6. SITE 529[1]

Shipboard Scientific Party[2]

HOLE 529

Date occupied: 18 July 1980

Date departed: 20 July 1980

Time on hole: 2 days, 14 hr.

Position: 28°55.83′S; 02°46.08′E

Water depth (sea level; corrected m, echo-sounding): 3035

Water depth (rig floor; corrected m, echo-sounding): 3045

Bottom felt (m, drill pipe): 3043

Penetration (m): 417

Number of cores: 44

Total length of cored section (m): 417

Total core recovered (m): 309.7

Core recovery (%): 74

Oldest sediment cored:
Depth sub-bottom (m): 417
Nature: Nannofossil chalk
Age: Late Maestrichtian
Measured velocity (km/s): 2.5

Principal results:

1. A complete sedimentary section from seafloor to 417 sub-bottom was cored in a single rotary-drilled hole. Sediments were carbonate oozes and chalks, with cherts present in the lower Eocene and Paleocene and volcanic material particularly common in the basal (Paleocene–Maestrichtian) unit.

2. Erosional hiatuses and slump deposits are common at this site. Slumps of Pliocene material were found in the Pleistocene; slumps were also identified within the middle Miocene and upper Paleocene. Erosional hiatuses were found within the middle Pliocene, from the lower Pliocene to the middle Miocene, within the middle Miocene and middle Oligocene, from the upper Eocene into the middle Eocene, from the lower part of the middle Eocene into the lower Eocene, and within the lower Paleocene. This site, located near a topographic saddle in the ridge, experienced an active lateral movement of sediment through most of its history. Some of these erosional hiatuses (e.g., those of the Paleocene and lower mid-Miocene) may be correlatable with similar events at other sites in the transect.

3. The Oligocene section is perhaps the most continuous and best-preserved interval at this site and is comparable to that recovered at Site 526. However, the relatively high concentrations of *Braarudosphaera* found in the mid-Oligocene at Site 526 were not identified at Site 529. Relative to other sites, the Oligocene–Eocene and Oligocene–Miocene transitions are extended and well recovered at Site 529.

5. Because of the pervasive slumping and erosion at this site, average accumulation rates are difficult to determine and hard to evaluate in terms of long-term changes in pelagic supply and dissolution on the seafloor.

6. Preservation of the calcareous microfossils was moderate through the Neogene and Oligocene. Nannofossils remain moderately to well preserved throughout the section; however, foraminifers are recrystallized and cemented in and below the lower Eocene.

7. As at all but the shallowest site on the Walvis Ridge, the Cretaceous/Tertiary boundary was recovered at Site 529.

BACKGROUND AND OBJECTIVES

Geologic and Oceanographic Setting

Site 529 (planned as SAII-2) lies at an intermediate depth between Sites 525 and 528 in a transect of sites extending down the western slope of a NNW–SSE-trending block in the Walvis Ridge (Fig. 1). Reflection records of the *Vema* and *Thomas B. Davie* (Fig. 1) show the presence of 0.54 s of sediment (approx. 490 m) conformably overlying basement. Studies of the crustal magnetic anomalies and the results of Sites 525 and 528 indicate that the basement age should be mid- to early Maestrichtian (approx. 69 Ma). Results thus far also indicate that the Walvis Ridge has followed a normal depth versus time cooling curve; therefore the depth of this site has probably increased from less than 1000 m at the time of crustal formation to its present depth of 3050 m.

Acoustic reflectors within the sediment column cannot be directly traced to either Site 525 or Site 528; however, their general character can be compared to these nearby sites. Such comparisons suggest that parts of the Upper Cretaceous–lower Tertiary interval and the mid-Tertiary interval may be somewhat expanded. The location of Site 529 is near a topographic saddle at the head of northward- and southward-sloping submarine valleys (Fig. 1). The section revealed in many of the surrounding acoustic records shows evidence of erosion and redeposition, though special care was taken to avoid erosional features and to locate the site in an area of conformable reflectors. Two parts of the section which are of prime interest in completing the Walvis Ridge tran-

[1] Moore, T. C., Jr., Rabinowitz, P. D., et al., *Init. Repts. DSDP*, 74: Washington (U.S. Govt. Printing Office).

[2] Theodore C. Moore, Jr. (Co-chief Scientist), Graduate School of Oceanography, University of Rhode Island, Kingston, Rhode Island (present address: Exxon Production Research Co., P.O. Box 2189, Houston, TX 77001); Philip D. Rabinowitz (Co-chief Scientist), Lamont-Doherty Geological Observatory, Palisades, New York (present address: Department of Oceanography, Texas A&M University, College Station, TX 77843); Anne Boersma, Lamont-Doherty Geological Observatory, Palisades, New York (present address: P.O. Box 404, R.R. 1, Stony Point, NY 10980); Peter E. Borella, Deep Sea Drilling Project, Scripps Institution of Oceanography, La Jolla, California; Alan D. Chave, Geological Research Division, Scripps Institution of Oceanography, La Jolla, California (present address: Institute of Geophysics and Planetary Physics, University of California, San Diego, La Jolla, California); Gérard Duée, Laboratoire Géologie Stratigraphique, Université des Sciences et Techniques de Lille, Villeneuve d'Ascq, France; Dieter Fütterer, Geologisch-Paläontologisches Institut und Museum der Universität Kiel, Kiel, Federal Republic of Germany; Ming Jung Jiang, Department of Oceanography, Texas A&M University, College Station, Texas (present address: Robertson Research [U.S.] Inc., Houston, Tex.); Klaus Kleinert, Geologisches Institut der Universität Tübingen, Tübingen, Federal Republic of Germany; Andrew Lever, School of Environmental Sciences, University of East Anglia, Norwich, United Kingdom (present address: Department of Mineral Resources Engineering, Imperial College of Sciences and Technology, London, U.K.); Hélène Manivit, Laboratoire de Palynologie, BRGM, Orléans, France; Suzanne O'Connell, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts; (present address: Lamont-Doherty Geological Observatory, Palisades, NY 10964); Stephin H. Richardson, Department of Earth and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts; and Nicholas J. Shackleton, Godwin Laboratory, University of Cambridge, Cambridge, United Kingdom.

