOGY



IW

LITHOLOGIC DESCRIPTION

VOID

N5, 5G 7/1, 5GY 5/2, 5GY 6/1, 5G 6/2

5B 7/1, 5B 6/1

5G 8/1, 5G 6/3

5B 6/1, 5B 5/1, 5Y 4/1

5Y 3/2, 5Y 4/2, 5Y 3/1, 5Y 7/2

5GY 6/3, 5G 6/3

5G 4/1, 5G 7/1

5GY 6/2, 5G 7/1, 5G 5/1

5G 4/2, 5G 5/2

N3

5G 5/2, 5G 4/1, 5GY 5/1

N2

5G 6/2, 5G 5/2

5G 7/2

N2, N5

5GY 6/1, 5Y 4/2

Cyclic alternation of SILICEOUS-BEARING CALCAREOUS OOZE, dominantly light greenish gray (5G 8/1) in color and SILICEOUS MARL, dominantly dark olive gray (5Y 3/2) in color. Gradations in color and sediment composition are common. Burrowing and color mottling are common. A zoophycus burrow is at 130 cm in Section 1 and an open burrow is at 68 cm in Section 3. Pyritized burrows and bands of pyrite enrichment (grayish black [N2] and dark gray [N3] are common.

SMEAR SLIDE SUMMARY

	1-90	1-108	3-20
	D	M	D
Pyrite	–	–	1/T
Clay minerals	24/C	90/D	29/A
Volcanic glass (lt)	–	–	2/R
Volcanic glass (dk)	1/T	–	2/R
Carbonate unspec.	15/C	10/C	15/C
Foraminifers	15/C	–	–
Calcareous nannofossils	15/C	–	10/C
Diatoms	5/C	–	12/C
Radiolarians	10/C	–	12/C
Silicoflagellates	–	–	2/R
Micrite	15/C	–	15/C

CLAY MINERALOGY (<2 μm): 2-71 cm

Smectite	96%
Chlorite & Kaolinite	4%

CARBON-CARBONATE: 7, CC

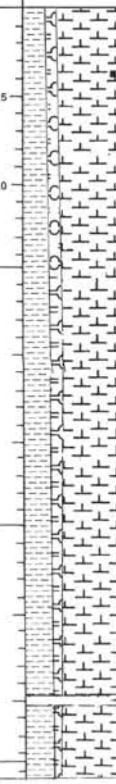
% Carbonate	34
% Organic carbon	0.5

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 8 CORED INTERVAL 29.2–33.6 m

TIME-ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
late Pliocene	G. fistulosus (F); C. macintyrei (N); P. prismatium (R)	CM		RP, C/MG	RP	29.20, 30.60, 32.11, 33.11, 33.41, 33.52	1, 2, 3, CC	0.5, 1.0

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

5G 2/1

5G 5/2, 5G 6/2

5G 7/2, 5G 6/2

5G 5/2, 5GY 5/2, 5G 4/2

5GY 4/1

5G 5/2, 5G 4/2

5G 5/2

5G 2/1, 5G 3/1, 5Y 3/2, 5G 3/2, 5GY 2/1, 5Y 4/2, 5G 6/1

5G 5/2

VOID

5G 2/1, 5GY 5/1

Cyclic alternation of SILICEOUS-BEARING CALCAREOUS OOZE, dominantly grayish green (5G 5/2) in color with SILICEOUS-BEARING MARL, dominantly greenish black (5G 3/1) to black (5G 2/1) in color. Burrowing and mottling are common. Zoophycus is at 64 cm in Section 1. Carbonate nodules, formed around burrows, are at 32 cm in Section 1 and 70 cm in Section 2. Burrows and mottles are subdued at the bottom of the core.

SMEAR SLIDE SUMMARY

	2-45	3-20
	D	D
Pyrite	1/T	–
Clay minerals	26/A	50/A
Volcanic glass (lt)	1/T	–
Volcanic glass (dk)	2/R	–
Carbonate unspec.	30/A	15/C
Foraminifers	5/C	3/R
Calcareous nannofossils	10/C	5/C
Diatoms	4/R	7/C
Radiolarians	4/R	15/C
Sponge spicules	2/R	–
Micrite	15/C	5/C

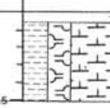
CARBON-CARBONATE: 8, CC

% Carbonate	28
% Organic carbon	0.3

SITE 503 HOLE B CORE (HPC) 9 CORED INTERVAL 33.6–38.0 m

TIME-ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
					B	33.60	1	0.5

GRAPHIC LITHOLOGY



LITHOLOGIC DESCRIPTION

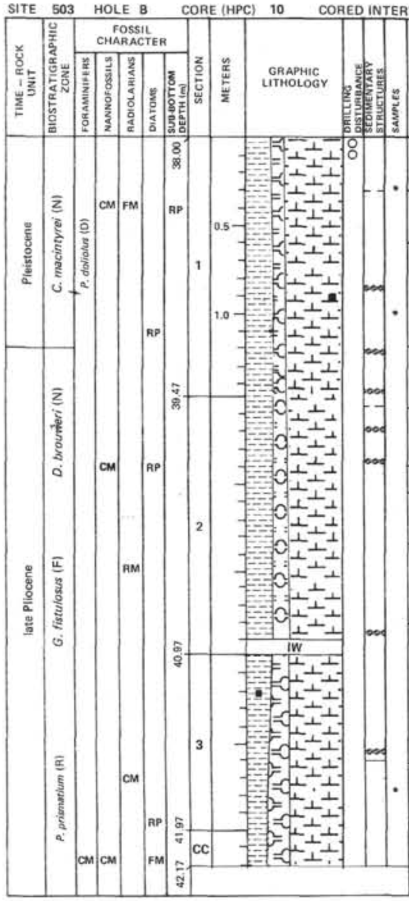
VOID

Drilling breccia of rust, broken nodules, and sediment.

CARBON-CARBONATE: 9, CC

% Carbonate	35
% Organic carbon	0.3

SITE 503 HOLE B CORE (HPC) 10 CORED INTERVAL 38.0–42.4 m



LITHOLOGIC DESCRIPTION

5G 7/1
5G 5/1, 5G 6/1
5G 7/1, 5G 8/1
5G 6/1
5G 8/1, 5GY 8/1
5G 6/1
N5, N3, 2.5Y 6/2, 5GY 7/2
5G 8/1, 5G 6/1
5G 5/1, 5G 4/1
5G 2/1, 5GY 4/1, 5Y 4/1
5G 7/1, 5G 6/1

Cycles of SILICEOUS-BEARING MARL, ranging from greenish black (5GY 2/1) and dark greenish gray (5GY 4/1) to light greenish gray (5G 8/1) in color. Gradations in color between the end types are common. Burrowing and color mottling are common. A zoophycus burrow is at 84 cm (and open burrows are at 117 and 138 cm in Section 1 and 30–38 cm in Section 2. Carbonate nodules, light gray (2.5Y 7/2) in color, which are formed around burrows, are at 79 cm in Section 1 and 23 cm in Section 3. Pyritized burrows and zones enriched in pyrite are common.

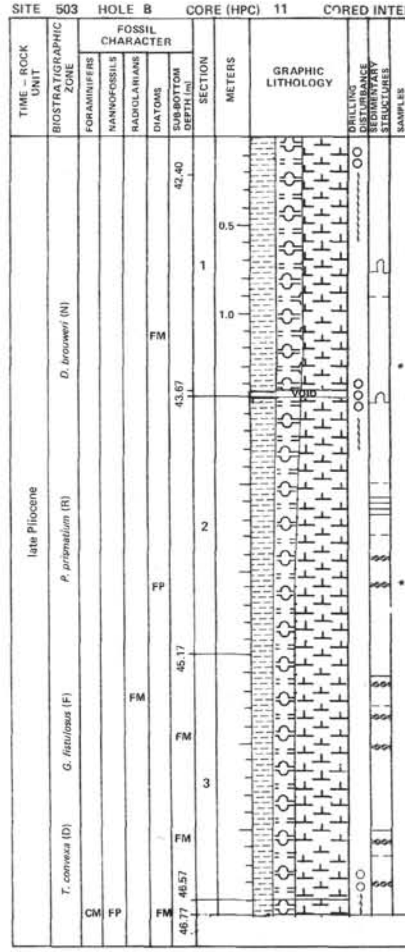
SMEAR SLIDE SUMMARY

	1-30	1-100	3-80
	M	D	D
Pyrite	1/T	–	2/T
Clay minerals	81/D	28/A	29/A
Volcanic glass (lt)	–	15/C	–
Volcanic glass (dk)	–	2/R	1/T
Carbonate unspec.	15/C	15/C	30/A
Foraminifers	–	1/T	–
Calcareous nannofossils	3/R	25/A	5/C
Diatoms	–	7/C	10/C
Radiolarians	1/T	7/C	12/C
Sponge spicules	–	–	1/T
Micrite	–	–	10/C

CARBON-CARBONATE: 10, CC
% Carbonate 46
% Organic carbon 0.4

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 11 CORED INTERVAL 42.4–38.0 m



LITHOLOGIC DESCRIPTION

5G 6/1, 5G 4/1
5G 6/1
5G 4/1, 5G 3/1
5G 5/1, 5G 6/1
N5, 5GY 6/1, 5Y 7/3
5Y 7/3
5B 7/1, 5GY 6/1, 5G 6/3
5Y 5/1, 5Y 4/1, 5GY 2/1, 5GY 5/2
5GY 6/1, 5GY 5/1, 5G 7/1
5G 7/3, 5G 6/3, 5Y 8/1, 5G 8/2
5Y 5/1, 5GY 6/1, 5GY 5/1
5GY 6/1
5Y 5/1, 5GY 5/1, 5GY 6/1, 5B 3/1
5Y 5/1, 5Y 4/1, 5GY 2/1, 5GY 5/2

Cycles of SILICEOUS MARL, ranging from dark greenish gray (5G 4/1) to light greenish gray (5G 7/1) in color. Gradation in color between the endtypes is common. Burrowing and mottling are common. Open burrows are found at 90–95 cm in Section 2 and 35 cm in Section 3. A zoophycus burrow is at 134 cm in Section 3. Pyritized burrows are at 85–90 cm in Section 2. The interval from 50–70 cm in Section 2 shows common bedding.

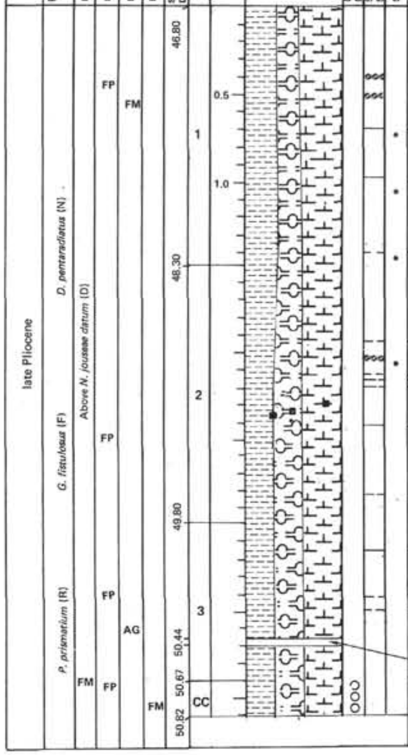
SMEAR SLIDE SUMMARY

	1-130	2-110
	D	D
Pyrite	–	1/T
Clay minerals	29/A	26/A
Volcanic glass (dk)	1/T	1/T
Carbonate unspec.	25/A	25/A
Calcareous nannofossils	10/C	15/C
Diatoms	10/C	10/C
Radiolarians	15/C	12/C
Micrite	10/C	10/C

CARBON-CARBONATE: 11, CC
% Carbonate 36
% Organic carbon 0.7

SITE 503 HOLE B CORE (HPC) 12 CORED INTERVAL 46.8–51.2 m

TIME – ROCK UNIT | BIOSTRATIGRAPHIC ZONE | FOSSIL CHARACTER: FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS | SUB-BOTTOM DEPTH (m) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION



5Y 4/2, 5Y 2.5/1

5Y 5/1, 5G 3/1

5G 4/2

5G 4/2

5G 6/1

N4 N6

5Y 6/1, N5, N3, 5GY 5/1

5Y 4/2, 4/3, 5Y 6/1, 5GY 6/1

5Y 5/1, 5Y 4/1, N3

5G 6/2

5GY 8/1, N4, 5G 7/1, N5

5Y 4/2, 5G 4/1, 5GY 6/1, 5G 5/1, 5GY 5/1, 5G 2/1

VOID

5Y 4/1, 5Y 3/1

Cyclic alternation of SILICEOUS MARL, dominantly dark grayish green (5G 4/2) in color, and SILICEOUS-BEARING MARL, which is dominantly greenish gray (5G 6/1), in color. Gradations in color and sediment composition are common. Burrowing and color mottling are common. An open burrow is at 54 cm in Section 2. Carbonate nodules, formed around burrows, are at 80–90 and 106 cm in Section 2. A zoophycus burrow is at 105–111 cm in Section 2. Areas of pyrite enrichment are common.

SMEAR SLIDE SUMMARY

	1-72	1-109	1-145	2-55
	M	M	D	D
Pyrite	2/R	2/R	–	1/T
Clay minerals	25/A	16/C	30/A	25/A
Volcanic glass (dk)	2/R	2/R	1/T	1/T
Carbonate unspec.	20/C	25/A	30/A	25/A
Foraminifers	–	5/C	2/R	1/T
Calcareous nannofossils	10/C	15/C	5/C	10/C
Diatoms	15/C	5/C	12/C	13/C
Radiolarians	15/C	15/C	10/C	12/C
Sponge spicules	1/T	–	–	1/T
Fish debris	–	–	–	1/T
Micrite	10/C	15/C	10/C	10/C

CLAY MINERALOGY (<2 μm): 2-71 cm

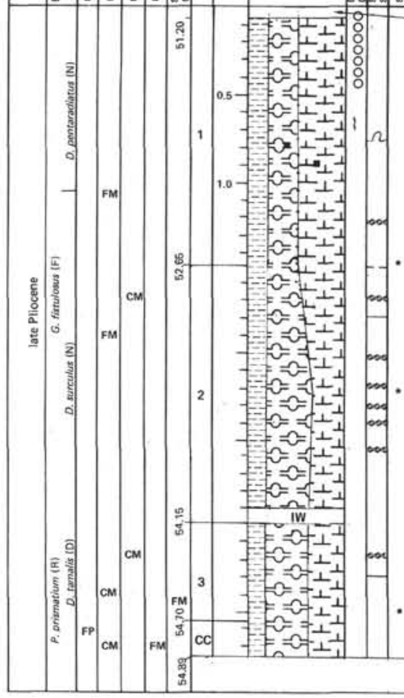
Smectite	95%
Chlorite & Kaolinite	5%

CARBON-CARBONATE:	12, CC
% Carbonate	13
% Organic carbon	0.5

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 13 CORED INTERVAL 51.2–55.6 m

TIME – ROCK UNIT | BIOSTRATIGRAPHIC ZONE | FOSSIL CHARACTER: FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS | SUB-BOTTOM DEPTH (m) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION



VOID

5Y 4/1, 5G 7/1, N5

5B 7/1, 5B 6/1

5GY 6/2, 5Y 6/1, 5GY 5/1

5G 8/1, 5GY 8/1

5GY 6/1, 5Y 8/1, N4

5GY 5/1, 6/1, N4

5Y 4/2, 3/2

5G 5/1, 5Y 4/1, N4

5B 7/1, N5, N6, N4

N4, N5

5GY 5/1

5GY 6/1

5G 7/1, 6/1, 8/1, N6

Cycles of SILICEOUS MARL, which is light greenish gray (5GY 8/1, 5G 8/1, and 5G 7/1), olive gray (5Y 4/2), and dark olive gray (5Y 3/2) in color. Gradations in color are common. Burrowing and color mottling are common. Carbonate nodules, light gray (2.5Y 7/2) in color, formed around burrows, are at 2–13, 81–85, and 93 cm in Section 1. Spots, burrows, and zones showing pyrite enrichment are common.

SMEAR SLIDE SUMMARY

	1-140	2-70	3-50
	D	D	D
Pyrite	–	2/R	1/T
Clay minerals	20/C	38/A	28/A
Volcanic glass (dk)	1/T	–	–
Carbonate unspec.	25/A	15/C	25/A
Foraminifers	5/C	–	–
Calcareous nannofossils	10/C	5/C	10/C
Diatoms	12/C	15/C	13/C
Radiolarians	12/C	15/C	12/C
Sponge spicules	3/R	–	1/T
Fish debris	2/R	–	–
Micrite	10/C	10/C	10/C

CARBON-CARBONATE:	13, CC
% Carbonate	46
% Organic carbon	0.3

SITE 503 HOLE B CORE (HPC) 14 CORED INTERVAL 55.6–60.0 m

TIME – ROCK UNIT: late Pliocene

BIOSTRATIGRAPHIC ZONE: N. jouseae (D); D. tamalis (N); P. prismatium (R); G. fistulosus (F); S. pentas (R)

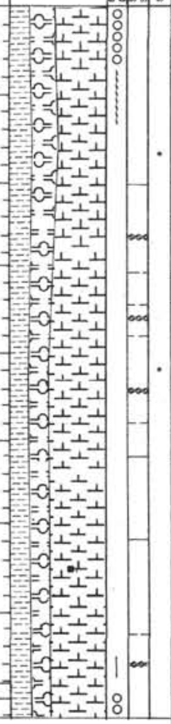
FOSSIL CHARACTER: FORAMINIFERS CM; NANNOFOSSILS FM, AM; RADIOLARIANS CM, AG; DIATOMS CM

SUB-BOTTOM DEPTH (m): 55.60, 56.71, 58.22, 59.12, 59.27

SECTION: 1, 2, 3, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES



LITHOLOGIC DESCRIPTION

5G 7/1
5Y 5/1, 5B 6/1
5B 7/1, N6
5GY 6/1, N6, N2
5Y 7/1, 5G 7/1, 5Y 8/1
5GY 4/1, 5Y 4/2, 5G 7/1, N2
5GY 6/1, 4/1, N6
5GY 5/1, N5
5G 7/1. 5G 8/1, 5G 6/1
5B 6/1
5B 7/1
5GY 6/1, 5Y 7/1, 5G 7/1
N5

Cycles of SILICEOUS MARL, ranging from light greenish gray (5G 8/1, 5G 7/1) to brownish gray (5Y 4/1) and dark greenish gray in color. Fairly uniform with only subtle burrows and mottles from 70–150 cm in Section 1, 50–150 cm in Section 2, and 0–40 cm in Section 3. Other intervals are highly burrowed and mottled. Fragments of a carbonate nodule are at 23 cm in Section 3. Pyrite enriched spots and burrows are common.