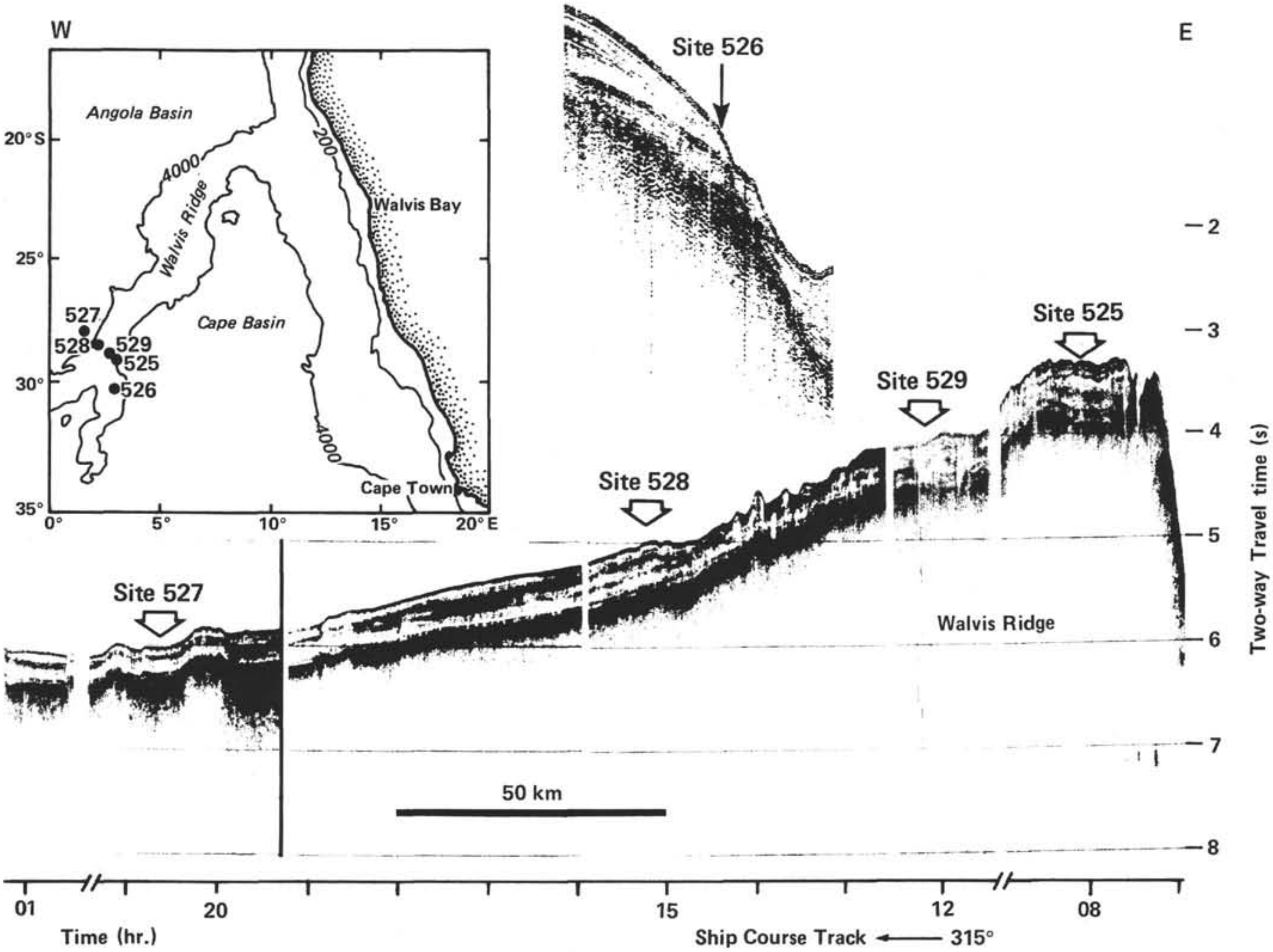

Figure 1. Index and location map for Site 529 and reflection profile record of *Vema* and *Thomas B. Davie*.

sect of sites are the recovery of the upper Miocene, and of the Oligocene–upper Eocene. The upper Miocene is poorly recovered or missing in all but the shallowest sites (525 and 526); nearly complete Oligocene sections are found only at Sites 526 (well preserved) and 528 (very poorly preserved).

The oceanographic setting of this site is identical to that of the neighboring sites. Thus it is assumed that the pelagic rain of biogenic and detrital material is the same at all sites of the transect. The major oceanographic difference between these sites is in water depth. At 3035 m, Site 529 is approximately 600 m deeper than Site 525 and 800 m shoaler than Site 528. All of these sites presently lie within the depth interval covered by North Atlantic Deep Water. This water mass dominates the Angola Basin in modern times, and the relatively low dissolved CO_2 content (high alkalinity) of these waters assures good preservation of the recently deposited biogenic carbonates. Results of previous drilling on this and other legs of DSDP indicate, however, that both erosion and carbonate dissolution have strongly affected to Tertiary sections recovered in this basin.

Scientific Objectives

The scientific objectives of this site, as part of the Walvis Ridge transect, focus on three main topics: (1) the history of bottom waters within the eastern South Atlantic, (2) the development of detailed biostratigraphies and paleomagnetic stratigraphies for this area; and (3) the tectonic evolution of the Walvis Ridge.

Site 529 is an intermediate-depth site on the Walvis Ridge transect and provides important additional control in our studies of the history of vertical gradients in this ocean basin. Available drilling time did not allow us to sample the section completely and core into basement; however, we cored as much of the total section as time permitted.

OPERATIONS

Glomar Challenger departed Site 526 on 17 July 1980 at 2218 hr. Continuous seismics, bathymetry, and magnetics were collected en route to Site 529.

A geophysical site survey was conducted prior to Leg 74 by *Thomas B. Davie* of the University of Cape Town on all of the Walvis Ridge sites to be drilled on this leg (Rabinowitz and Simpson, 1979). Other geological/geophysical ships' tracks in the vicinity which were of importance in the site selection included those of *Vema* (L-DGO) and *Atlantis II* (WHOI). A predrilling survey by *Challenger* in the site area was not necessary.

Before dropping a beacon, we passed over the site for about 2.5 mi. We then reversed course, passed over the site, and dropped the beacon at 0700 hr., 18 July 1980 at a water depth of 3039 m and sediment thickness of 0.52 s (two-way reflection time). After the beacon drop, we reversed course and commenced Site 529 at 0830 hr., 18 July 1980.

We drilled 44 rotary cores to give a continuous section from the seafloor to 417.0 m sub-bottom (Table 1). The recovery rate was 74%. The drilling was stopped when time constraints made us depart for Walvis Bay (2248 hr., 20 July 1980). A sonobuoy was deployed on departure, and continuous underway geophysical profiles were collected en route to Walvis Bay.

SEDIMENT LITHOLOGY

The sediments recovered from Hole 529 are divided into three major lithologic units. From top to bottom these are (I) foraminifer-nannofossil and nannofossil ooze; (II) nannofossil and foraminifer-nannofossil ooze and chalks; and (III) foraminifer-nannofossil and nannofossil chalks. Figure 2 is a lithostratigraphic summary which includes all the criteria used for differentiating units, special lithologies and structures existing within each of the major units.

Table 1. Coring summary, Hole 529.

Core No.	Date (July 1980)	Time	Depth from Drill Floor (m) Top Bottom	Depth below Seafloor (m) Top Bottom	Length Cored (m)	Length Recovered (m)	Recovery (%)
1	18	1424	3043.0–3051.5	0.0–8.5	8.5	8.5	100
2	18	1523	3051.5–3061.0	8.5–18.0	9.5	9.6	100+
3	18	1638	3061.0–3070.5	18.0–27.5	9.5	6.2	65
4	18	1745	3070.5–3080.0	27.5–37.0	9.5	9.8	100+
5	18	1845	3080.0–3089.5	37.0–46.5	9.5	0.9	9
6	18	1949	3089.5–3099.0	46.5–56.0	9.5	9.7	100+
7	18	2052	3099.0–3108.5	56.0–65.5	9.5	9.0	95
8	18	2154	3108.5–3118.0	65.5–75.0	9.5	9.7	100+
9	18	2256	3118.0–3127.5	75.0–84.5	9.5	9.5	100
10	19	0006	3127.5–3137.0	84.5–94.0	9.5	5.2	5
11	19	0116	3137.0–3146.5	94.0–103.5	9.5	9.3	98
12	19	0220	3146.5–3156.0	103.5–113.0	9.5	8.5	89
13	19	0317	3156.0–3165.5	113.0–122.5	9.5	9.4	99
14	19	0413	3165.5–3175.0	122.5–132.0	9.5	9.0	95
15	19	0510	3175.0–3184.5	132.0–141.5	9.5	9.5	100
16	19	0620	3184.5–3194.0	141.5–151.0	9.5	9.9	100+
17	19	0723	3194.0–3203.5	151.0–160.5	9.5	9.7	100+
18	19	0820	3203.5–3213.0	160.5–170.0	9.5	8.4	88
19	19	0919	3213.0–3222.5	170.0–179.5	9.5	9.6	100+
20	19	1016	3222.5–3232.0	179.5–189.0	9.5	9.5	100
21	19	1114	3232.0–3241.5	189.0–198.5	9.5	8.7	92
22	19	1212	3241.5–3251.0	198.5–208.0	9.5	9.4	99
23	19	1315	3251.0–3260.5	208.0–217.5	9.5	9.5	100
24	19	1418	3260.5–3270.0	217.5–227.0	9.5	8.1	85
25	19	1517	3270.0–3279.5	227.0–236.5	9.5	0.0	0
26	19	1620	3279.5–3289.0	236.5–246.0	9.5	9.2	97
27	19	1730	3289.0–3298.5	246.0–255.5	9.5	9.7	100+
28	19	1838	3298.5–3308.0	255.5–265.0	9.5	8.2	86
29	19	1940	3308.0–3317.5	265.0–274.5	9.5	3.8	40
30	19	2035	3317.5–3327.0	274.5–284.0	9.5	0.0	0
31	19	2145	3327.0–3336.5	284.0–293.5	9.5	3.4	36
32	19	2300	3336.5–3346.0	293.5–303.0	9.5	6.7	71
33	20	0020	3346.0–3355.5	303.0–312.5	9.5	5.5	58
34	20	0130	3355.5–3365.0	312.5–322.0	9.5	5.2	55
35	20	0243	3365.0–3374.5	322.0–331.5	9.5	3.8	40
36	20	0353	3374.5–3384.0	331.5–341.0	9.5	8.2	86
37	20	0528	3384.0–3393.5	341.0–350.5	9.5	3.4	36
38	20	0624	3393.5–3403.0	350.5–360.0	9.5	2.9	31
39	20	0750	3403.0–3412.5	360.0–369.5	9.5	3.5	37
40	20	0935	3412.5–3422.0	369.5–379.0	9.5	4.1	43
41	20	1128	3422.0–3431.5	379.0–388.5	9.5	10.0	100+
42	20	1324	3431.5–3441.0	388.5–398.0	9.5	8.3	87
43	20	1515	3441.0–3450.5	398.0–407.5	9.5	7.1	75
44	20	1730	3450.5–3460.0	407.5–417.0	9.5	0.1	1
Totals					417.0	309.7	74

Unit I: Foraminifer-Nannofossil and Nannofossil Ooze

Unit I extends from the mud line to a depth of 160 m (Cores 1–17) and ranges in age from late Pleistocene to late early Oligocene. The homogeneous ooze is predominantly white (N9) to yellowish gray (5YR8/1) with poor preservation of biogenic sedimentary structures. Where preserved, the burrows are vague and scattered. Halo burrows (Fig. 3) are the most common ichnogenera present. Primary sedimentary structures (e.g., horizontal or inclined laminations or contorted bedding) are rare. However, paleontologic evidence indicates that minor slump deposits are present in Cores 1 and 8. Color changes accompany these slumped intervals. Based on lithology, Core 14 (122.5–132 m sub-bottom) also contains a minor slump deposit. Here primary sedimentary structures are preserved. Highly contorted and mottled beds occur between horizontal multicolored laminations.

Calcium carbonate content averages about 95% within Unit I.

Unit II: Nannofossil and Foraminifer-Nannofossil Ooze and Chalk

Unit II extends from 160 to 284 m (Cores 18–30) and is late early Oligocene to late Paleocene in age. The oozes and chalks are pinkish gray (5YR8/1) to very pale orange (10YR8/2) and alternate throughout the interval. Contacts between the ooze and chalk are gradational in the upper part. The frequency of sharp contacts and the percentage of chalk increase with depth.

Primary sedimentary structures and biogenic structures are better preserved than in Unit I. For example, Core 18 contains a beautifully preserved normal microfault, as well as horizontal and inclined laminations. These features are suggestive of a minor slump. Cores 21, 22, 24, and 27 also show horizontal or inclined laminations and wavy bedding preserved in the chalks. Halo burrows predominate, but horizontal and vertical burrows are also present. The increased preservation of primary and secondary sedimentary structures is directly proportional to the increase in chalk.

Beginning in Core 26 (236.5 m sub-bottom) and extending across the Lithologic Unit II/Unit III boundary to Core 37 (341–350.5 m sub-bottom) are a series of chert beds and fragments (Fig. 2). The cherts are a dusky brown. Analyses by X-ray diffraction techniques show the cherts to be composed of microcrystalline quartz and cristobalite. The cherts are considered to be secondary (diagenetic) in origin and may be derived from siliceous microfossils, which are very rare at this and other sites drilled during Leg 74. In most cases, drilling through the cherts disturbed the adjacent sediments, creating artificial oozes. The original sediment

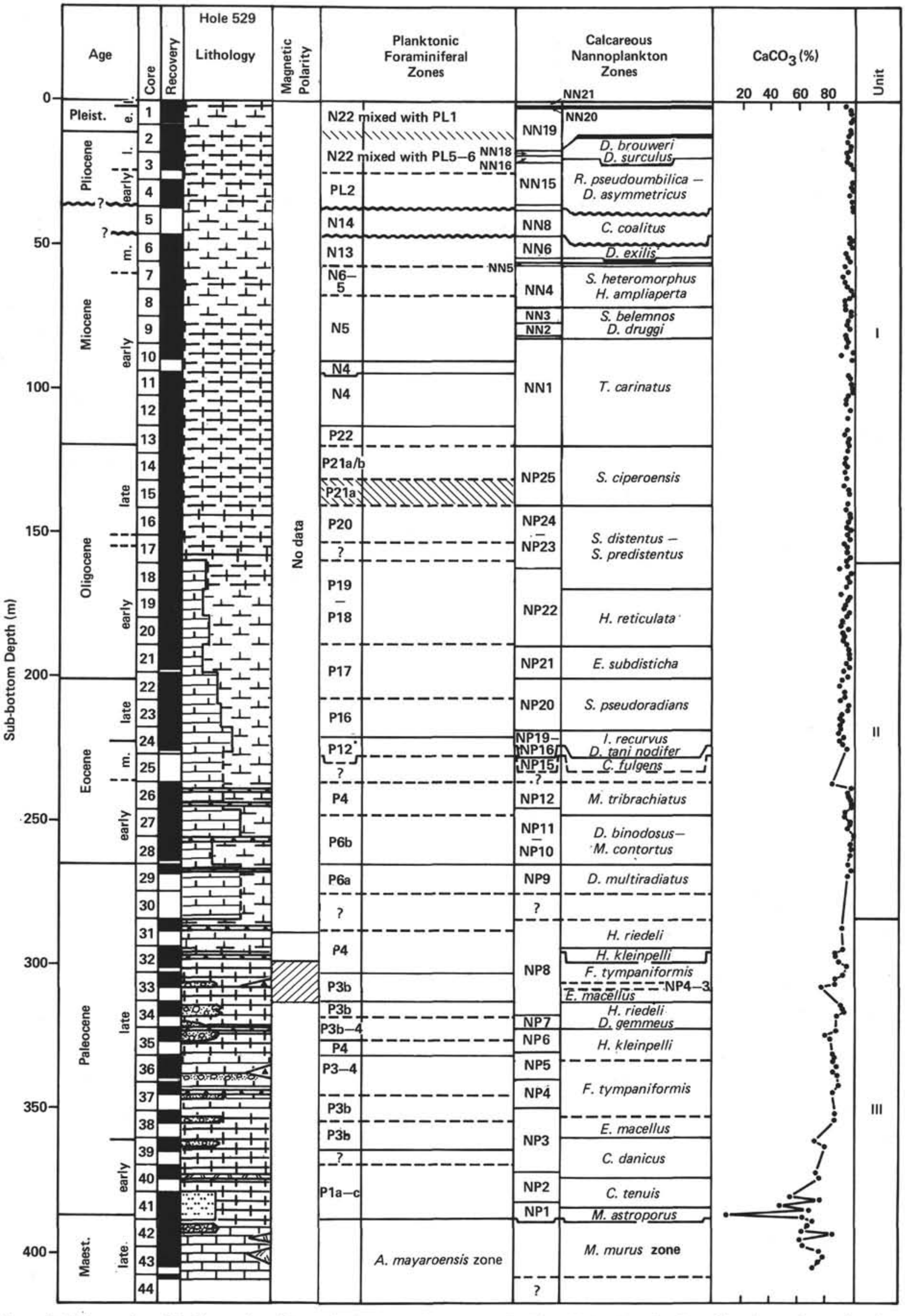

Figure 2. Lithostratigraphic, biostratigraphic, and paleomagnetic summary for Site 529 (see Introduction, this volume, for explanation of symbols used).

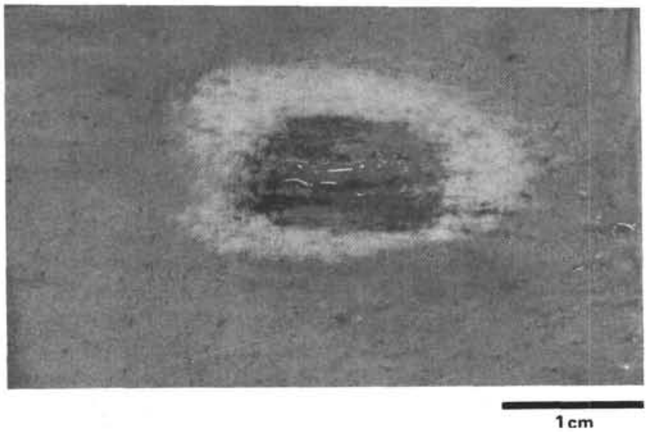

Figure 3. Sample 529-8-5, 130–135 cm. A well-preserved halo burrow in foraminifer-nannofossil ooze.

type was probably chalk. The end of Unit II or the beginning of Unit III may coincide with the first occurrence of chert (Core 26). The middle Eocene hiatus is located in this interval.

Calcium carbonate content in Unit II averages about 90%.

Unit III: Foraminifer–Nannofossil and Nannofossil Chalks

The top of Unit III is arbitrarily placed at Core 31 (284.0 m sub-bottom) and continues to the bottom of the hole, which ends at 417.0 m. The very light gray (N8) chalks are late Paleocene to late Maestrichtian in age. Preservation of primary and secondary sedimentary structures is excellent. For example, Cores 32 and 33 show parallel horizontal and inclined laminations, a normal microfault, current ripples and flaser bedding (Fig. 4), and breccias with rotated intraclasts which have annealed to the surrounding matrix (Fig. 5). These structures indicate that slumping and currents were present and active in the area. Paleontological results independently confirm the presence of a large slump or disturbed areas within Cores 32 and 33. (See biostratigraphy, this chapter.) Other minor slumps or displaced sediments were identified in Cores 34–39. Superb examples of convolute and contorted beds that have been faulted (Fig. 6) and of drag folds (Fig. 7) are present in Core 42. This slump is just below the Cretaceous/Tertiary boundary, which is at 130 cm in Core 41, Section 6 (384.5 m sub-bottom).