SMEAR SLIDE SUMMARY

	1-80	2-80
	D	D
Pyrite	–	2/R
Clay minerals	21/C	16/C
Volcanic glass (dk)	2/R	1/T
Carbonate unspec.	25/A	35/A
Foraminifers	5/C	–
Calcareous nannofossils	10/C	10/C
Diatoms	10/C	12/C
Radiolarians	15/C	12/C
Sponge spicules	2/R	–
Fish debris	–	1/T
Silicoflagellates	–	1/T
Micrite	10/C	10/C

CARBON-CARBONATE: 14, CC
% Carbonate 43
% Organic carbon 0.3

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 15 CORED INTERVAL 60.0–64.4 m

TIME – ROCK UNIT: late Pliocene; early Pliocene

BIOSTRATIGRAPHIC ZONE: R. praebergonii (D); D. tamalis (N); S. dehiscens (F); Above N. cylindrica datum (D); S. pentas (R)

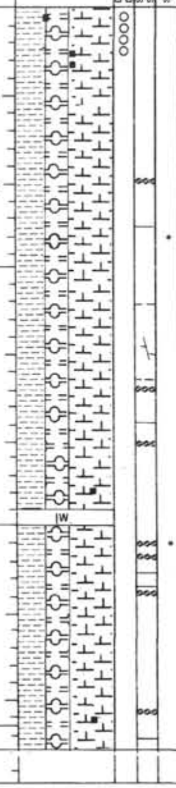
FOSSIL CHARACTER: FORAMINIFERS CM, CM; NANNOFOSSILS FM; RADIOLARIANS CM, CM, CM; DIATOMS CM, CM, CM

SUB-BOTTOM DEPTH (m): 60.00, 61.15, 62.65, 63.80, 63.94

SECTION: FM, 1, FP, 2, 3, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES



LITHOLOGIC DESCRIPTION

5GY 4/1, 5B 5/1
5G 6/1, 5G 7/1
5B 6/1, N4
5GY 6/1, 5G 6/1, 5Y 7/2, N2
5G 4/3, 5GY 5/2, N2
N3, N5, 5GY 6/1
5G 7/1, 6/1
5G 6/2, 5/2
5G 7/1, 6/1
N4, N5
5G 7/1, 6/1
5G 6/2, 5/2
N5

Cycles of SILICEOUS MARL, ranging from light greenish gray (5G 7/1) to dark green (5G 4/3) in color. Subtle burrowing and mottling dominate. Open burrows are at 100 cm in Section 1 and 9 cm in Section 2. Pyritized burrows and bands of pyrite enrichment are common. A zoophycus burrow is at 12 cm in Section 3. Carbonate nodules are at 6, 28, and 36 cm in Section 1; 132 cm in Section 2; and 108 cm in Section 3. A microfault is at 40–50 cm in Section 2.

SMEAR SLIDE SUMMARY

	1-130	3-10
	D	D
Clay minerals	31/A	29/A
Volcanic glass (dk)	2/R	1/T
Carbonate unspec.	25/A	20/C
Foraminifers	2/R	–
Calcareous nannofossils	10/C	10/C
Diatoms	8/C	10/C
Radiolarians	12/C	13/C
Silicoflagellates	–	2/R
Micrite	10/C	15/C

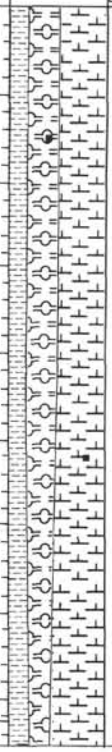
CLAY MINERALOGY (<2 μm): 2-71 cm
Smectite 94%
Chlorite & Kaolinite 6%

CARBON-CARBONATE: 15, CC
% Carbonate 35
% Organic carbon 0.3

SITE 503 HOLE B CORE (HPC) 16 CORED INTERVAL 64.4–68.8 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	S. dehiscens (F); S. pentas (R); Above N. cylindrica datum (D); D. tamalis (N)	CM	CM	CM, CM, CM	FM	64.40, 65.74, 67.24, 68.36, 68.52	1, 2, 3, CC	0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

LITHOLOGIC DESCRIPTION

5G 7/1

N5, 5Y 5/1, 5Y 6/1

5Y 7/2, 5Y 6/1, N4, 5Y 8/1, 5GY 8/1

5Y 4/3, 5Y 5/3, N2

5Y 4/2, 3/2, N2

5G 4/1, 5/1, N2

5B 6/1, N5, N6, N2

5G 7/1

5G 5/2

5Y 7/1

5GY 7/1, 5B 7/1

5G 7/1

5GY 7/1

N5, 5B 7/1

5Y 7/1, N7

Cyclic alternation of SILICEOUS MARL, which is grayish olive (5Y 4/1) and dark greenish gray (5G 4/1) in color, and SILICEOUS-BEARING MARL, which is yellowish gray (5Y 7/1) and light greenish gray (5G 7/1) in color. Gradations in color and sediment composition are common. Burrowing and mottling are common from 140 cm in Section 1 to 100 cm in Section 2. A zoophycus burrow is at 132 cm in Section 1. Carbonate nodules, formed around burrows, are at 77 cm in Section 1 and 117 cm in Section 2. Burrows enriched in pyrite are common. Faint white laminae at 0.5–1 cm spacing at 90–105 cm in Section 3.

SMEAR SLIDE SUMMARY

	2-50	3-60
	D	D
Pyrite	1/T	–
Clay minerals	20/C	24/C
Volcanic glass (dk)	2/R	1/T
Carbonate unspec.	20/C	25/A
Calcareous nannofossils	10/C	10/C
Diatoms	18/C	14/C
Radiolarians	12/C	8/C
Sponge spicules	–	1/T
Silicoflagellates	2/R	2/R
Micrite	15/C	15/C

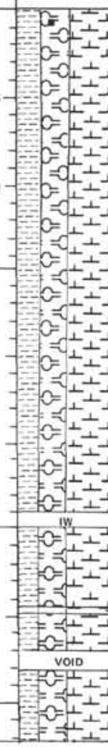
CARBON-CARBONATE:	16, CC
% Carbonate	55
% Organic carbon	0.3

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 17 CORED INTERVAL 68.8–73.2 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	S. dehiscens (F); S. pentas (R); Above N. cylindrica datum (D); D. tamalis (N)	CM	CM	CM	FM, FM	68.80, 70.21, 71.71, 72.16, 72.41, 72.49, 72.68	1, 2, 3, CC	0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

LITHOLOGIC DESCRIPTION

5G 8/1

5G 5/1, 6/1, N4, N6

5GY 6/1, 5Y 6/1

5GY 6/1, 5GY 5/1, N4

5G 5/2, 5GY 5/2, 5GY 4/1, 5GY 5/1, N4

5GY 4/1, 5Y 6/2, N3

5B 5/1, N4

5G 6/1, 5G 5/1

5G 6/1, N4

5Y 6/2, 5GY 6/1

VOID

5Y 6/1, N4

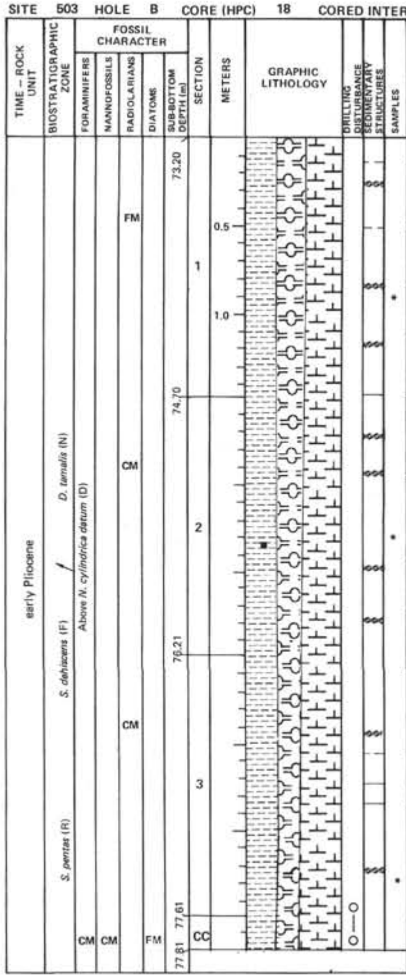
Cycles of SILICEOUS MARL ranging in color from light greenish gray (5G 8/1) to dark greenish gray (5GY 4/1) in color. Burrowing is common with some color mottling. A carbonate nodule is at 5–8 cm in Section 1. A zoophycus burrow is at 53 cm in Section 3. Zones of pyrite enrichment are common.

SMEAR SLIDE SUMMARY

	1-85	2-130
	D	D
Pyrite	1/T	–
Clay minerals	28/A	21/C
Volcanic glass (dk)	1/T	1/T
Carbonate unspec.	25/A	25/A
Calcareous nannofossils	15/C	10/C
Diatoms	10/C	15/C
Radiolarians	12/C	10/C
Sponge spicules	1/T	1/T
Silicoflagellates	2/R	2/R
Micrite	15/C	15/C

CARBON-CARBONATE:	17, CC
% Carbonate	48
% Organic carbon	0.2

SITE 503 HOLE B CORE (HPC) 18 CORED INTERVAL 73.2–77.6 m



LITHOLOGIC DESCRIPTION

5GY 4/1, 5/1

5GY 6/1

5GY 4/1, 5/1, 5G 4/1, N3

5Y 4/2, 5G 4/2

5B 7/1, 5/1, 5G 6/3

5GY 5/1

5G 7/1

5GY 6/1, 5G 6/1

5GY 7/1, 6/1

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

5GY 6/2, 6GY 5/2

5GY 6/2

5G 6/1, 5/1

5Y 8/1, 5GY 8/1, 5G 8/1

5G 6/1, 5GY 4/1, N4

Cycles of SILICEOUS MARL ranging from light greenish gray (5GY 8/1 and 5G 8/1) and yellowish gray (5Y 8/1) to grayish olive (5Y 4/2) and dark grayish green (5G 4/2) in color. Burrowing and mottling are common. Zoophycus burrows are at 26 cm in Section 1 and 34 cm in Section 2. Burrows enriched in pyrite are common. Mottling is subtle in the lower two sections.

SMEAR SLIDE SUMMARY

	1-90 D	3-80 D	3-130 D
Pyrite	1/T	1/T	–
Clay minerals	35/A	33/A	30/A
Volcanic glass (dk)	1/T	1/T	1/T
Carbonate unspec.	10/C	20/C	10/C
Foraminifers	1/T	–	8/C
Calcareous nannofossils	10/C	10/C	10/C
Diatoms	12/C	8/C	10/C
Radiolarians	14/C	10/C	15/C
Sponge spicules	–	1/T	–
Silicoflagellates	1/T	1/T	1/T
Micrite	15/C	15/C	15/C

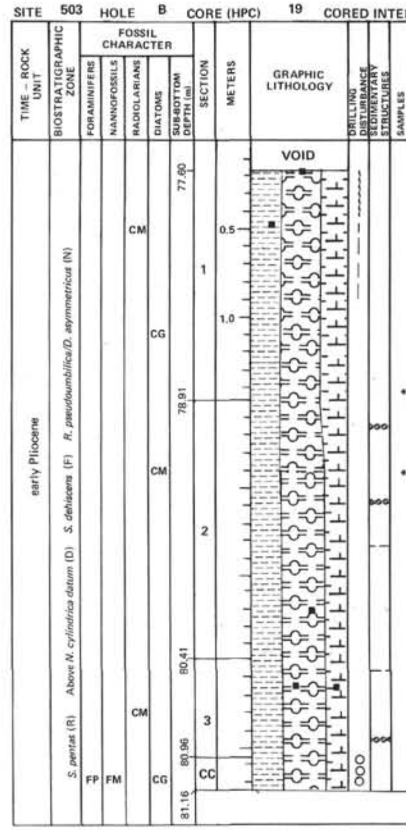
CLAY MINERALOGY ($<2\ \mu m$): 2-71 cm

Smectite	91%
Illite	2%
Chlorite & Kaolinite	7%

CARBON-CARBONATE: 18, CC

% Carbonate	56
% Organic carbon	0.2

SITE 503 HOLE B CORE (HPC) 19 CORED INTERVAL 77.6–82.0 m



LITHOLOGIC DESCRIPTION

N8, 5G 7/1, N4

5Y 4/1, 5G 2/1, 7/1

5G 6/1, 7/1, 5GY 6/1

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

5GY 4/1, 5G 4/1

5Y 4/1, N4, 5GY 5/1

5G 5/2, 5GY 6/2

5G 4/2, 5G 6/1

5G 6/1

Cyclic alternation of CALCAREOUS SILICEOUS OOZE, which is dark greenish gray (5GY 4/1 and 5G 4/1) in color, and SILICEOUS MARL light greenish gray (5G 7/1) and greenish gray (5G 6/1, 5GY 6/1) in color. Gradations in color and sediment composition between the endtypes are common. Burrowing and mottling are common in the upper half of Section 2 and less frequent elsewhere. Carbonate nodules are at 12 and 44 cm in Section 1; 126 cm in Section 2; and 115–120 cm in Section 3.

SMEAR SLIDE SUMMARY

	1-140 D	2-40 D
Clay minerals	38/A	31/A
Volcanic glass (dk)	2/R	2/R
Carbonate unspec.	15/C	10/C
Foraminifers	2/R	–
Calcareous nannofossils	10/C	5/C
Diatoms	12/C	20/C
Radiolarians	12/C	20/C
Sponge spicules	2/R	2/R
Silicoflagellates	1/T	–
Micrite	10/C	10/C

CARBON-CARBONATE: 19, CC

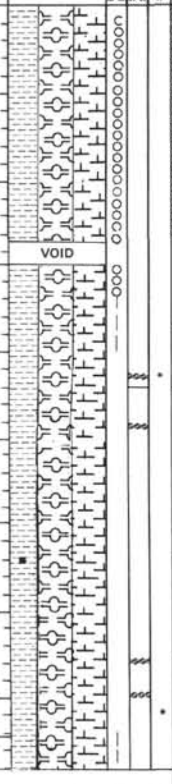
% Carbonate	31
% Organic carbon	0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 20 CORED INTERVAL 82.0–86.4 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	R. pseudoumbilica/D. asymmetricus (N); Above N. cylindrica datum (D); S. dehiscens (F); S. pentas (R)	RP		FP		82.00	1	0.5, 1.0
				CM		83.47	2	
						84.66	3	
		RM	AM		CG	84.86	CC	

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

Drilling rubble

5G 7/1, 5G 2/1, 5G 5/1

5GY 4/1, 5G 2/1

5G 4/1, 5GY 4/1

5GY 4/1, 5G 2/1

5G 8/1, 5B 7/1, 5GY 8/1

Section 1 is entirely drilling breccia. The remainder of the core consists of cyclic alternation of SILICEOUS MARL, dark greenish gray (5GY 4/1) and greenish black (5G 2/1) in color, with SILICEOUS-BEARING MARL, light greenish gray (5GY 8/1 and 5G 8/1) and light bluish gray (5B 7/1) in color. Burrowing and mottling are common from 70–115 cm in Section 3. The remainder of the undisturbed portion of the core is quite uniform. A carbonate nodule is at 25 cm in Section 3. Pyrite enrichment of burrows and other zones is common.