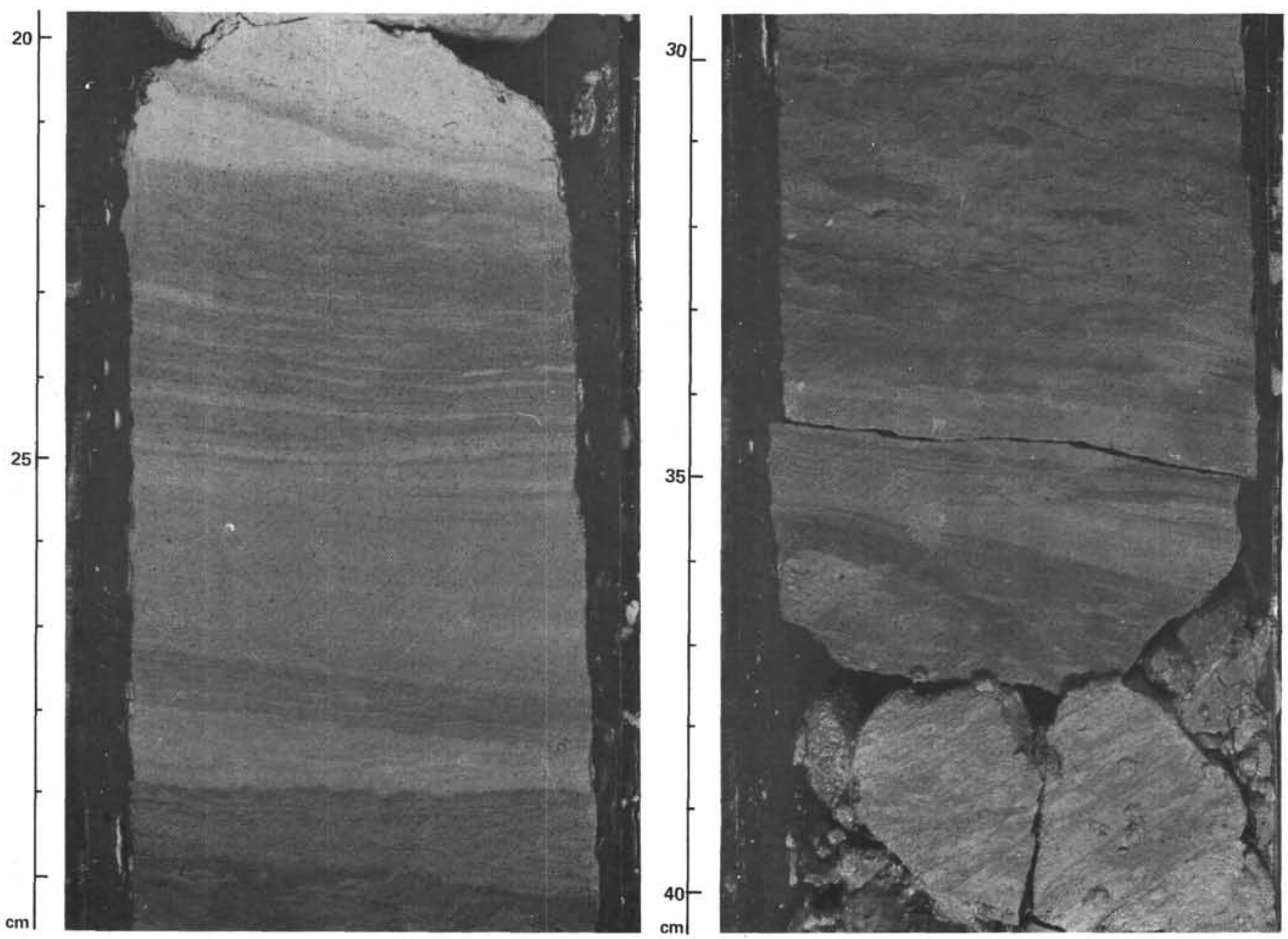

Figure 4. Sample 529-33-3, 20–40 cm. This chalk shows well-preserved horizontal and inclined-parallel laminations, current ripple marks, and flaser bedding.

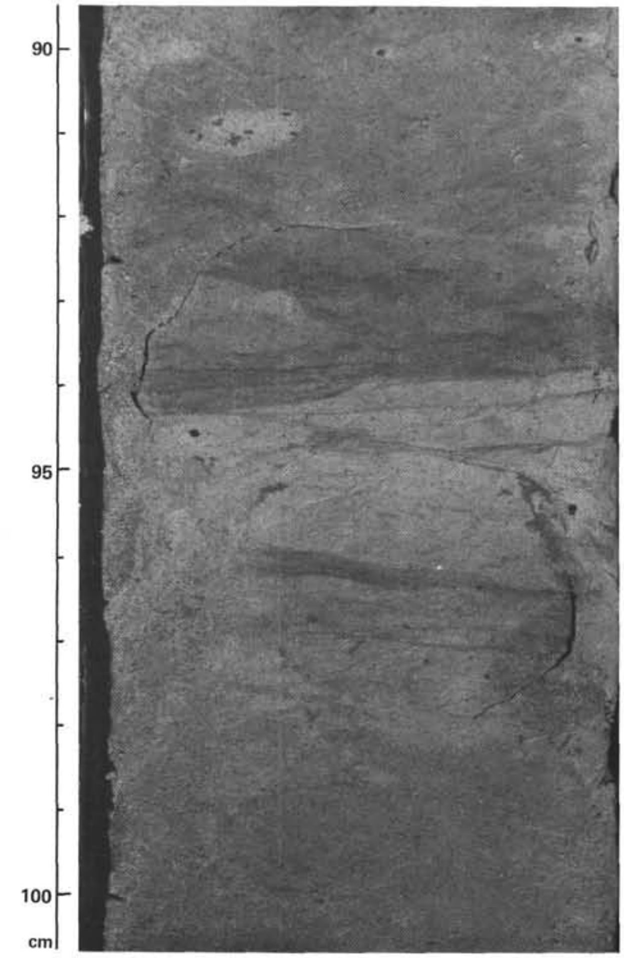

Figure 5. Sample 529-33-3, 90–100 cm. This rock slab is brecciated with rotated intraclasts which have annealed to the surrounding matrix.

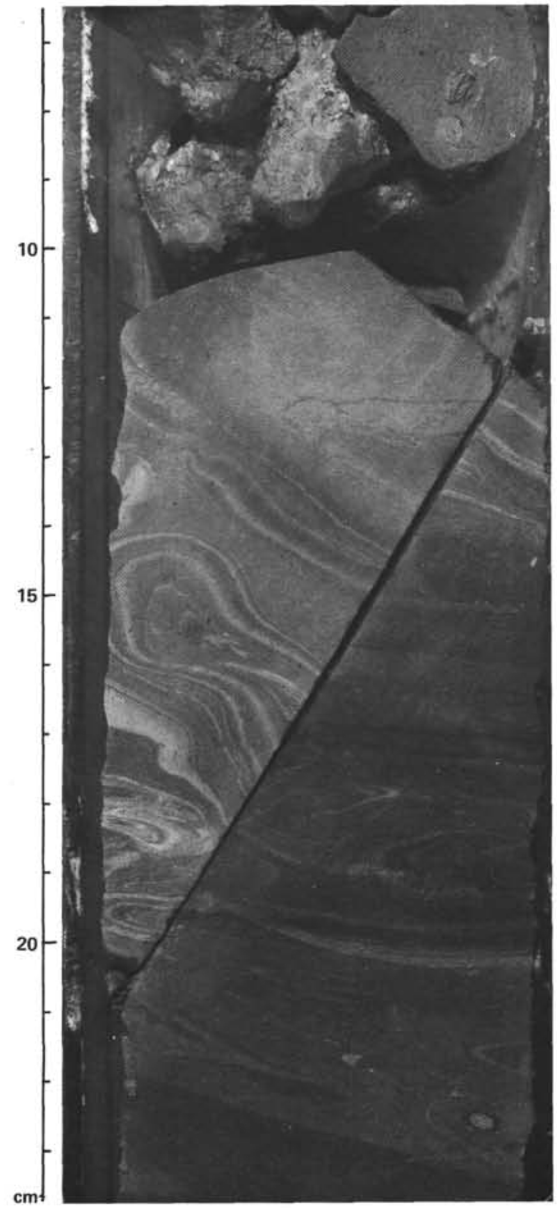

Figure 6. Sample 529-42-1, 7–24 cm. This rock slab is composed of contorted and convoluted beds which have been faulted.

Trace fossils are beautifully preserved. *Planolites, Chondrites, Zoophycos*, and composite burrows are abundant as are other large vertical and horizontal burrows (Fig. 8). The intensity of bioturbation is extreme and leaves little doubt that all of the sediment has been reworked at least once (Fig. 8).

In addition to the previously discussed chert layers that extend down to Core 37, volcaniclastic sediments are first observed in Core 35, Section 1, 25 cm (Fig. 8) and become a dominant lithology alternating with the chalks in Core 41. There are two types of volcaniclastic sediments. The first and predominant type is dark yellowish brown and contains approximately 20 to 30% nannofossils. These sediments have been reworked by benthic organisms (Fig. 8) and were probably transported to the depositional site by currents. They alternate with chalk layers, which suggests a periodic introduction of volcanic sediments into a dominantly pelagic sedimentary environment. Smear slide analyses show high percentages of volcanic glass, rock fragments, and fresh quartz. The second type of volcaniclastic sediment is a dusky blue (5PB3/2) volcanic ash. The ashes contain reworked (but fresh) volcanic glass and quartz, which are the dominant minerals. In several instances the ash layers are at the base of the yellowish brown volcaniclastic sediments. It is possible that initial ash deposition was followed by current reworking or slumping, creating volcaniclast-rich sediments. Alternatively, the blue to brown color change may be a geochemically or biologically induced continuum. From Cores 41–44, volcaniclastic sediments are less abundant. The Cretaceous/Tertiary boundary is located in Core 41.

Calcium carbonate content varies from 10–90% in Unit III. The low values occur in the volcaniclastic sediment layers.

INORGANIC GEOCHEMISTRY—INTERSTITIAL WATER STUDIES

The results of the interstitial pore waters for Site 529 are summarized in Table 2 and graphically represented in Figure 9).

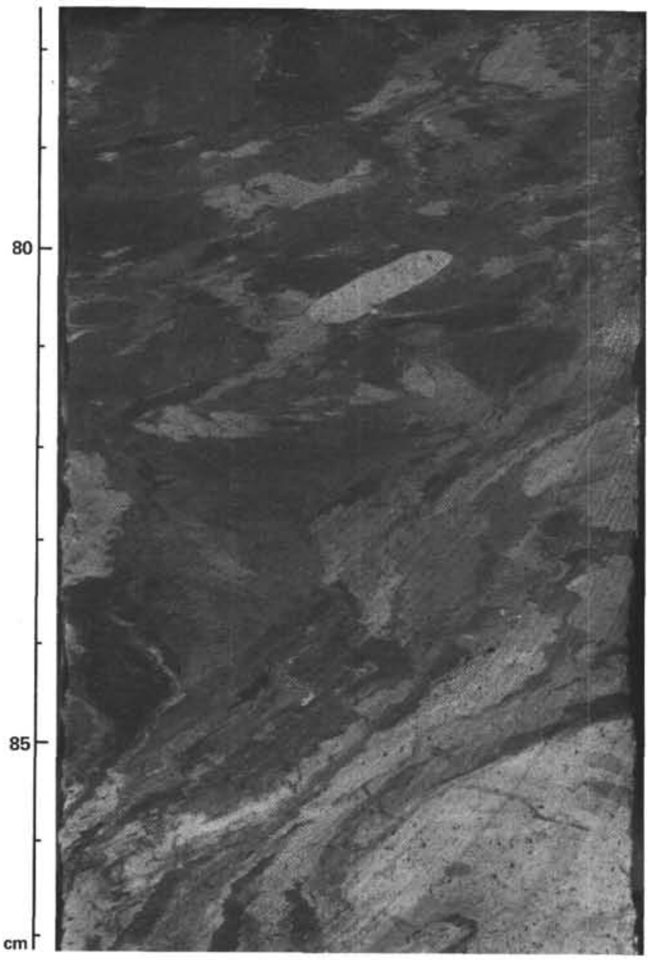

Figure 7. 529-42-2, 78–87 cm. A well-preserved example of drag folding is present within this rock slab.

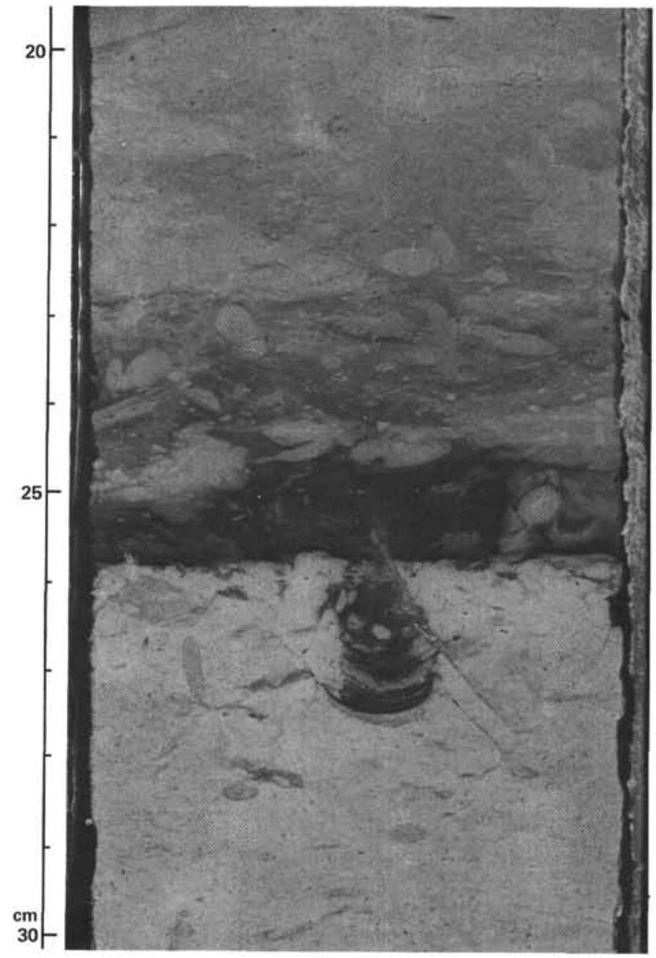

Figure 8. Sample 529-35-1, 20–30 cm. Excellent examples of biogenic sedimentary structures are present, indicating the intensity of bioturbation. The dark layer is volcanogenic sediment, probably an ash, part of which has been reworked into the underlying foraminifer–nannofossil chalk by burrowing organisms.

No correlation exists between lithostratigraphy and pore water chemistry.

The results at this site are very similar to the pore water studies at Sites 525, 527, and 528. pH is constant and is below surface seawater standards. Salinity and chlorinity are constant and are approximately the same as surface seawater. Alkalinity shows a decrease toward the bottom of the hole. This is probably due to the increasing amounts of Mg combining with HCO_3^- and $CO_3^=$ and forming magnesium carbonates as precipitates.

Within the sediment pore waters, magnesium and calcium curves show the same trends as at Sites 525, 527, and 528. Calcium is being dissolved and magnesium is being extracted from seawater and is enriched in the sediments.

BIOSTRATIGRAPHIC SUMMARY

At Site 529, 44 cores retrieved by rotary coring contained a section from Pleistocene to upper Maestrich-

Table 2. Summary of shipboard pore water study, Hole 529.

Sample No.	DSDP Sample (interval in cm)	Sub-bottom Depth (m)	pH	Alkalinity (meq/l)	Salinity (‰)	Calcium (mmoles/l)	Magnesium (mmoles/l)	Chlorinity (‰)
IAPSO			7.446	2.288	35.2	—	—	—
SSW			7.898	2.224	35.5	10.76	55.29	19.88
82	1-4, 144–150	5.96–6.00	7.098	2.596	35.2	10.56	53.09	19.34
83	6-4, 140–150	52.40–52.50	7.170	2.298	35.2	12.40	50.92	19.81
84	11-5, 140–150	101.40–101.50	7.103	2.270	35.2	16.71	46.46	19.58
85	16-5, 140–150	148.90–149.00	7.090	1.885	35.2	19.76	43.81	19.72
86	21-5, 140–150	196.40–196.50	6.888	1.930	35.5	22.50	41.06	19.75
87	26-4, 140–150	242.40–242.50	6.931	1.852	35.5	25.87	37.97	19.94
88	31-2, 140–150	286.90–287.00	6.985	1.909	35.5 (35.2)	28.11	35.33	19.79
89	36-4, 139–150	337.39–337.50	6.923	0.226	35.5 (35.8)	31.80	29.67	19.91
90	42-4, 140–150	394.40–394.50	—	—	35.2	40.58[a]	19.19[a]	19.69

[a] 0.1 ml sample used in analysis.