SMEAR SLIDE SUMMARY

	2-60	3-110
	D	D
Pyrite	–	1/T
Clay minerals	30/A	26/A
Volcanic glass (dk)	1/T	–
Carbonate unspec.	10/C	10/C
Foraminifers	–	3/R
Calcareous nannofossils	5/C	20/C
Diatoms	20/C	10/C
Radiolarians	15/C	8/C
Sponge spicules	1/T	–
Silicoflagellates	3/R	2/R
Micrite	15/C	20/C

CLAY MINERALOGY ($<2\ \mu m$): 2-71 cm

Smectite	90%
Chlorite & Kaolinite	10%

CARBON-CARBONATE: 20, CC

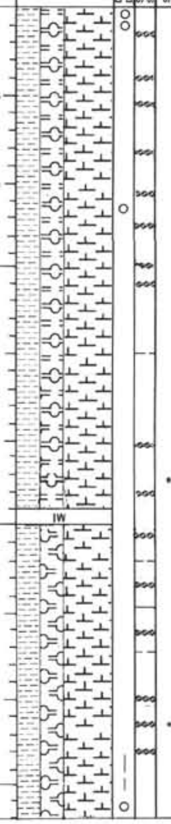
% Carbonate	72
% Organic carbon	0.1

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 21 CORED INTERVAL 86.4–90.8 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SUB-BOTTOM DEPTH (m)	SECTION	METERS
early Pliocene	R. pseudoumbilica/D. asymmetricus (N); Above N. cylindrica datum (D); S. dehiscens (F); S. pentas (R)			CM		86.40	1	0.5, 1.0
				CM		87.85	2	
		AP						
				FM		89.35	3	
		FP	AM		CG	90.81, 91.06	CC	

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5G 5/1

5G 7/1

5G 6/1

5G 7/1

5G 6/1, 5G 7/1

5G 7/1

5G 6/1

5G 7/1

5G 6/2, 5GY 6/1

5GY 7/2, 5G 7/2

5GY 8/1, 5G 8/1

5GY 7/2, 5G 7/2

5G 6/1

5GY 7/1, 6/1

5GY 8/1, 5B 7/1

5G 6/1, 5G 7/1, 5G 8/1

5G 8/1

5GY 5/1, 5G 6/1

5G 7/1

5GY 6/1, 5Y 6/1

Cyclic alternation of SILICEOUS-BEARING MARL, which is light greenish gray (5GY 8/1 and 5G 8/1) in color and SILICEOUS MARL, which is yellowish gray (5GY 5/1) and greenish gray (5G 6/1) in color. Gradations between the endtypes in color and composition are common. Zoophycus burrows are at 56, 67, and 115 cm in Section 3. Pyrite enrichment of burrows is common.

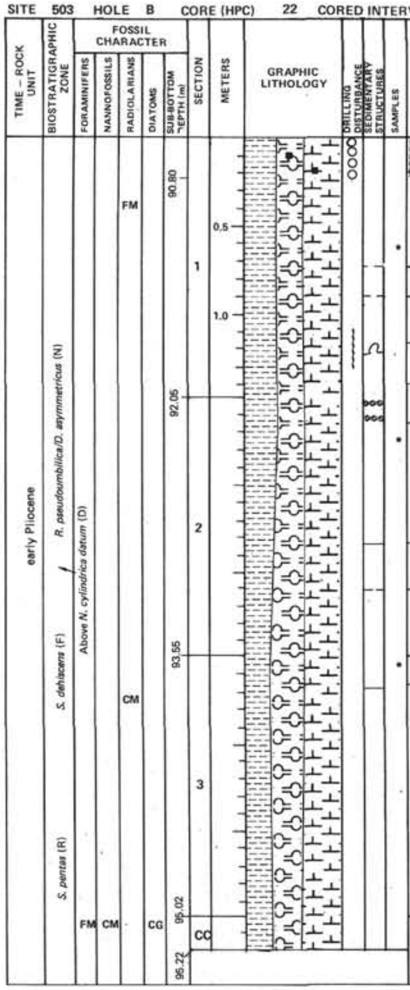
SMEAR SLIDE SUMMARY

	2-120	3-115
	D	D
Pyrite	1/T	1/T
Clay minerals	23/C	39/A
Volcanic glass (dk)	2/R	1/T
Carbonate unspec.	15/C	15/C
Foraminifers	5/C	–
Calcareous nannofossils	15/C	5/C
Diatoms	10/C	15/C
Radiolarians	10/C	12/C
Sponge spicules	2/R	–
Fish debris	–	1/T
Silicoflagellates	2/R	1/T
Micrite	15/C	10/C

CARBON-CARBONATE: 21, CC

% Carbonate	50
% Organic carbon	0.2

SITE 503 HOLE B CORE (HPC) 22 CORED INTERVAL 90.8–95.2 m



LITHOLOGIC DESCRIPTION

Rubble

5G 7/1

5G 8/1,
5G 7/1

5G 7/1

5G 4/1,
5G 7/1,
5G 6/1

5G 4/1,
5G 7/1

5G 5/3,
5GY 5/1,
5Y 4/1

5G 8/1,
5G 7/1

5G 6/1,
5G 4/2

5GY 3/1,
5Y 2/1, N4, N5

5G 7/1,
5GY 7/1,
5G 6/1

5GY 6/1, N2

Cyclic alternation of SILICEOUS MARL, which is olive black (5Y 2/1) and very dark greenish gray (5GY 3/1) in color, and SILICEOUS-BEARING MARL, which is light greenish gray (5G 7/1) in color. Gradations between endtypes in color and composition are common. Burrowing and color mottling are common below 70 cm in Section 1. A zoophycus burrow is at 5–15 cm in Section 2. The sediment is very uniform below 20 cm in Section 3. Carbonate nodules are in the disturbed section at the top of the core. Some pyrite enrichments are present in the sediment.

SMEAR SLIDE SUMMARY

	1-60	2-25	3-5
	D	D	D
Pyrite	1/T	–	2/R
Clay minerals	34/A	34/A	30/A
Volcanic glass (lt)	–	–	5/C
Volcanic glass (dk)	–	–	1/T
Carbonate unspec.	20/C	15/C	10/C
Foraminifers	–	–	2/R
Calcareous nannofossils	10/C	10/C	10/C
Diatoms	8/C	10/C	15/C
Radiolarians	12/C	15/C	15/C
Silicoflagellates	–	1/T	–
Micrite	15/C	15/C	10/C

CLAY MINERALOGY (<2 μm): 2-71 cm

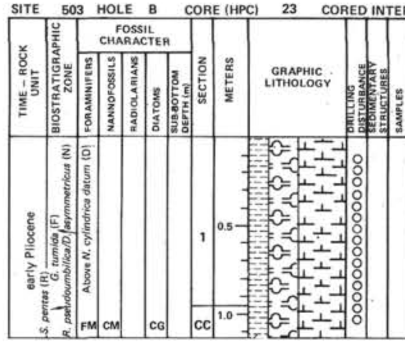
Smectite	91%
Illite	5%
Chlorite & Kaolinite	4%

CARBON-CARBONATE: 22, CC

% Carbonate	47
% Organic carbon	0.2

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 23 CORED INTERVAL 95.2–99.6 m



LITHOLOGIC DESCRIPTION

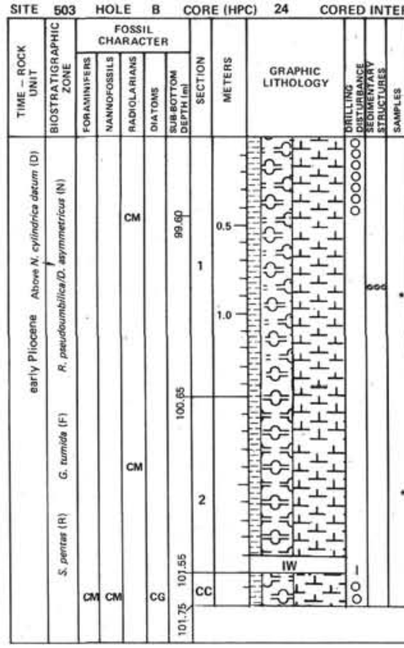
Drilling breccia

Drilling breccia of rust, carbonate nodule fragments, and sediment.

CARBON-CARBONATE: 23, CC

% Carbonate	43
% Organic carbon	0.2

SITE 503 HOLE B CORE (HPC) 24 CORED INTERVAL 99.6–104.0 m



LITHOLOGIC DESCRIPTION

Drilling breccia

5G 8/1

5GY 6/1,
5G 6/1,
5Y 6/1

5G 7/1,
5GY 7/1,
5Y 8/1

N5,
5G 5/1,
5Y 5/1,
5GY 6/3,
5G 5/2,
N2

5GY 8/1, 5Y 8/1

Cycles of SILICEOUS CALCAREOUS MARL, ranging from light greenish gray (5G 8/1) to medium gray (N5), olive gray (5Y 5/1) and greenish gray (5G 5/1) in color. Gradations between endtypes in color are common. Below 120 cm in Section 1, burrowing and mottling are common. Pyrite enrichment of burrows is common. The center of the core shows a collapse structure which appears to be a HPC coring artifact.

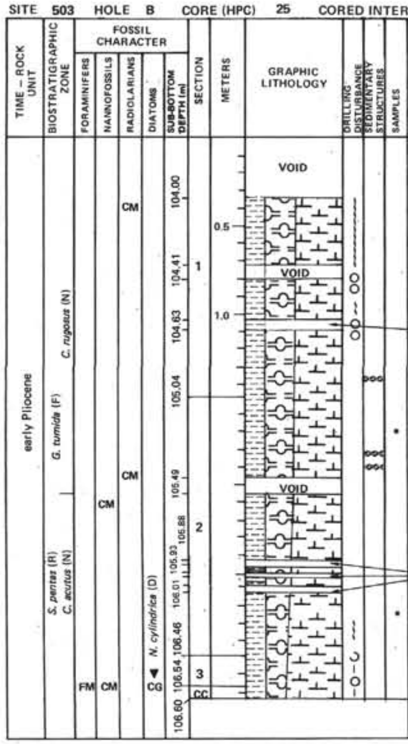
SMEAR SLIDE SUMMARY

	1-90	2-60
	D	D
Clay minerals	18/C	32/A
Volcanic glass (dk)	–	1/T
Carbonate unspec.	15/C	20/C
Foraminifers	4/R	–
Calcareous nannofossils	20/C	5/C
Diatoms	15/C	15/C
Radiolarians	10/C	15/C
Sponge spicules	1/T	2/R
Silicoflagellates	2/R	–
Micrite	15/C	10/C

CARBON-CARBONATE: 24, CC

% Carbonate	67
% Organic carbon	0.2

SITE 503 HOLE B CORE (HPC) 25 CORED INTERVAL 104.0–108.4 m



LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS MARL, ranging in color from light greenish gray (5GY 8/1, 5G 8/1) and pale yellow (5Y 5/1) to greenish gray (5GY 6/1). Burrowing and mottling are common throughout. A zoophycus burrow is at 143–148 cm in Section 1.

5GY 7/1, N8, 5Y 7/1, 5G 7/1

VOID

5GY 6/1, 5G 5/2, 5G 8/1, 5GY 7/1, N4

5GY 8/1, 5Y 8/1, 5Y 8/3, N7, 5G 8/1, N6

VOIDS

5GY 6/1, 5Y 7/1, N5

5GY 8/1, N7

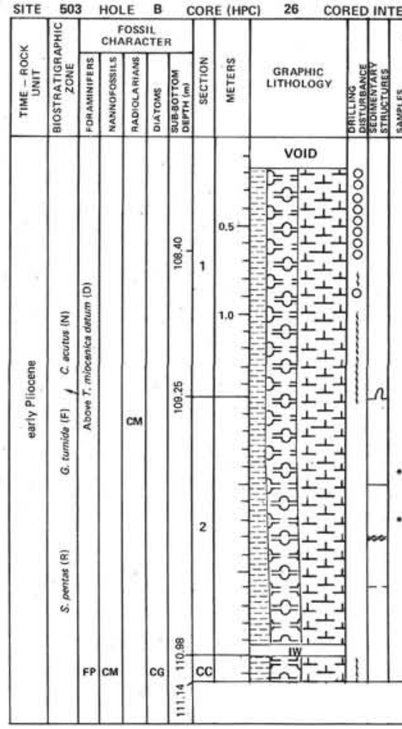
SMEAR SLIDE SUMMARY

	2-20	2-120
	D	D
Pyrite	2/R	1/T
Clay minerals	21/C	23/C
Volcanic glass (dk)	2/R	1/T
Carbonate unspec.	15/C	10/C
Calcareous nannofossils	10/C	30/A
Diatoms	20/C	15/C
Radiolarians	15/C	10/C
Micrite	15/C	10/C

CARBON-CARBONATE: 25, CC
% Carbonate 50
% Organic carbon 0.3

Note: Graphic lithology represents average composition derived from smear slides and does not reflect the detailed alternation of sediment types. Gradational changes between smear slides are arbitrary and do not imply actual lithologic trends. Color variations approximate lithologic changes.

SITE 503 HOLE B CORE (HPC) 26 CORED INTERVAL 108.4–112.8 m



LITHOLOGIC DESCRIPTION

Cycles of SILICEOUS NANNO MARL, ranging from light greenish gray (5G 8/1 and 5GY 8/1) to greenish gray (5GY 6/1) and green (5GY 6/3) in color. The upper section is highly disturbed. The sediment is highly burrowed and mottled. Pyrite enrichment is abundant from 45–115 cm in Section 2.