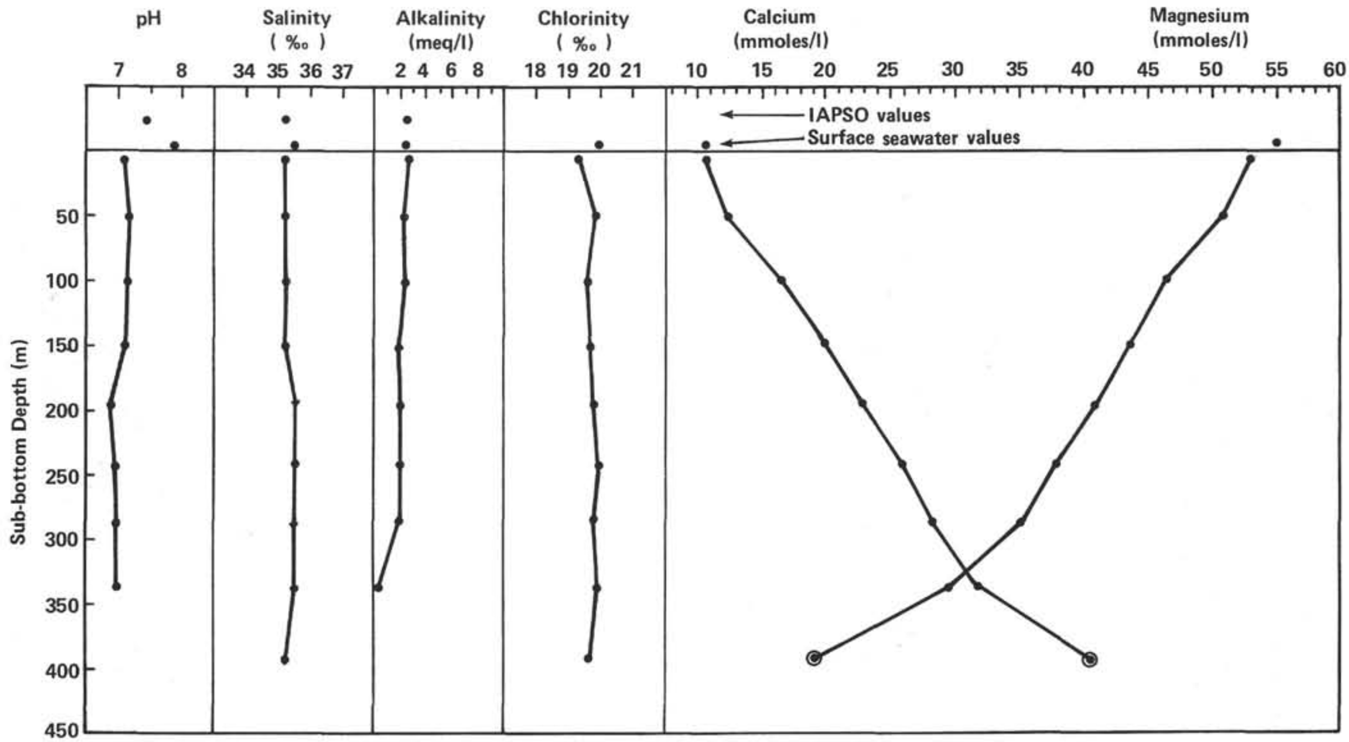

Figure 9. Results of pore water chemistry plotted versus depth, Site 529.

tian. Planktonic foraminifers, nannofossils, benthic foraminifers, echinoids, and ostracodes were present in all samples. Radiolarians were found in only one sample, in the Oligocene.

The biostratigraphy of this long carbonate sequence is shown in the biostratigraphic summary diagram (Fig. 2).

Calcareous Nannoplankton

Though Site 529 is located between Sites 525 and 528, the sedimentary sequence younger than Paleocene by no means shows a transition between the two. A hiatus occurs between Sample 529-4,CC and Core 529-5, where the lower Pliocene is underlain by the middle Miocene. Three apparent slump deposits were observed at this site: one in the lower Pleistocene (NN19), one in the lower part of middle Miocene or upper part of lower Miocene (NN5-4), and one in the upper Paleocene (NP8). Another slumping may have occurred in the lowermost Miocene (NN1). The uppermost Cretaceous *Micula murus* Zone is overlain by the lowermost Tertiary *Markalius astroporus* Zone. The thickness of Zone NP1 at this site is about 3.5 m.

Pleistocene (0-12.1 m)

Closely spaced samples were taken and studied from Cores 1 and 2. Their nannofossil assemblages are as follows:

Section 529-1-1, top	NN21
Sample 529-1-1, 150 cm	NN20
Sample 529-1-2, 73 cm	NN19 mixed with Pliocene nannofossils
Sample 529-1-2, 80 cm	NN15
Sample 529-1-2, 150 cm	NN15
Sample 529-1,CC	NN14
Sample 529-2-2, 150 cm	lower Pliocene
Sample 2-3, 60 cm	NN19

Obviously Samples 529-1-2, 73 cm through 529-2-2, 150 cm contain slumped materials, and this slumping occurred in the lower Pleistocene (Zone NN19).

Pliocene (18.0-37.0 m)

Sample 529-2,CC contains a few *Discoaster brouweri* with rare *D. pentaradiatus* and belongs to Zone NN17 of the upper Pliocene. Samples 529-3-2, 40-42 cm and 529-3-3, 40-42 cm are assigned to Zone NN16 because of the presence of *D. surculus*. The last appearance of *Reticulofenestra pseudoumbilica* was encountered in Sample 529-3,CC, which places it in Zone NN15 of the lower Pliocene. In Sample 529-4-CC, both *D. asymmetricus* and *Amaurolithus delicatus* were found, which indicates the presence of Zone NN14.

Miocene (37.0-46.5 m)

The recovery in Core 5 is poor (< 1 m). The top of this core contains *Catinaster calyculus* and *C. coalitus*, with very rare *Discoaster bellus*, and probably belongs to the lower part of Zone NN9 or to the Zone NN8 of the middle Miocene. Sample 529-5,CC on the other hand, contains rare *C. calyculus* and *C. coalitus*, without *D. bellus*, and is assigned to Zone NN8.

The nannoplankton assemblages change significantly between Sample 529-5,CC and the top of Core 6. The top of Section 529-6-1 through Sample 529-6-6, 100 cm contains abundant *Cyclicargolithus floridanus*, without *Sphenolithus heteromorphus*, which indicates Zone NN6 of the middle Miocene. Therefore a questionable hiatus is suggested.

The last appearance of *S. heteromorphus* was traced as far as Sample 529-6-6, 150 cm, where the NN5/NN6 boundary is marked. Sample 529-6,CC remains in Zone NN5. Then, in subsequent cores, the nannofossil assemblages change very fast. Closely spaced samples were studied in this interval. The results are as follows:

Sample 529-7-5, 35 cm	NN5–NN4
Sample 529-7-5, 100 cm	NN5–NN4
Sample 529-7-5, 114 cm	NN3 (top of foram sands)
Section 529-7-6, top	NN3 (foram sands)
Sample 529-7-6, 40 cm	lower Miocene
Sample 529-7-6, 148 cm	lower Miocene
Sample 529-7,CC	lower Miocene
Sample 529-8-2, 63 cm	NN5–NN4 (there is a sharp color change here)
Sample 529-8-3, 60 cm	NN5–NN4
Sample 529-8-4, 90 cm	NN3
Sample 529-8,CC	lower Miocene (NN3–NN2)

Therefore it is suggested that the lower Miocene sediments between Sample 529-7-5, 114 cm (top of foraminifer sands) and 529-8-2, 63 cm (where there is a sharp color change) are slumped materials. The slumping occurs during the NN5–NN4 zonal interval.

Sample 529-9,CC is roughly assigned to the lower Miocene. Samples 529-10,CC through 529-13-4, 30–31 cm contain *Dictyococcites bisectus* and *Zygrhablithus bijugatus* without *S. ciperoensis* and belong to the Miocene–Oligocene transition. Because the occurrences of *D. bisectus* and *Z. bijugatus* are discontinuous in this long interval, a slumping or redeposition from the Miocene–Oligocene transition to the NN1 zone is suggested.

Oligocene (119.3–199.8 m)

Samples 529-13-5, 30–31 cm through 529-15-5, 40–41 cm belong in the upper Oligocene (Zone NP25), based on the presence of *S. ciperoensis*. The last appearance of *S. distentus* was encountered in Sample 529-15-6, 40–41 cm, which marks the top of Zone NP24. Samples 529-15,CC through 529-17,CC could be assigned to the NP24/NP23 zonal interval because of the absence of *Reticulofenestra umbilica*. Differentiation between Zones NP24 and NP23 is impossible, however, because of the scarcity of *S. ciperoensis* at its first occurrence.

Rare *R. umbilica* was first encountered in Sample 529-18,CC, which places it in Zone NP22 of the lower Oligocene. Sample 529-19,CC belongs in the same zone. Then, the last appearance of *Cycloccolithus formosus* occurs in Sample 529-20,CC, which limits it to Zone NP21. Zone NP21 can be traced down to Sample 529-22-1, 128 cm, where a sharp color change occurs in the sediments.

Eocene (199.8–265.0 m)

Common *Discoaster barbadiensis* and *D. saipanensis* first occur in Sample 529-22-1, 130 cm, where the top of the Eocene (i.e., top of NP20) is placed. That floras from Samples 529-22,CC and 529-23,CC belong to the same zone is indicated by the presence of *Sphenolithus pseudoradians*. In Core 24, the nannoplankton assemblages change very fast. Closely spaced samples were studied. The results are as follows:

Sample 529-24-3, 125 cm Sample 529-24-3, 145 cm	NP17 (18?)	*D. saipanensis, Bramletteius serraculoides, H. situliformis*, and *Chiasmolithus grandis*
Sample 529-24-4, 40 cm	NP16	*Triquetrorhabdulus inversus, Coccolithus solitus*, and *B. serraculoides*
Sample 529-24-5, 40 cm	NP15	*C. gigas* and *Reticulofenestra umbilica*
Sample 529-24,CC cm	NP15	as above with *S. furcatolithoides*

It seems that no hiatus occurs during the upper Eocene at this site. However, the sedimentation rate was so low that the entire interval from Zones NP16 to NP19 is present in only a few meters.

There was no recovery in Core 25. Core 26 belongs to Zone NP12 of the lower Eocene, based on the co-occurrence of *Marthasterites tribrachiatus* and *D. lodoensis*. It is uncertain whether or not a hiatus occurs in Core 25.

Zone NP12 can be traced down to Sample 529-27-1, 80 cm. Samples 529-27-1, 150 cm through 529-28,CC contain *M. tribrachiatus*, without *D. lodoensis*, and are attributed to the NP11 to NP10 zonal interval.

Paleocene (265.0–387.8 m)

The entirety of Sample 529-29,CC is attributed to the Paleocene (Zone NP9) because of the common presence of *Discoaster multiradiatus* and the absence of *D. diastypus* and *Marthasterites tribrachiatus*. There is no recovery in Core 30. Core 31 belongs to Zone NP8, based on the common presence of *D. gemmeus* and rare *Heliolithus riedelii*. Cores 32 and 33 contain slumped sediments. These materials range from Zone NP4 (NP3?) to NP6. Detailed records are as follows:

Sample 529-31,CC	NP8	Sample 529-32,CC	NP5
Section 529-32-1, top	NP6	Sample 529-33-1, 145	NP5
Sample 529-32-1, 150	NP6	Sample 529-33-2, 150	NP5
Sample 529-32-2, 10	NP6	Sample 529-33-3, 28	NP4
Sample 529-32-2, 28	NP5	Sample 529-33-3, 150	NP3
Sample 529-32-2, 50	NP5	Sample 529-33-4, 18	NP3
Sample 529-32-2, 150	NP5	Sample 529-33,CC	NP4
Sample 529-32-3, 150	NP5	Section 529-34-1, top	NP8

The top of Core 34 is attributed to Zone NP8, based on the same criteria as the foregoing. It is obvious that the slumping occurred during deposition of sediments of Zone NP8. Sample 529-34,CC, *D. mohleri* is common; however, because no *H. riedelii* was found, its position cannot be below Zone NP7.

Common *H. kleinpellii*, without *D. mohleri*, are present throughout Core 35, which indicates Zone NP6. In Samples 529-36,CC and 529-37,CC, *H. kleinpellii* is absent. The presence of *Fasciculithus tympaniformis* then limits these two cores to Zone NP5.

Samples 529-38,CC and 529-39,CC are assigned to Zone NP3 of the lower Paleocene, based on the common occurrence of *Coccolithus cavus, Cruciplacolithus tenuis*, and *Cyclococcolithus* cf. *robustus*, with rare *Zygrhablithus sigmoides, Markalius astroporus*, and *Chiasmolithus* sp. Many small coccoliths probably attributable to *Biscutum* cf. *dimorphosum* are also present in this interval. Zone NP3 can be traced down to Sample

529-40-2, 105 cm. In Sample 529-40,CC, *Chiasmolithus* sp. is absent, but the common presence of *Cruciplacolithus tenuis* then placed this core in Zone NP2.

Cretaceous/Tertiary Boundary (387.8 m)

The Cretaceous/Tertiary boundary is located in Sample 529-41-6, 130 cm, where a fracture separates sediments of two different colors: light brown in the upper part and light blue in the lower part. Many slides were processed from this core near the boundary. The results are as follows:

Sample 529-41-1, 42	NP2	Sample 529-41-4, 47	NP1
Sample 529-41-2, 85	NP2	Sample 529-41-5, 80	NP1
Sample 529-41-3, 80	NP2	Sample 529-41-6, 127 (light brown)	NP1
Sample 529-41-3, 129	NP2	Sample 529-41-6, 130 (light blue)	Cretaceous

The thickness of Zone NP1 is about 3.3 m, or a little more, at this site, which is comparable to that at other sites.

Upper Maestrichtian (387.8–417.0 m)

Samples 529-41,CC, 529-42,CC, 529-43,CC, and 529-44-1, 11–12 cm (the lowest sample) contain abundant nannofossils of the upper Cretaceous. The presence of *Micula murus* and *Lithraphidites quadratus*, however, limits them to the uppermost Cretaceous *M. murus* Zone.

Preservation

The preservation of calcareous nannofossils recovered at this site is, in general, moderate. The discoasters found in the middle Miocene through upper Paleocene show strong overgrowth. Nannofossil assemblages with fairly good preservation are found only in an interval ranging from Zones NP8 to NP3.

Foraminifers

Planktonic and benthic foraminifers were retrieved from all core catchers from the Pleistocene to upper Maestrichtian. Benthic foraminifers are relatively scarce in almost all samples. Preservation of planktonic species varied from moderate through the Neogene and Oligocene to upper Eocene and was poor in the lowermost Eocene, Paleocene, and Maestrichtian. Results of biostratigraphic subdivision of the section are as follows.

Pleistocene–Pliocene

The top of Core 529-1 (10 cm) contains an extremely well preserved assemblage which is probably of Holocene age. Many specimens of *Globigerinoides ruber* retain spines, and large *Globigerinita rubescens* (pink) are frequent. The presence of *Pulleniatina obliquiloculata* and *Globorotalia menardii* indicates relatively warm conditions. Sample 529-1-3, 10 cm, contains a Pliocene (P15/6) fauna, and Samples 529-1-4, 61 cm and 529-1,CC contain a mixture of Pleistocene with early Pliocene (P11) material. Sample 529-2,CC may be of Zone P1–5/6 age, with downhole contamination from the Pleistocene, or may be mixed as is part of Core 1.

Samples 529-3,CC and 529-4,CC both contain a fauna typical of Zone P12, with *G. margaritae* (rare in Core 3, common in 4), *Sphaeroidinellopsis seminulina, Globoquadrina altispira, Globorotalia puncticulata*, and *G. conomiozea*, but without *Globigerina nepenthes*.

It is at any rate clear that the lower half of Core 1 represents some sort of slump with extensive mixing of older and more recent material. If a single episode was involved, it would appear that it occurred less than 400,000 y. ago, since there is no more than 3 m of sediment above it. At this locality, the slumping may have cut down to sediment of over 3 m.y. age, if the slump overlies Zone P12 material. Nearby it must have cut even deeper, since Zone P11 material is incorporated in the slump.

The lower part of the Pliocene (P11) is missing at Site 529, as is the upper Miocene.

Middle Miocene (Core 529-5–Sample 529-6,CC)

Two zones were determined, Zone N14 (Core 5) and Zone N9 (Core 6), by the presence of *Globigerina nepenthes* in the former and *Catapsydrax dissimilis*, together with other middle Miocene species, in the latter. Recrystallization is evident in these samples, as is significant dissolution. The rare benthic foraminifers, including *Stilostomella subspinosa* and *Globocassidulina subglobosa*, are accompanied by echinoids and ostracodes.

Early Miocene (Core 529-7–Sample 529-12,CC)

Lower Miocene Zones N5 through N4 were recognized at this site. Several typical New Zealand species including *Globigerina woodi, Turborotalia semivera*, and *T. pseudocontinuosa* are present together with *Globoquadrina dehiscens* and *G. praedehiscens*. Preservation is moderate; very rare benthic foraminifers are accompanied by echinoids and fish teeth. The presence of *T. kugleri* in Core 10 indicates Zone N4.