5G 7/1, N5

5GY 6/1, 5G 7/3, 5G 8/1

5G 8/1, 5GY 8/1, 5GY 7/1, N2

5GY 6/1, 5GY 6/3, 5Y 6/3

5GY 7/1, 5Y 7/1, 5G 7/1, N2

5B 7/1, 5B 8/1, 5Y 8/1

N8

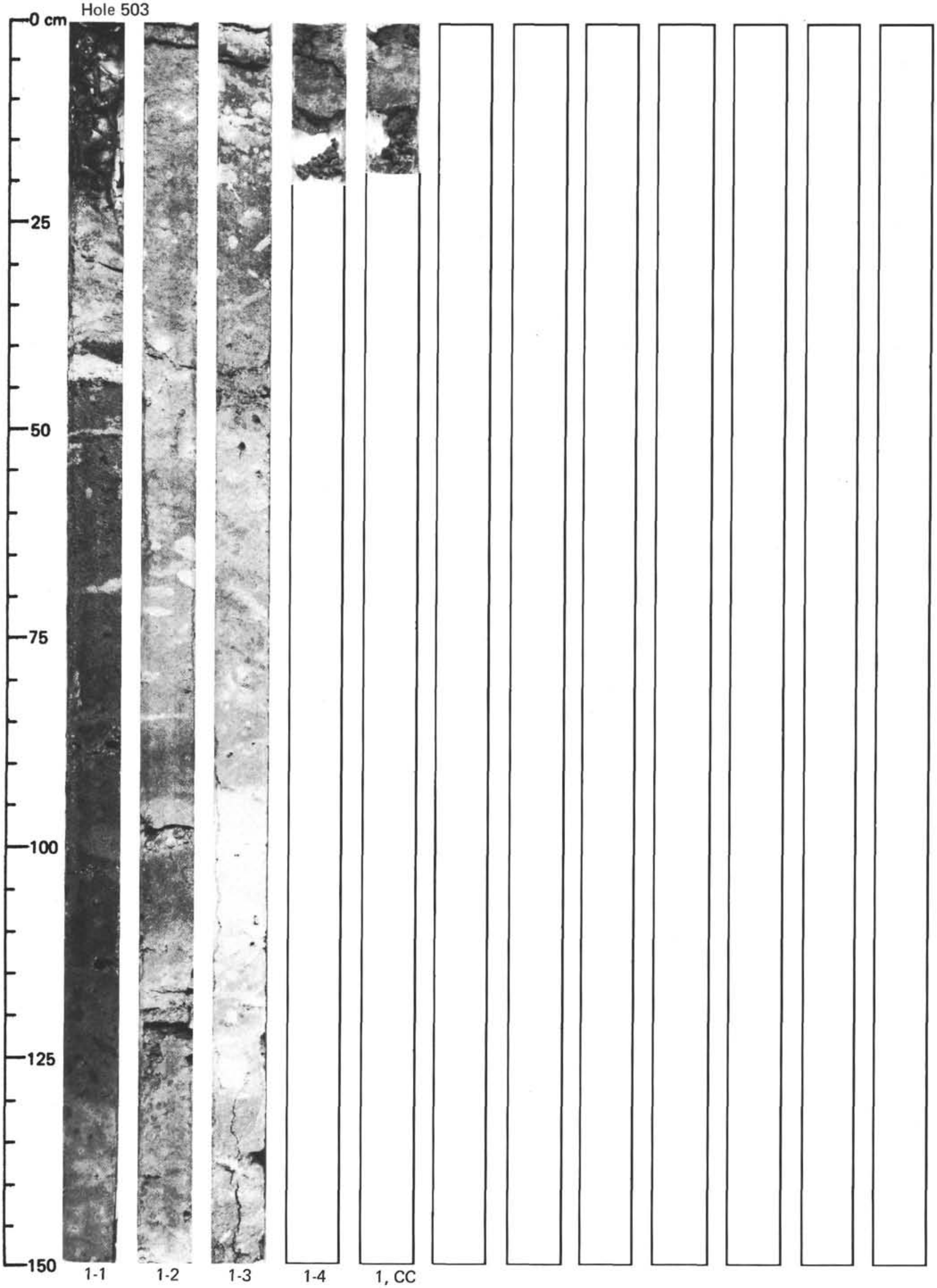
SMEAR SLIDE SUMMARY

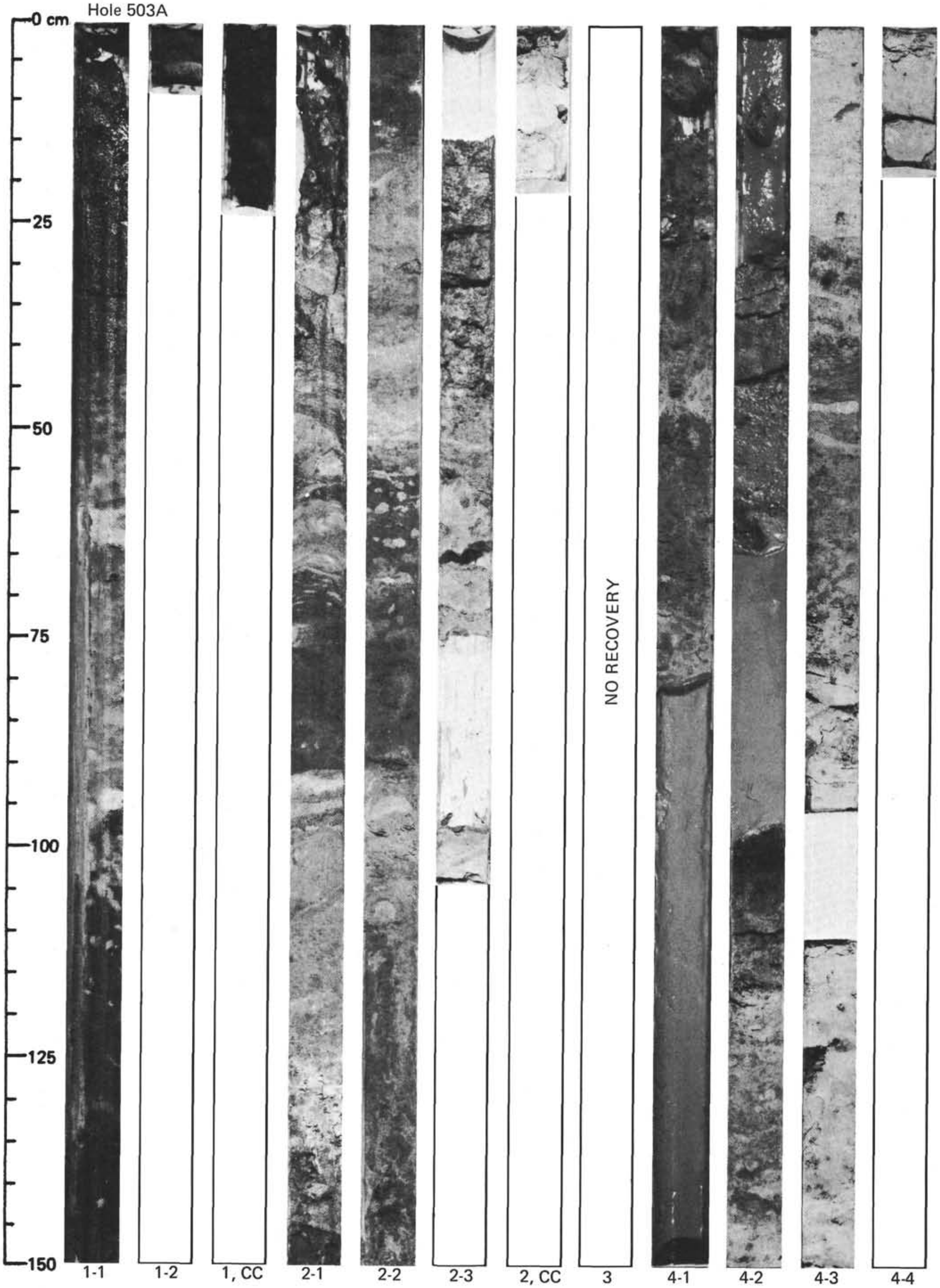
	2-40	2-70
	D	D
Pyrite	1/T	1/T
Clay minerals	17/C	23/C
Volcanic glass (dk)	–	1/T
Carbonate unspec.	10/C	10/C
Foraminifers	5/C	–
Calcareous nannofossils	25/A	20/C
Diatoms	20/C	15/C
Radiolarians	10/C	10/C
Silicoflagellates	2/R	–
Micrite	10/C	20/C

CLAY MINERALOGY (<2 μm): 2-71 cm

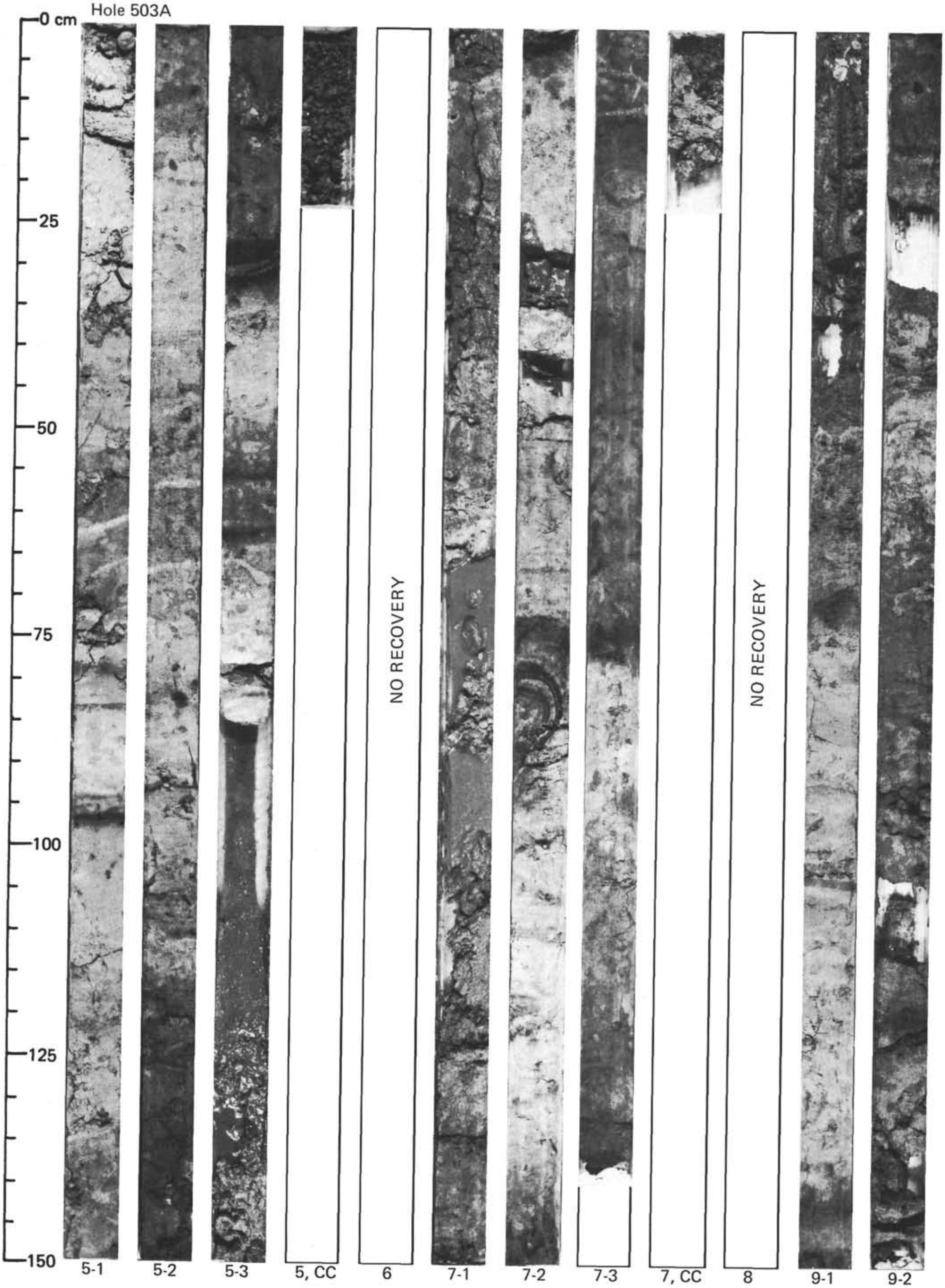
Smectite	91%
Illite	5%
Chlorite & Kaolinite	4%

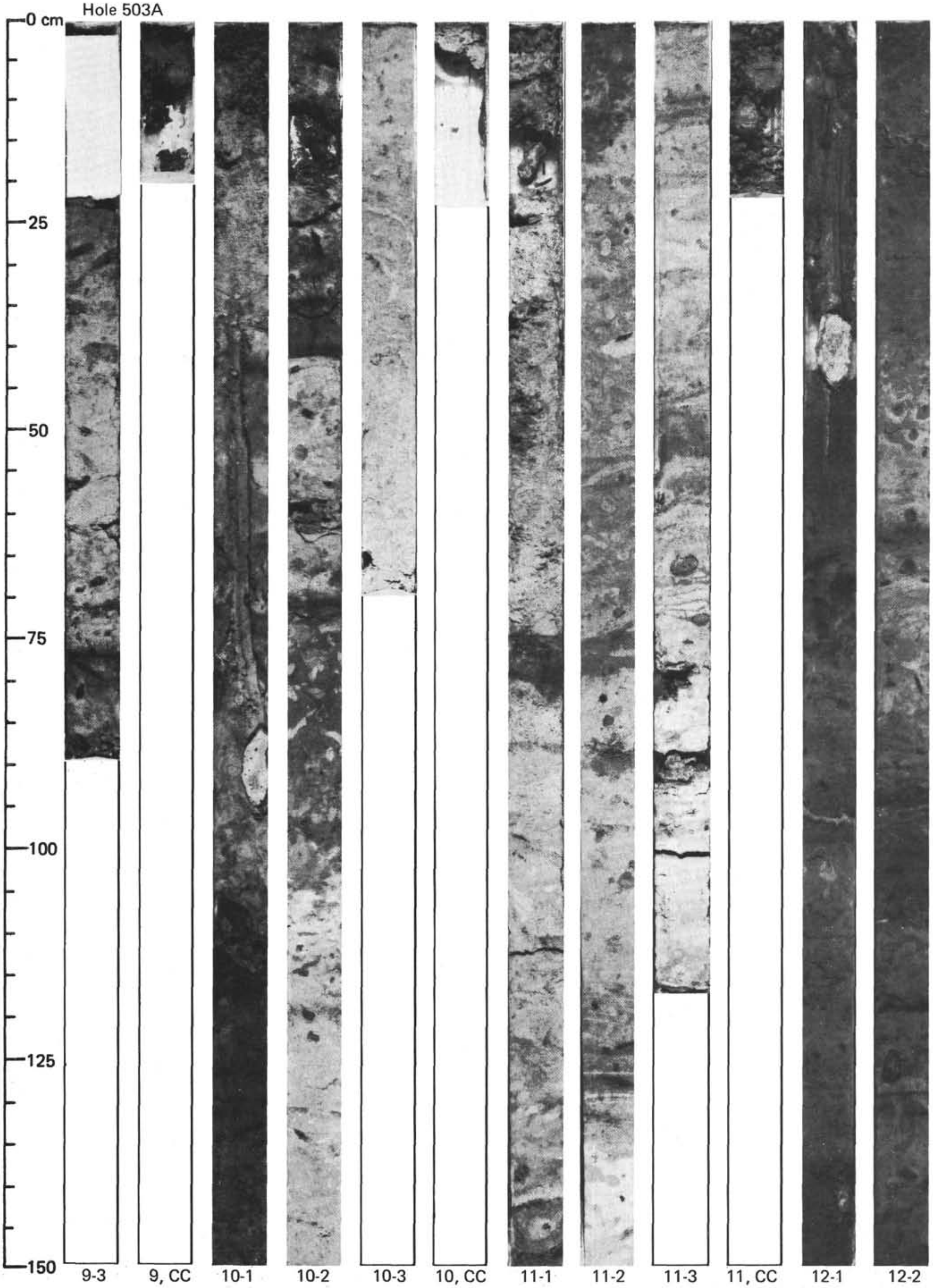
CARBON-CARBONATE: 26, CC
% Carbonate 72
% Organic carbon 0.1

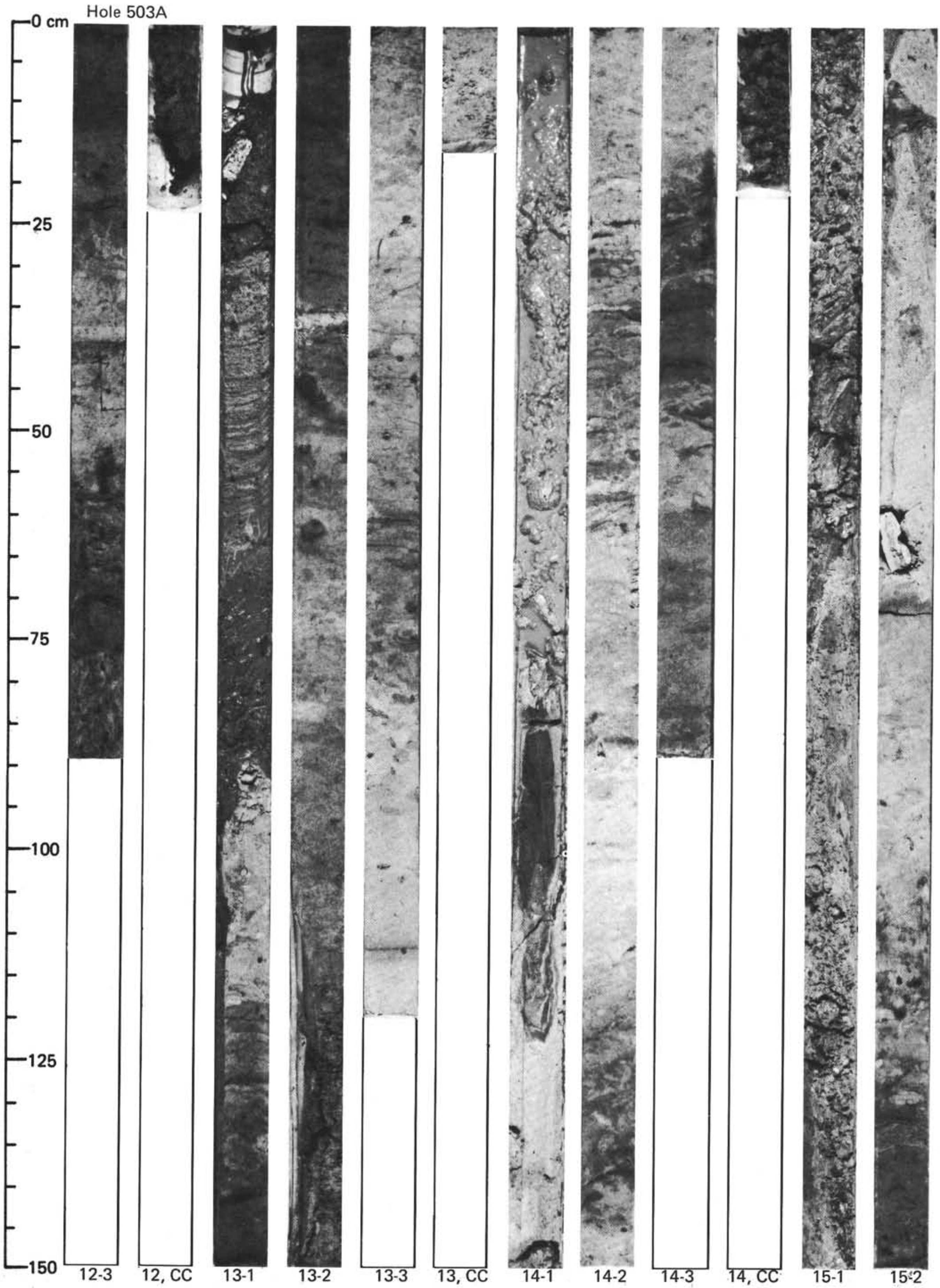

Hole 503
0 cm
25
50
75
100
125
150
1-1
1-2
1-3
1-4
1, CC

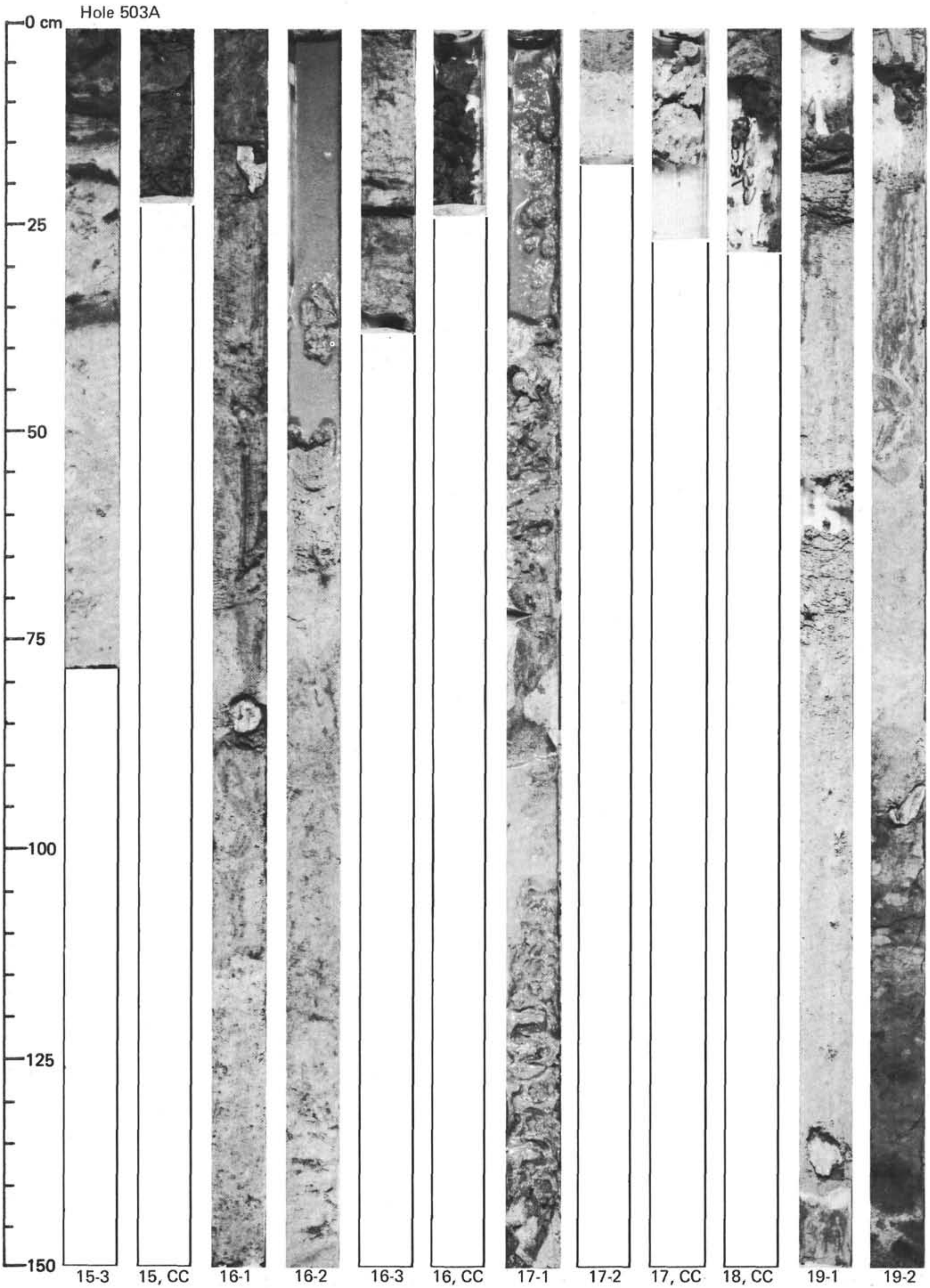


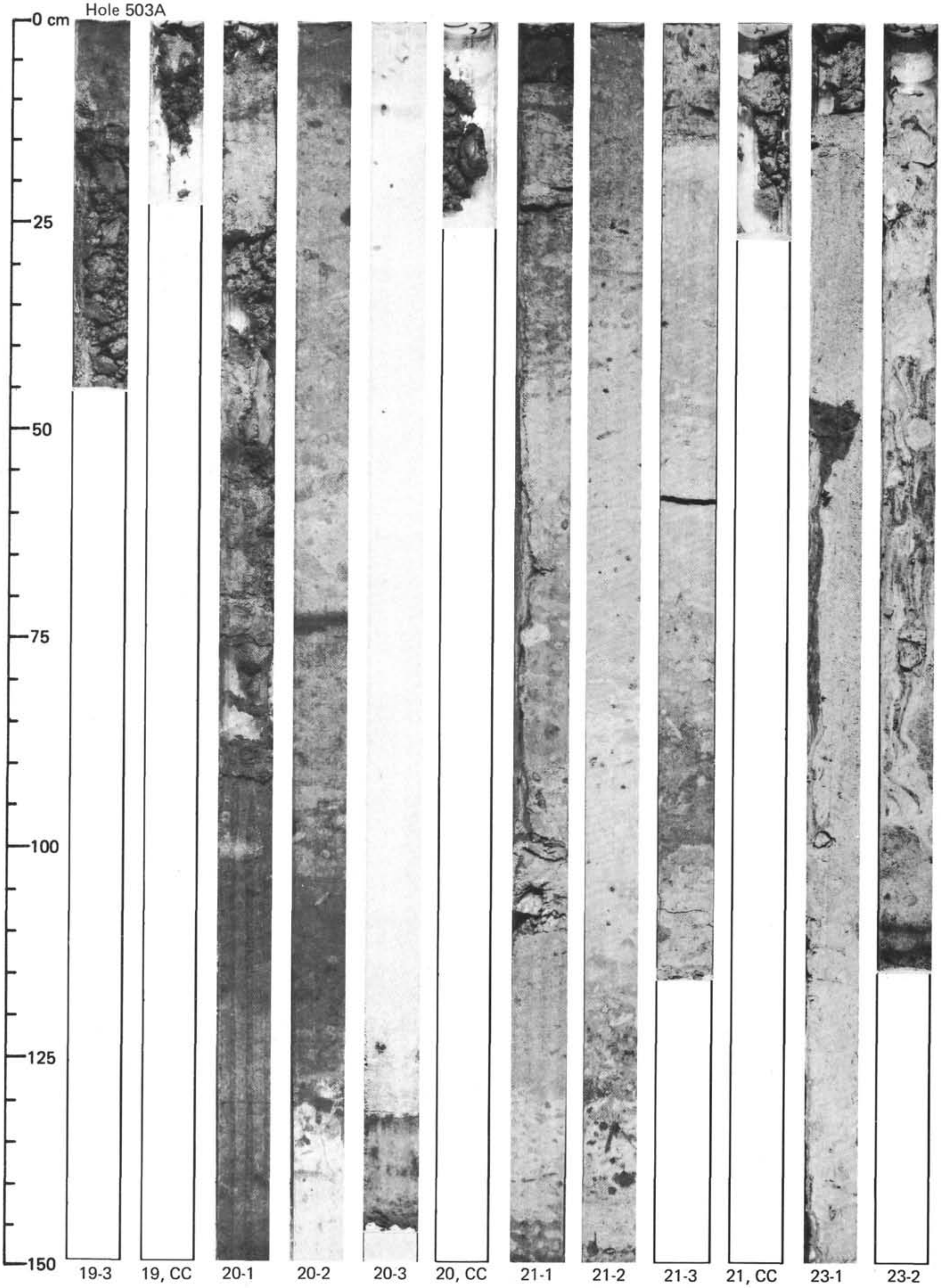
Hole 503A
0 cm
25
50
75
100
125
150
1-1
1-2
1, CC
2-1
2-2
2-3
2, CC
3
4-1
4-2
4-3
4-4
NO RECOVERY

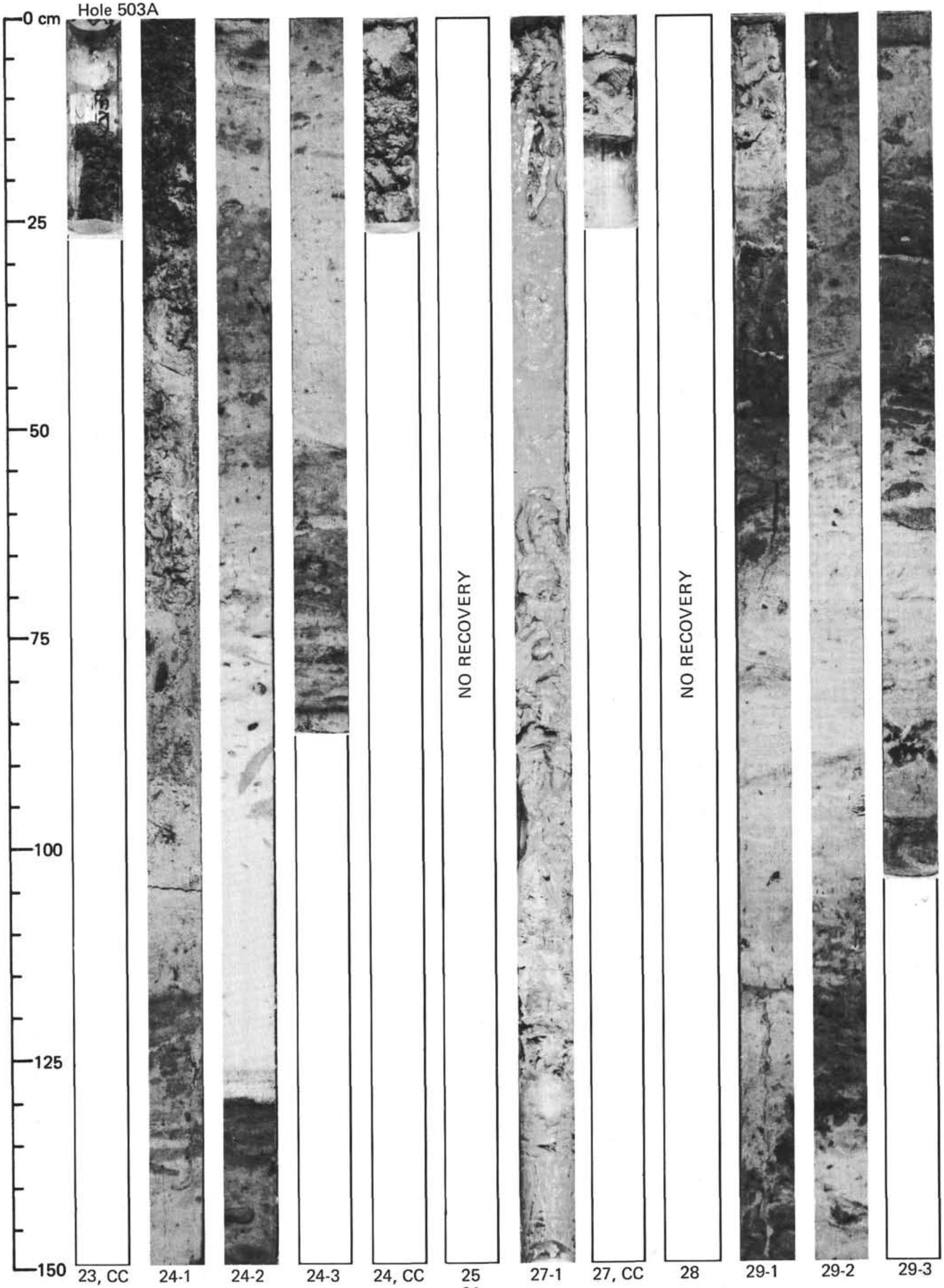

Hole 503A
0 cm
25
50
75
100
125
150
NO RECOVERY
NO RECOVERY
5-1
5-2
5-3
5, CC
6
7-1
7-2
7-3
7, CC
8
9-1
9-2

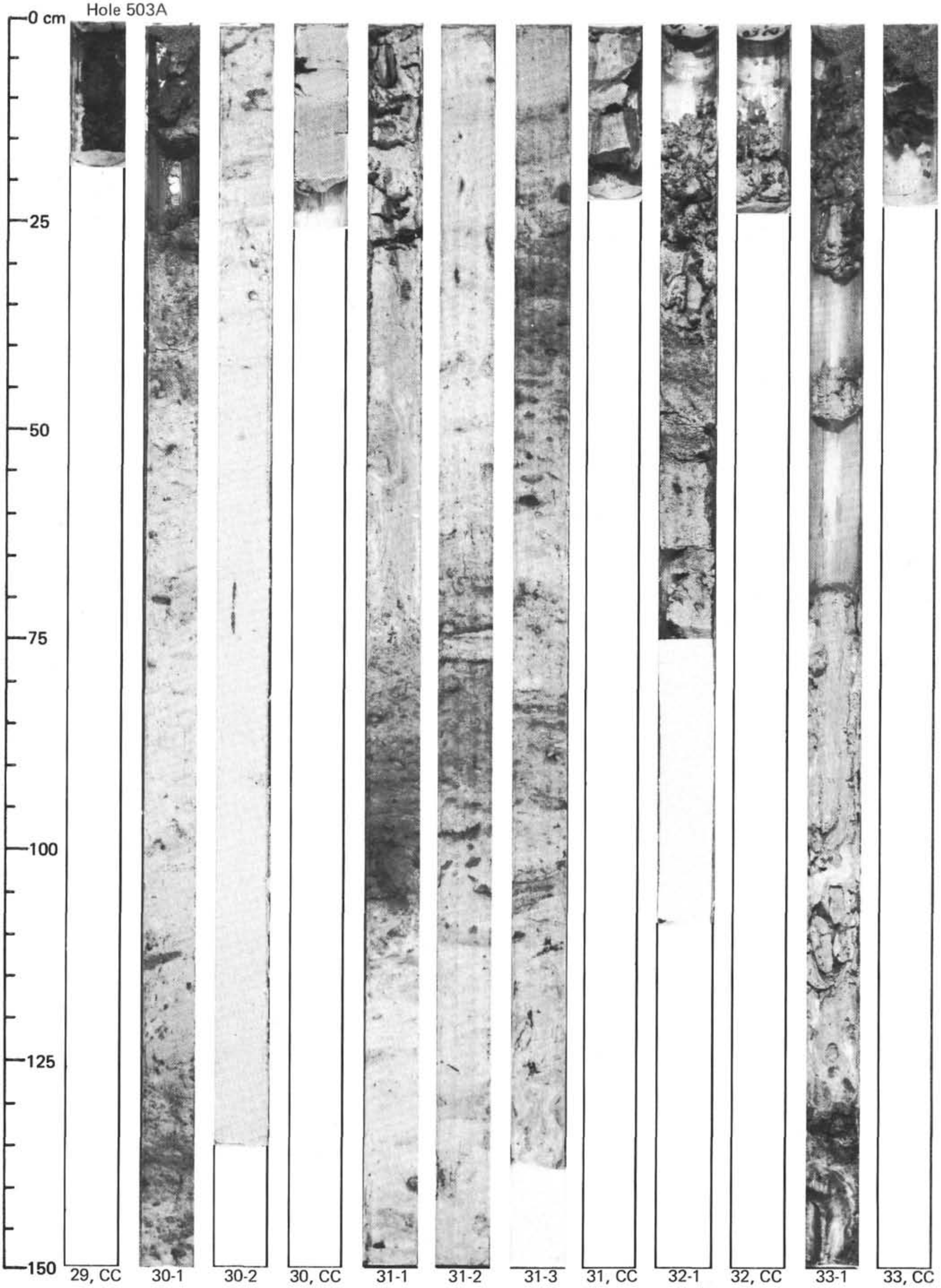

Hole 503A
0 cm
25
50
75
100
125
150
9-3
9, CC
10-1
10-2
10-3
10, CC
11-1
11-2
11-3
11, CC
12-1
12-2

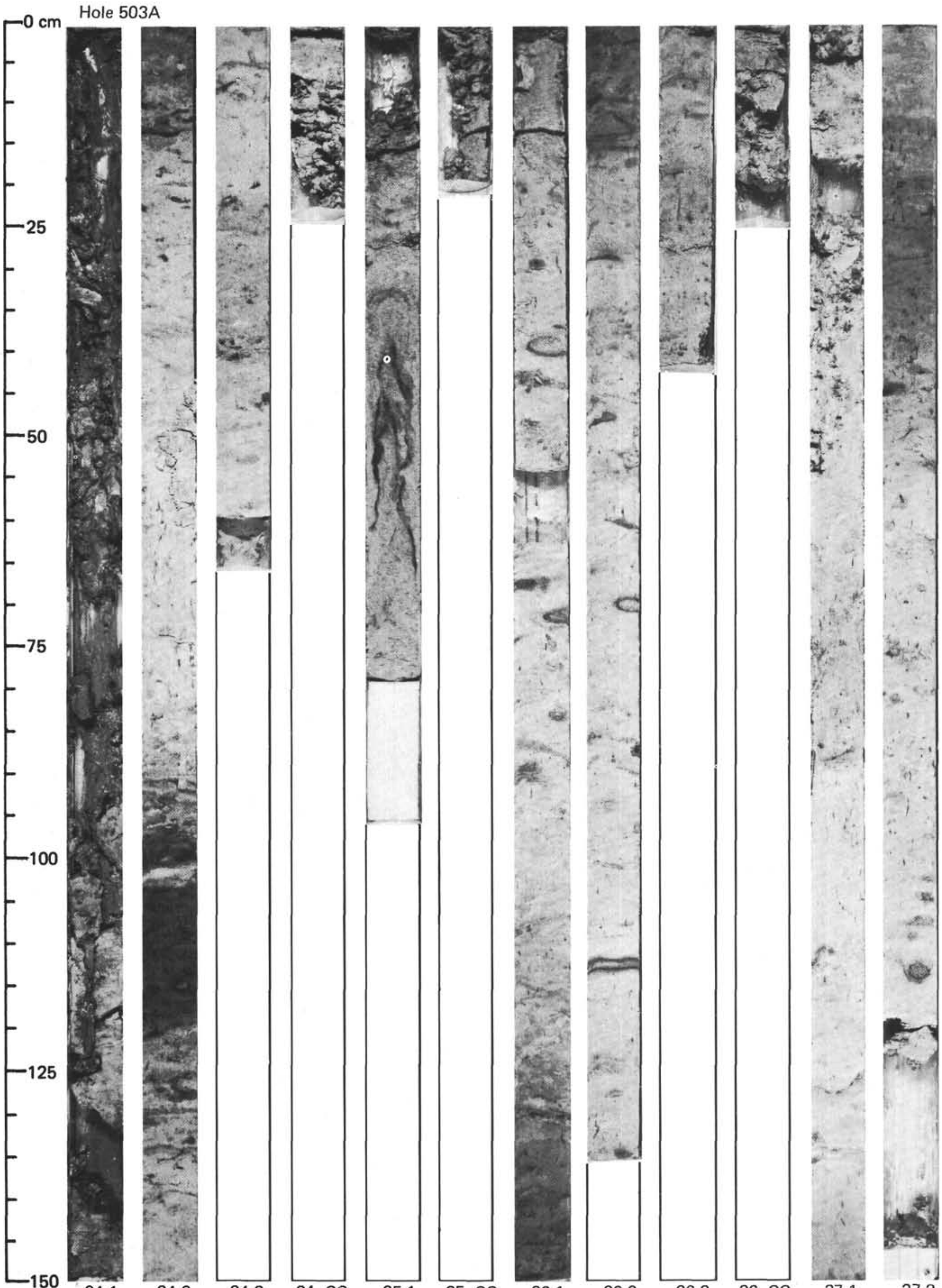

Hole 503A
0 cm
25
50
75
100
125
150
12-3
12, CC
13-1
13-2
13-3
13, CC
14-1
14-2
14-3
14, CC
15-1
15-2

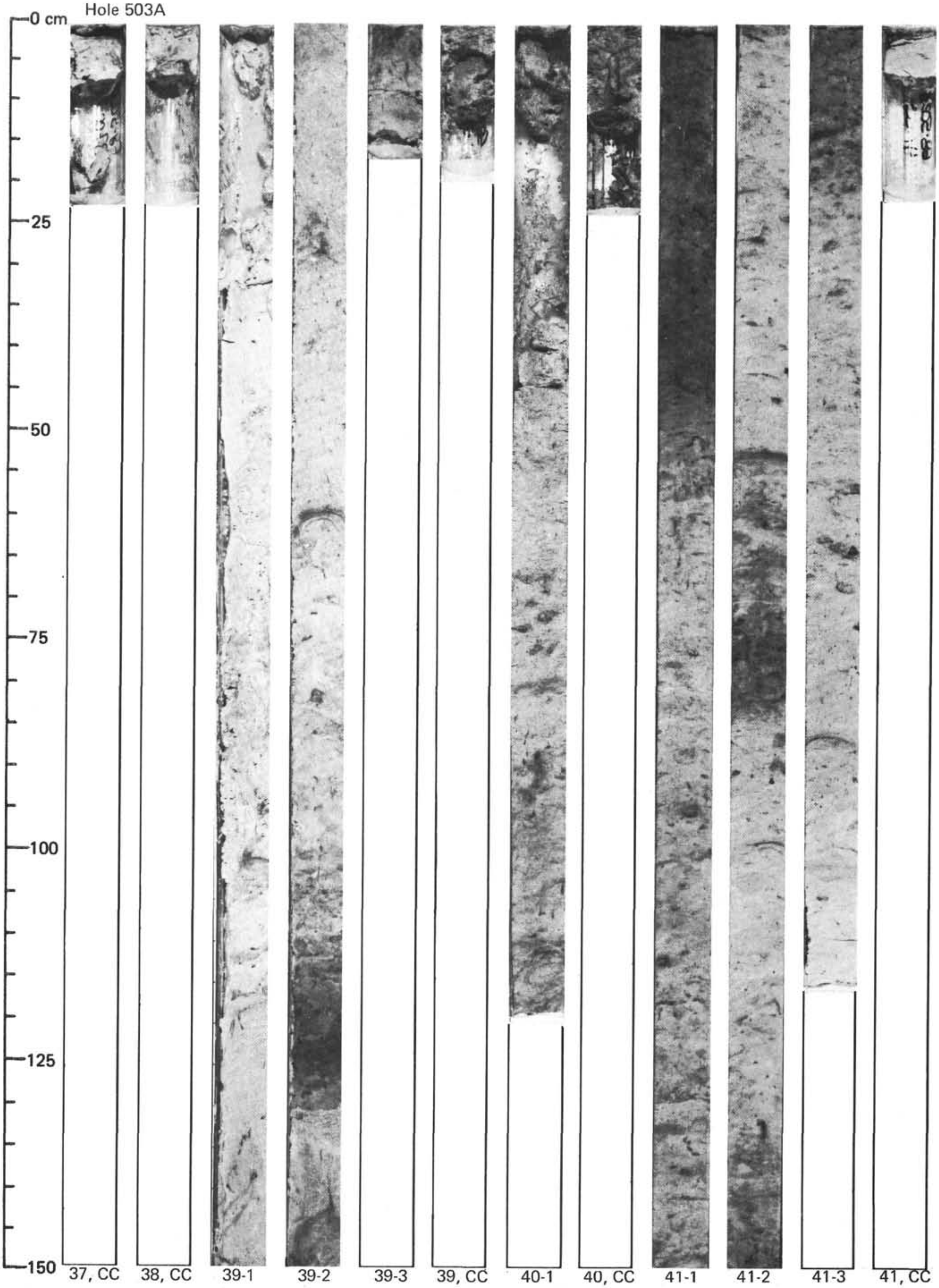

Hole 503A
0 cm
25
50
75
100
125
150
15-3
15, CC
16-1
16-2
16-3
16, CC
17-1
17-2
17, CC
18, CC
19-1
19-2

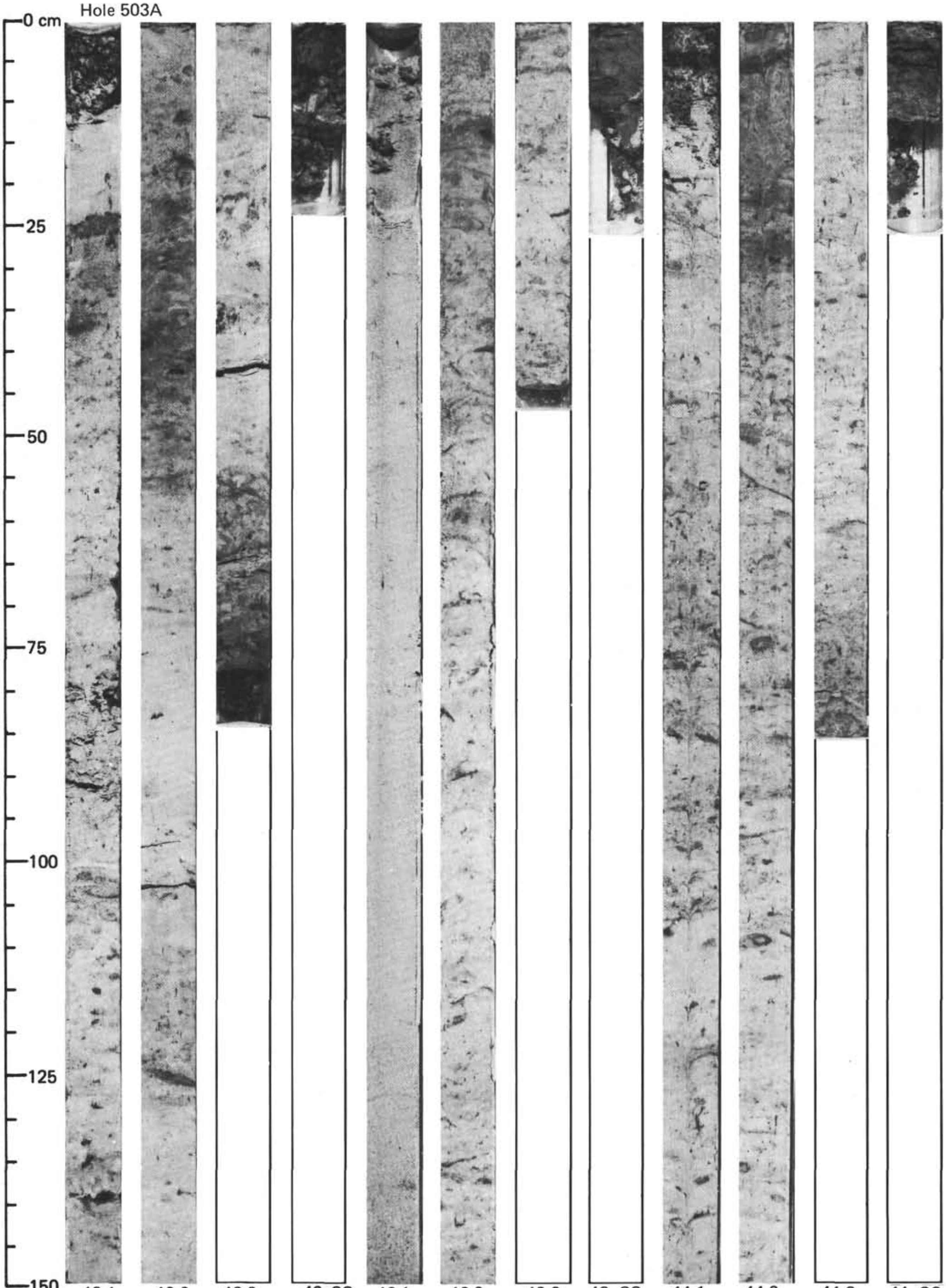

Hole 503A
0 cm
25
50
75
100
125
150
19-3
19, CC
20-1
20-2
20-3
20, CC
21-1
21-2
21-3
21, CC
23-1
23-2

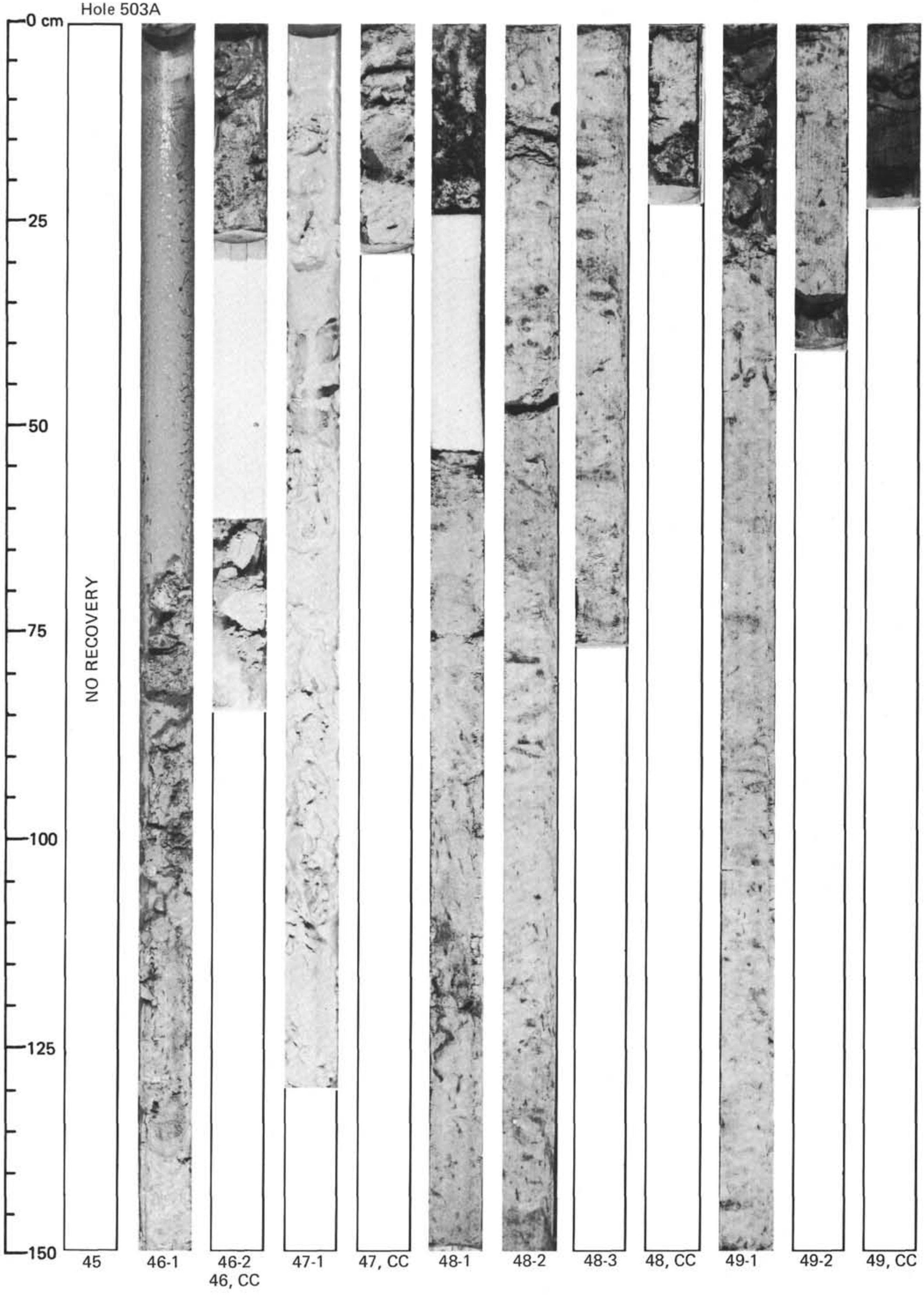

Hole 503A
0 cm
25
50
75
100
125
150
NO RECOVERY
NO RECOVERY
23, CC
24-1
24-2
24-3
24, CC
25
26
27-1
27, CC
28
29-1
29-2
29-3

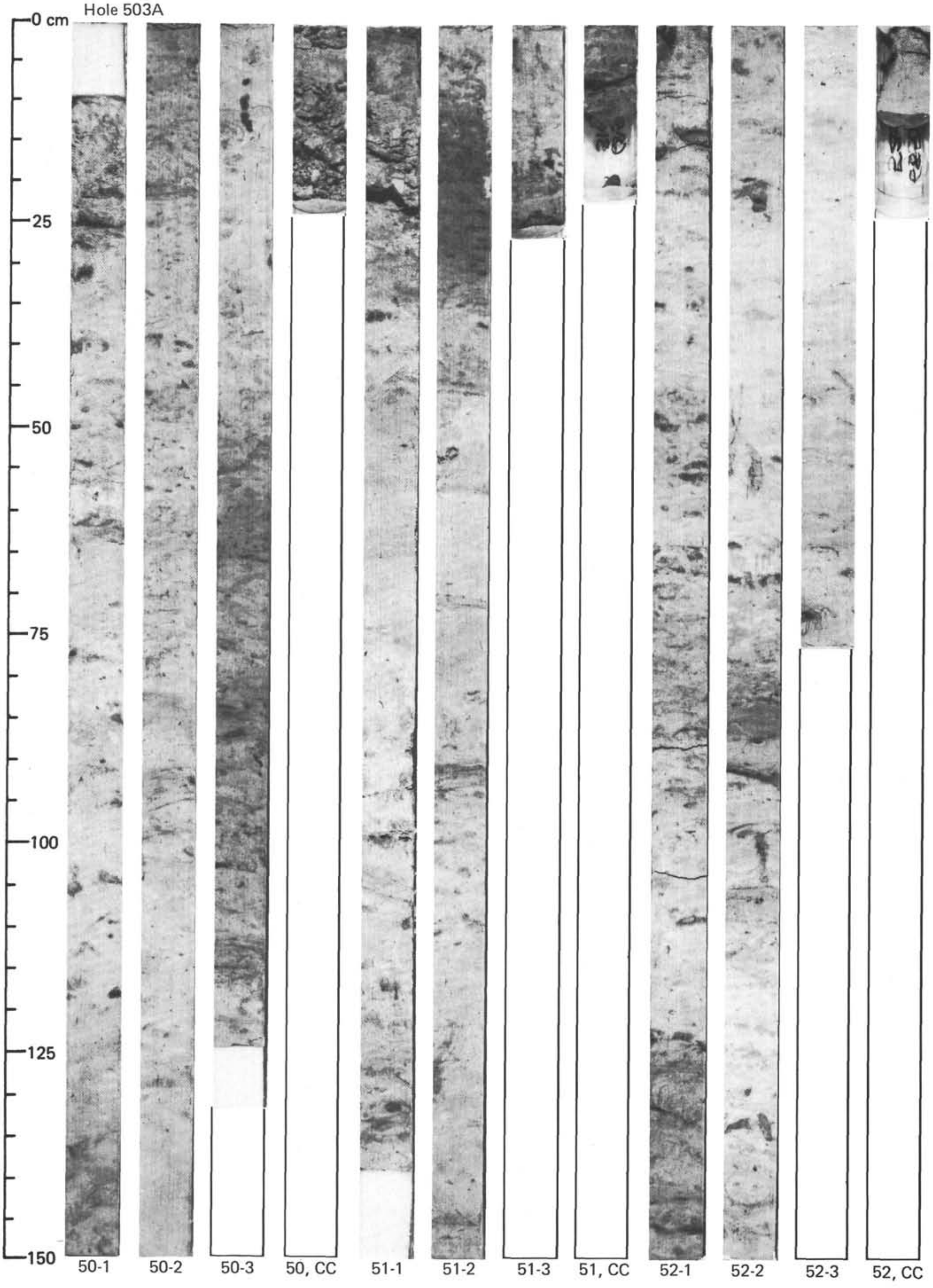

Hole 503A
0 cm
25
50
75
100
125
150
29, CC
30-1
30-2
30, CC
31-1
31-2
31-3
31, CC
32-1
32, CC
33-1
33, CC

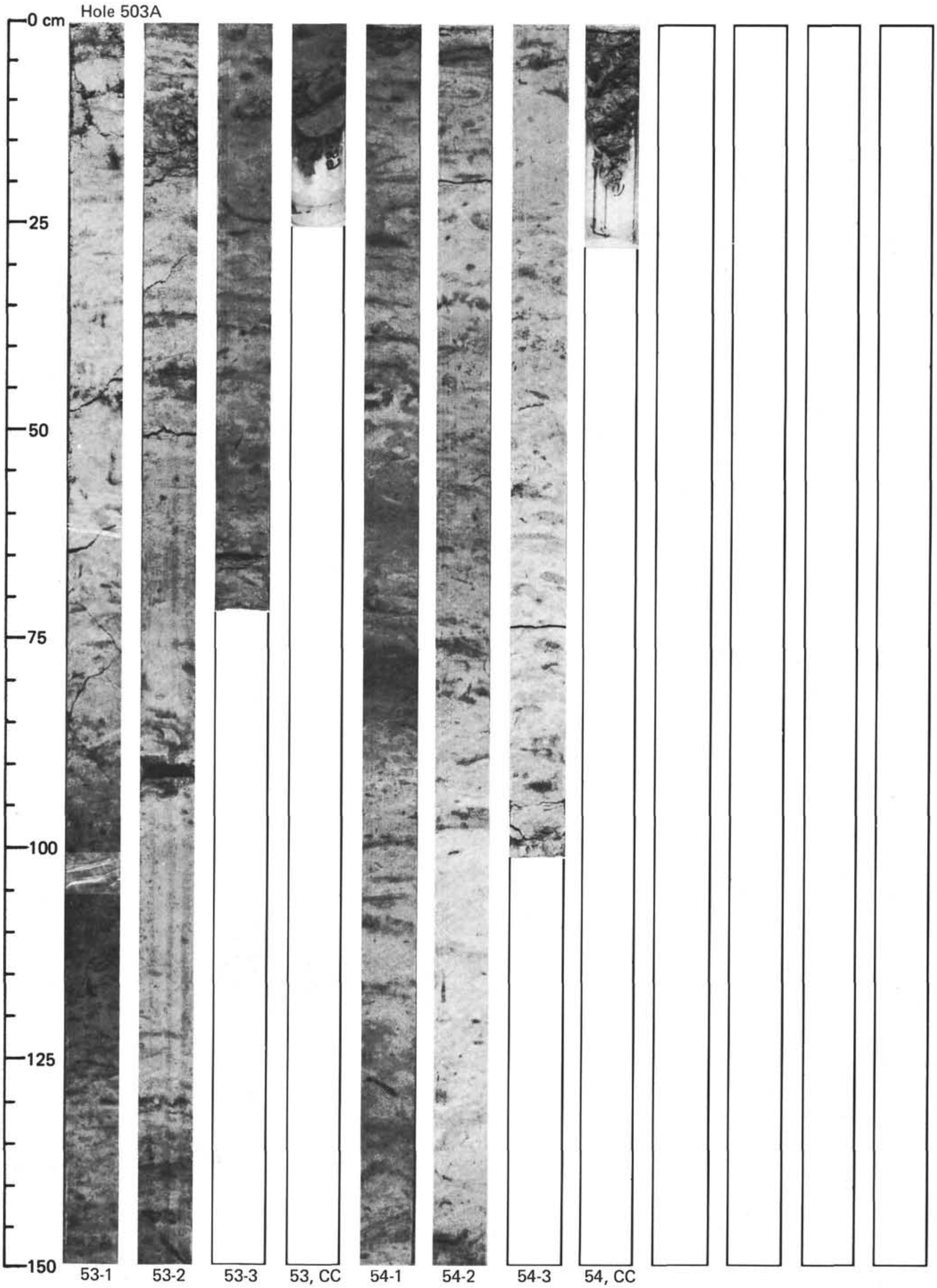

Hole 503A
0 cm
25
50
75
100
125
150
34-1
34-2
34-3
34, CC
35-1
35, CC
36-1
36-2
36-3
36, CC
37-1
37-2

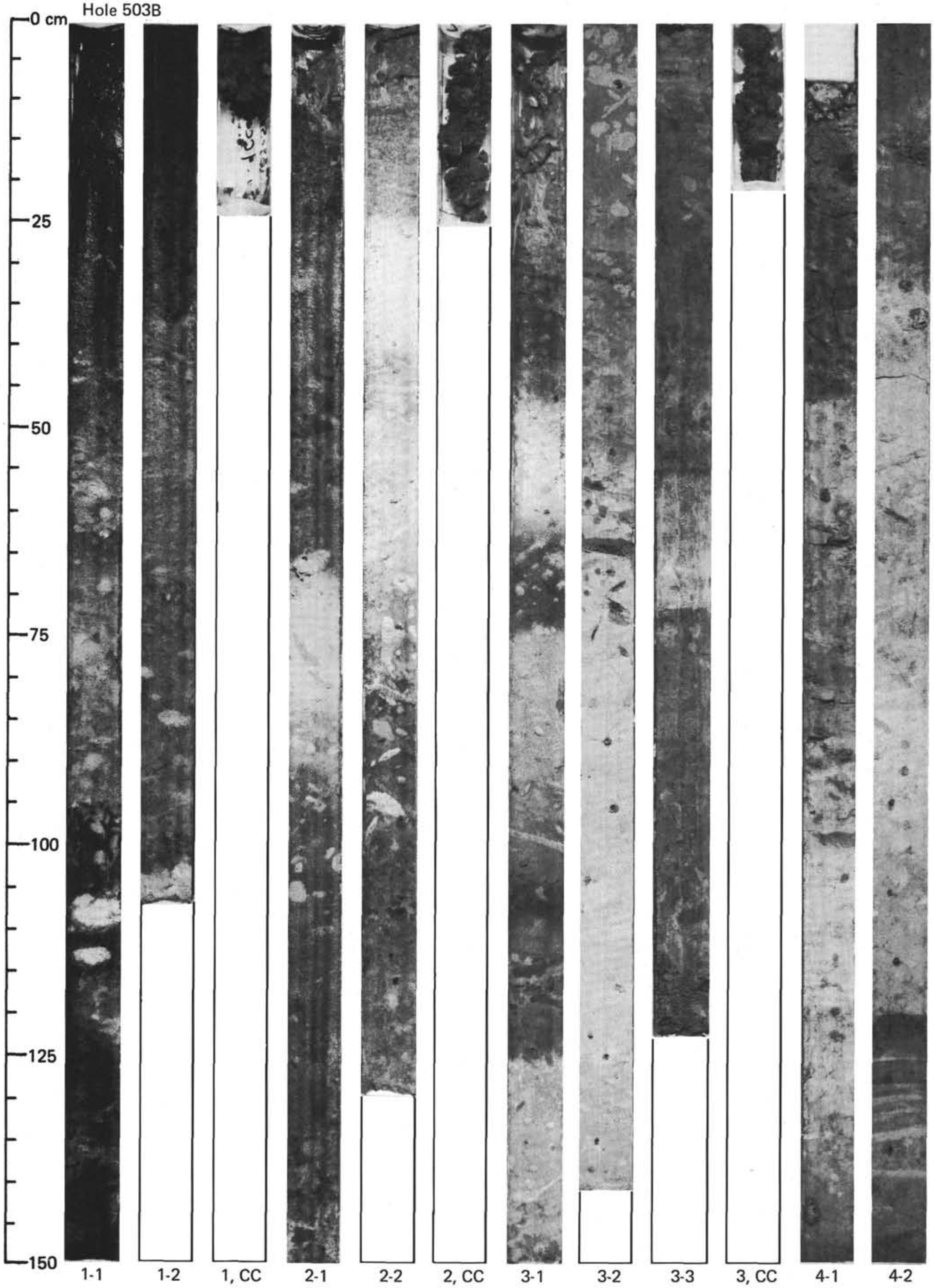

Hole 503A
0 cm
25
50
75
100
125
150
37, CC
38, CC
39-1
39-2
39-3
39, CC
40-1
40, CC
41-1
41-2
41-3
41, CC

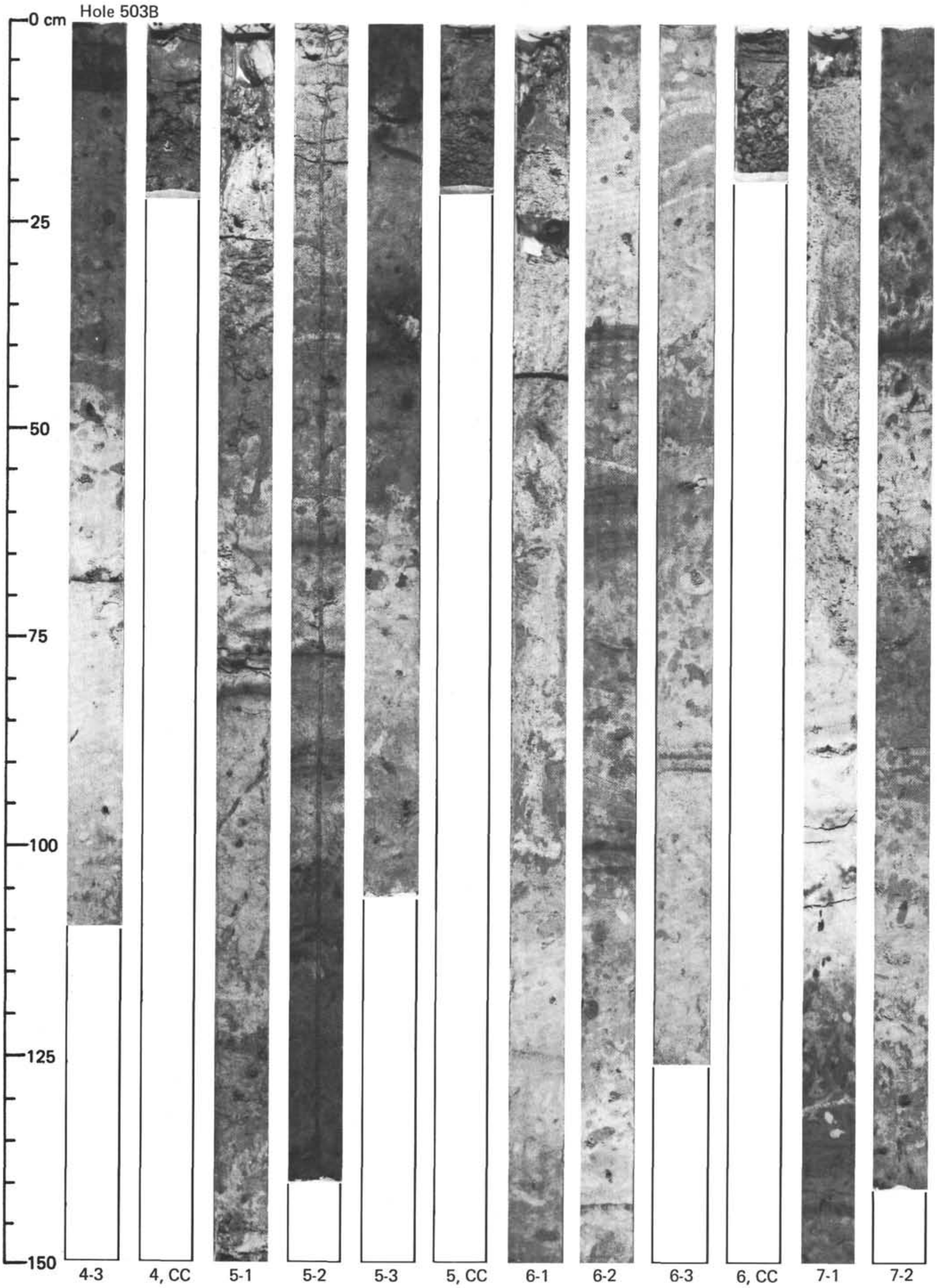

Hole 503A
0 cm
25
50
75
100
125
150
42-1
42-2
42-3
42, CC
43-1
43-2
43-3
43, CC
44-1
44-2
44-3
44, CC

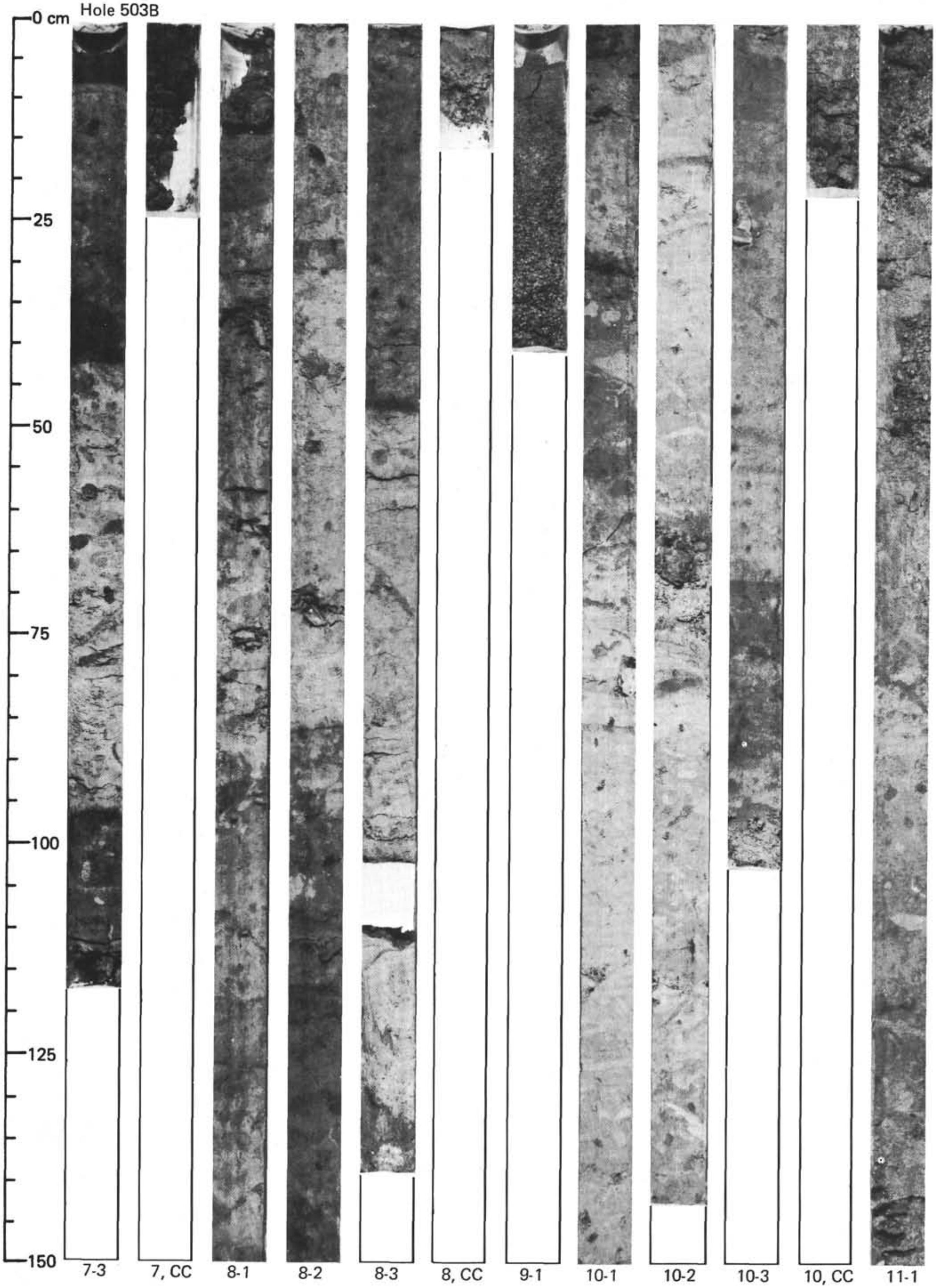

Hole 503A
0 cm
25
50
75
100
125
150
NO RECOVERY
45
46-1
46-2
46, CC
47-1
47, CC
48-1
48-2
48-3
48, CC
49-1
49-2
49, CC

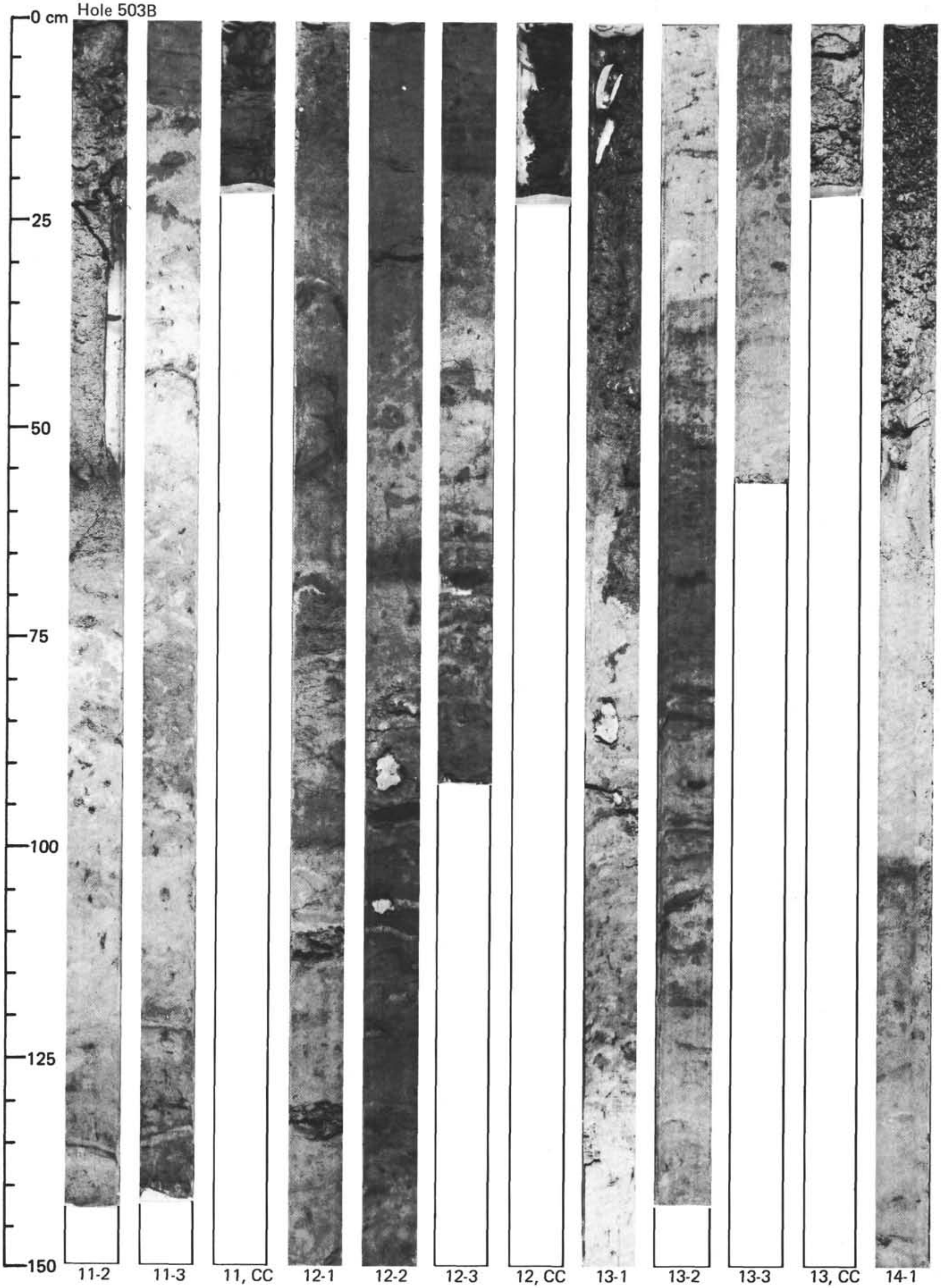

Hole 503A
0 cm
25
50
75
100
125
150
50-1
50-2
50-3
50, CC
51-1
51-2
51-3
51, CC
52-1
52-2
52-3
52, CC

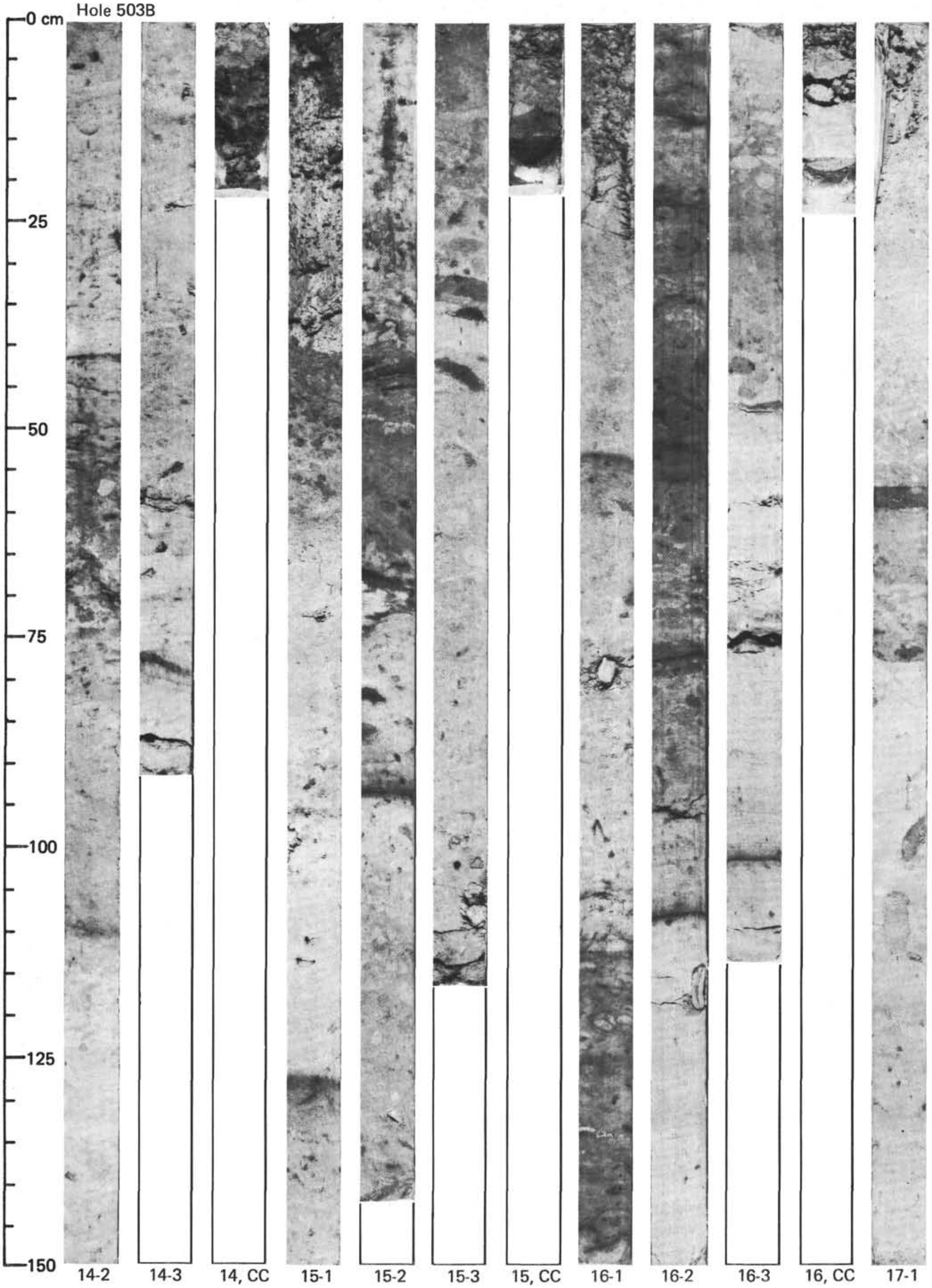

Hole 503A
0 cm
25
50
75
100
125
150
53-1
53-2
53-3
53, CC
54-1
54-2
54-3
54, CC

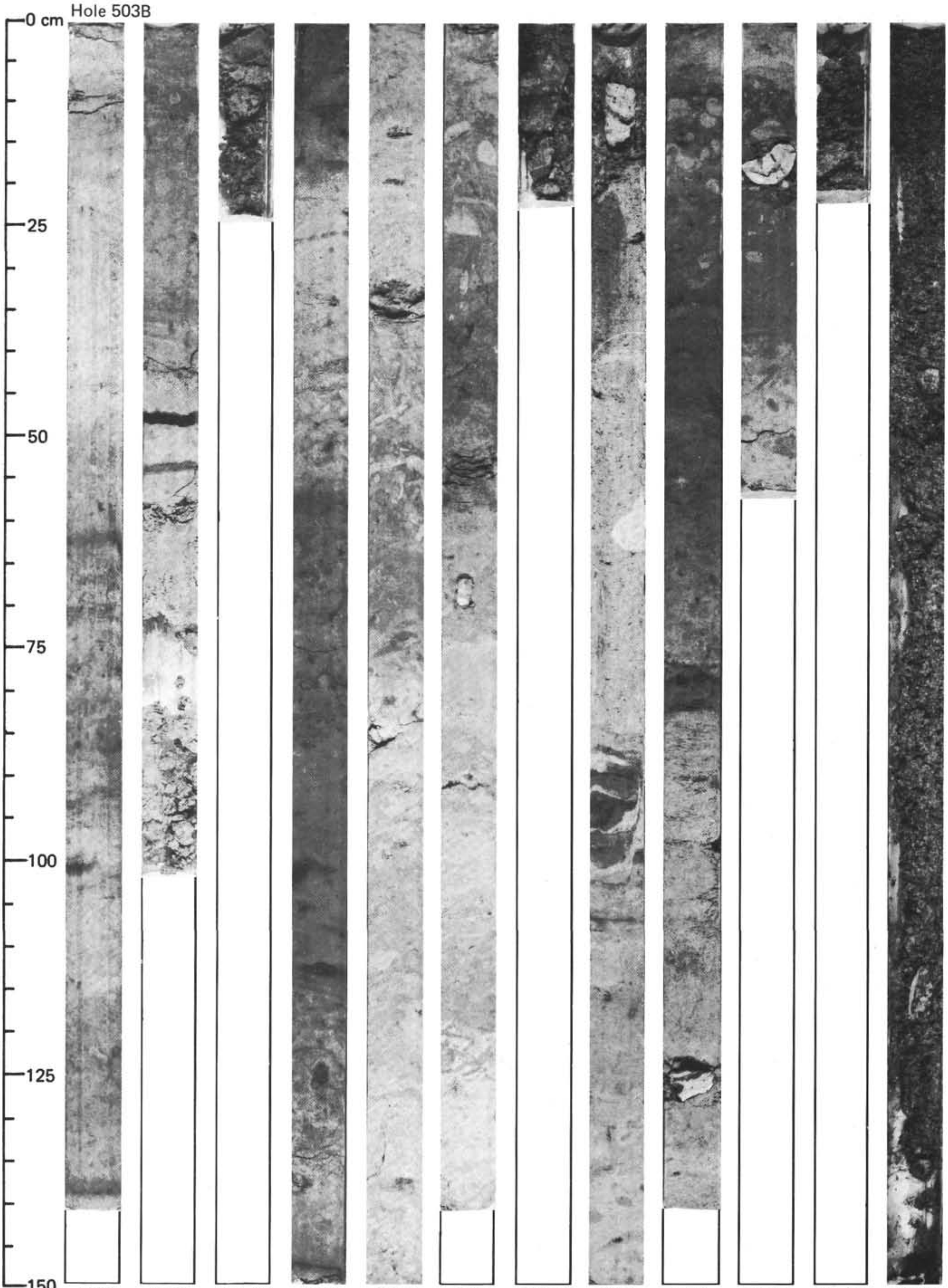

Hole 503B
0 cm
25
50
75
100
125
150
1-1
1-2
1, CC
2-1
2-2
2, CC
3-1
3-2
3-3
3, CC
4-1
4-2

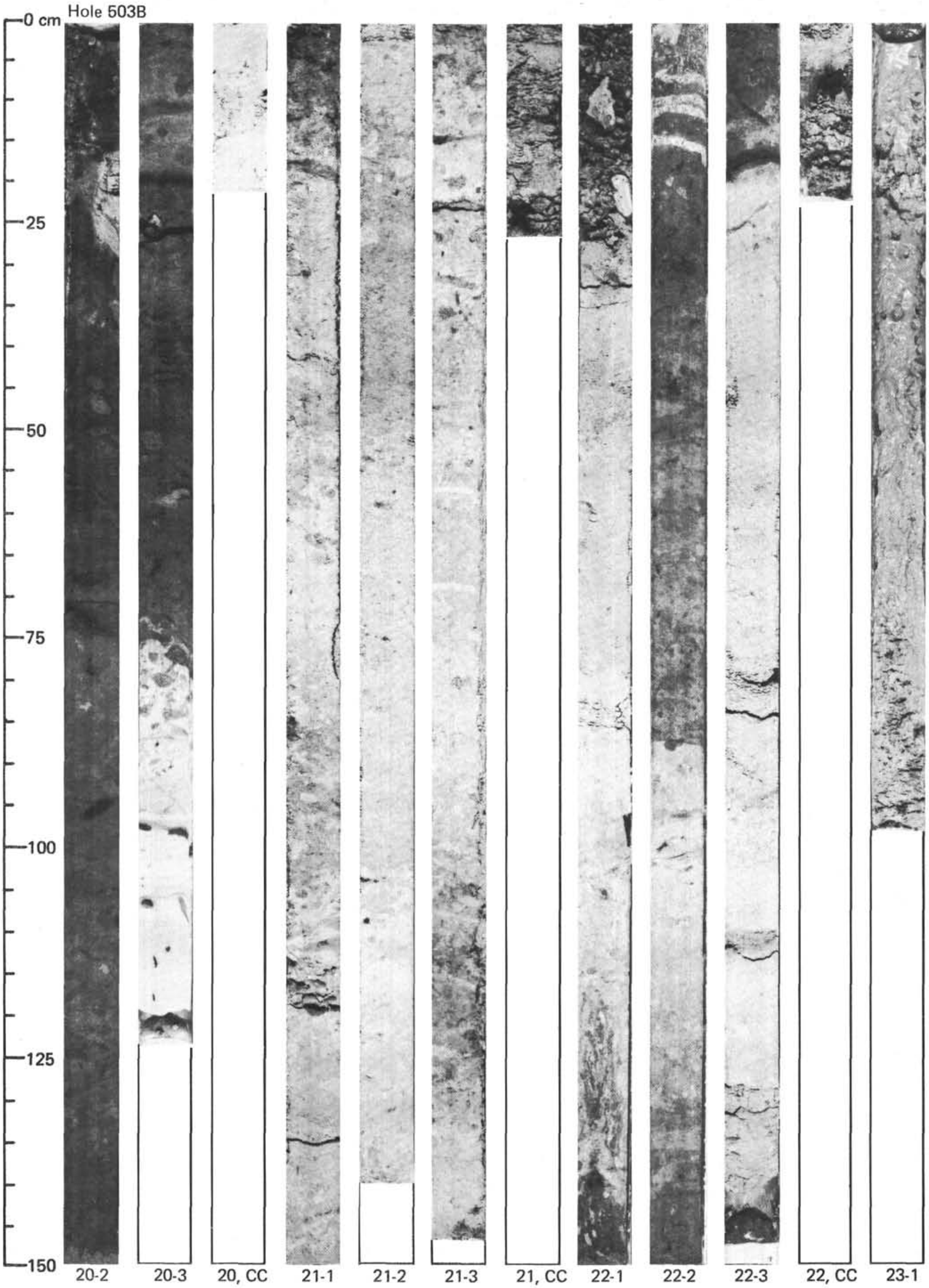

Hole 503B
0 cm
25
50
75
100
125
150
4-3
4, CC
5-1
5-2
5-3
5, CC
6-1
6-2
6-3
6, CC
7-1
7-2

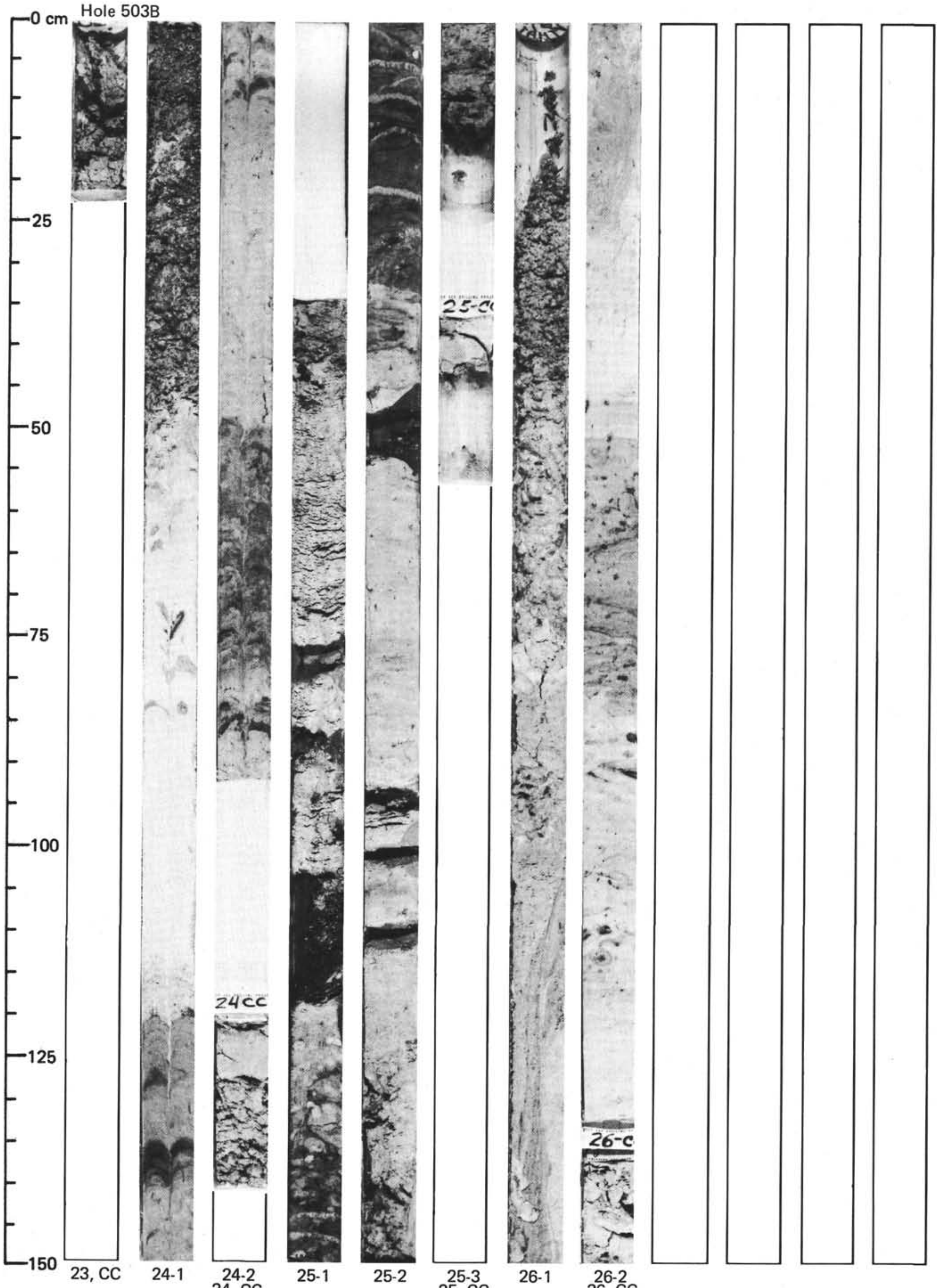

0 cm
Hole 503B
25
50
75
100
125
150
7-3
7, CC
8-1
8-2
8-3
8, CC
9-1
10-1
10-2
10-3
10, CC
11-1


0 cm
25
50
75
100
125
150
Hole 503B
11-2
11-3
11, CC
12-1
12-2
12-3
12, CC
13-1
13-2
13-3
13, CC
14-1


Hole 503B
0 cm
25
50
75
100
125
150
14-2
14-3
14, CC
15-1
15-2
15-3
15, CC
16-1
16-2
16-3
16, CC
17-1


Hole 503B
0 cm
25
50
75
100
125
150
17-2
17-3
17, CC
18-1
18-2
18-3
18, CC
19-1
19-2
19-3
19, CC
20-1


Hole 503B
0 cm
25
50
75
100
125
150
20-2
20-3
20, CC
21-1
21-2
21-3
21, CC
22-1
22-2
22-3
22, CC
23-1


Hole 503B
0 cm
25
50
75
100
125
150
23, CC
24-1
24-2
24, CC
25-1
25-2
25-3
25, CC
26-1
26-2
26, CC
24CC
25-CC
26-C