In Cores 11 and 12 preservation is markedly improved, and benthic foraminifers, including *Oridorsalis umbonatus, Bolivina striata, Stilostomella subspinosa, Nuttalides umbonifera*, and several pleurostomellids, are more common than in overlying cores.

Paleogene

Within the Paleogene sequence there is a marked change in the preservation of the foraminifers; from the upper Eocene–Paleocene, the preservation worsens rapidly and Paleocene foraminifers are recrystallized, cemented, and barely recognizable. Species just above the Cretaceous/Tertiary boundary were completely destroyed by diagenesis.

Upper Oligocene (Samples 529-13,CC–529-16,CC)

Oligocene faunas are particularly diverse and well preserved; solution-susceptible species are preserved almost as well as at Site 526. Zone P22 (Sample 529-13,CC) was recognized by the joint occurrence of *Globigerina angulisuturalis* and very rare and small *Turborotalia kugleri*. Typical New Zealand species, including *G. euaperta, G. brazieri*, and *G. labiacrassata*, are present. Benthic foraminifers are rare and similar to those of the lower Miocene.

The transition from Zone P21b to Zone P21a was recognized in Cores 14 and 15 by the presence of *T. opima* and *G. angulisuturalis*. Some dissolution/recrystallization is evident in this interval and *G. angulisuturalis* is less common than in overlying cores.

Lower Oligocene (Core 529-17–Sample 529-21,CC)

The co-occurrence of *Chiloguembelina cubensis* and *Pseudohastigerina micra* in Cores 17–19 suggests the presence of Zones P18–19, however, there are several slumps within these cores. Dissolution is much increased through this interval, and many foraminifers are recrystallizing.

The transition zone to the Eocene, Zone P17, was recognized in Cores 20 and 21; such a long transition is similar to that found at Site 363 at the eastern end of the Walvis Ridge, and the faunas, also similar, include *Turborotalia centralis*, *Globigerina pseudoampliapertura*, and typical lower Oligocene species. Benthic foraminifers are rare and small in size; *Bulimina jarvisi* is one of the most conspicuous forms.

Upper Eocene

The transition from the Oligocene to the Eocene is considered continuous; upper Eocene species such as *Turborotalia cerroazulensis*, *Hantkenina alabamensis*, and *T. cunialensis* are first found in Core 21. Eocene faunas are somewhat dissolved, globigerinathekids have coarse overgrowth, and some reworked middle Eocene material is present. Benthic foraminifers, ostracodes, and echinoids are present but rare.

Middle–Lower Eocene (Core 529-24–Sample 529-29,CC)

Following a hiatus, middle Eocene faunas of Zone P12 were identified by the presence of *Truncorotalites topilensis*, *Acarinina densa*, *Morozovella spinulosa*, and *Globigerapsis subconglobata*, but *Orbulinoides beckmanni* was not located. The large number of acarininids and morozovellids suggests warm surface waters.

Following a second hiatus, lower Eocene Zone P7 was identified in Core 27 by the presence of *M. aragonensis*, *M. formosa*, and *M. marginodentata*. Faunas are diverse, but recrystallization and dissolution are prevalent and preservation deteriorates markedly below this level.

Zone P6, identified by the presence of *M. acuta*, *M. subbotinae*, and, slightly higher, *Pseudohastigerina micra*, occurs in Core 30.

Upper Paleocene (Core 529-30–Sample 529-38,CC)

Upper Paleocene sediments are difficult to zone because of a slump deposit (inferred from sedimentologic and nannofossil evidence). Foraminiferal faunas in Cores 31 and 32 belong to Zone P4. Cores 32 through 34 have faunas ranging from Zone P4 through P3b and are very poorly preserved. The middle part of Zone P3, including *Morozovella conicotruncata*, *M. angulata*, *M. pusilla laevigata*, and *M. pusilla pusilla* (rarely), is found in Core 39.

Lower Paleocene (Core 529-40–Section 529-41-6)

Below Core 3 there is a hiatus including Zones P3a, P2, and P1d. The lower portions of Zone P1 are found in Cores 529-39 to Section 529-41-6, but preservation is very poor and most foraminifers completely recrystallized and cemented.

The basal Paleocene, identified on the basis of nannofossils, cannot be studied using foraminifers, for they are totally recrystallized or, in the basal sample 529-41-6, 128 cm, completely dissolved or recrystallized to amorphous carbonate.

Cretaceous

Three core catchers (from Cores 41–43) were processed for foraminifers, but few specimens were retrieved from this very hard sediment. Although recrystallized and dissolved, they served to indicate the presence of the uppermost Maestrichtian *Abathomphalus mayaroensis* Zone.

Summary

Examination of samples of all cores and of closely spaced samples through zones of inferred slumping produced the following results at Site 529:

1) A long calcareous section ranging in age from Pleistocene to late Maestrichtian was recovered; foraminifers and nannofossils are present in all core catchers; benthic foraminifers, ostracodes, and echinoid remains are present but scarce in most samples. At Sites 525, slightly shallower, and Site 528, slightly deeper than this site, benthic faunas are much more diverse and occur in much greater abundance.

2) The site was apparently a locus of active sediment movement, both into and out of the area. Large slumps were identified, including lower and upper Pliocene into upper Pleistocene, middle Miocene into higher middle Miocene, and upper Paleocene into higher upper Paleocene. Erosional hiatuses, some perhaps caused by slumping of sediments out of this area, were identified in the middle Pliocene, lower Pliocene to middle Miocene, within the middle Miocene, within the middle Oligocene, from the upper Eocene to the middle Eocene, from the lower middle Eocene to the upper lower Eocene, in the upper lower Paleocene, and possibly at the base of the Paleocene.

3) The Paleocene hiatus at Site 529 closely resembles that at Site 528, suggesting that a similar type of sediment erosion, active at these depths, eroded similar amounts of the sedimentary sequence.

4) Relative to other sites, the Oligocene–Eocene and the Oligocene–Miocene transitions are extended at this site.

5) Very thin middle Eocene nannofossil zones suggest erosional removal of material from the area at this time, possibly as gravity flows.

6) Preservation of foraminifers is generally moderate through the Neogene and Oligocene and becomes poor

in the lower Eocene and Paleocene, until in the basal Paleocene foraminifers are totally recrystallized and badly cemented. By contrast, nannofossil preservation remains moderate throughout the same sequence and is actually good during the upper to mid-Paleocene, where the foraminifers are barely recognizable. In the Upper Cretaceous, nannofossils are still moderately well preserved, whereas few foraminifers could even be extracted from the semilithified sediment.

7) As at other sites, the floras and faunas are typical of temperate water masses throughout the section. The Oligocene *Braarudosphaera*-rich intervals found at Site 526 were not located at Site 529.

8) Comparison of the sections at Site 529 with those of the others drilled on this leg demonstrates the vast differences in stratigraphic sections retrievable from a very small region of the ocean bottom; and this heterogeneity cannot be directly and solely related to the difFerrent depth of the sites.

SEDIMENT ACCUMULATION RATES

Figure 10 shows the age-depth plot for Site 529 (for data, see Table 3) using the time scale discussed in the Introduction (this volume). The section contains at least three major hiatuses covering the late Miocene, the early-to-middle Miocene, and part of the early Eocene. Continuity is further interrupted by at least three slumps of sufficient magnitude to become evident from the biostratigraphy (in the Plio-Pleistocene, the early Miocene, and the Paleocene). In addition, in the Paleocene, where varying sediment color permits their recognition by sedimentologists, some five other slumps representing about 21 m of sediment were identified within 56 m of section. There are also small slumps in other parts of the section.

One solution to the problem of estimating accumulation rates (Fig. 11) in the face of these complications is to subdivide the section so as to isolate sections with slumps from those without. At present this is impossible for Site 529 for two reasons: first, the biostratigraphic resolution, based mainly on core catchers, makes the estimates grossly inaccurate over short sections; and, second, the estimates of foraminiferal content are not sufficiently closely spaced. Instead we have taken the opposite approach and treated the slumping as random noise; slumps sometimes remove material and sometimes import material of a different age, but on balance they do not grossly distort the age-depth plot. The upper part of the 529 section illustrates this point: although the upper two cores contain early Pliocene material mixed with Pleistocene, they have (fortuitously) accumulated at about the expected rate.

Accumulation rates for foraminifers, for fine (< 63 μm) carbonate presumed to be dominated by coccoliths, and for noncarbonate (Fig. 11) have been estimated using the methods described in the sediment accumulation section of the Site 525 report. It was not possible to separate foraminifers from the lithified material below Core 32. Over some intervals (especially from 3 to 3.4

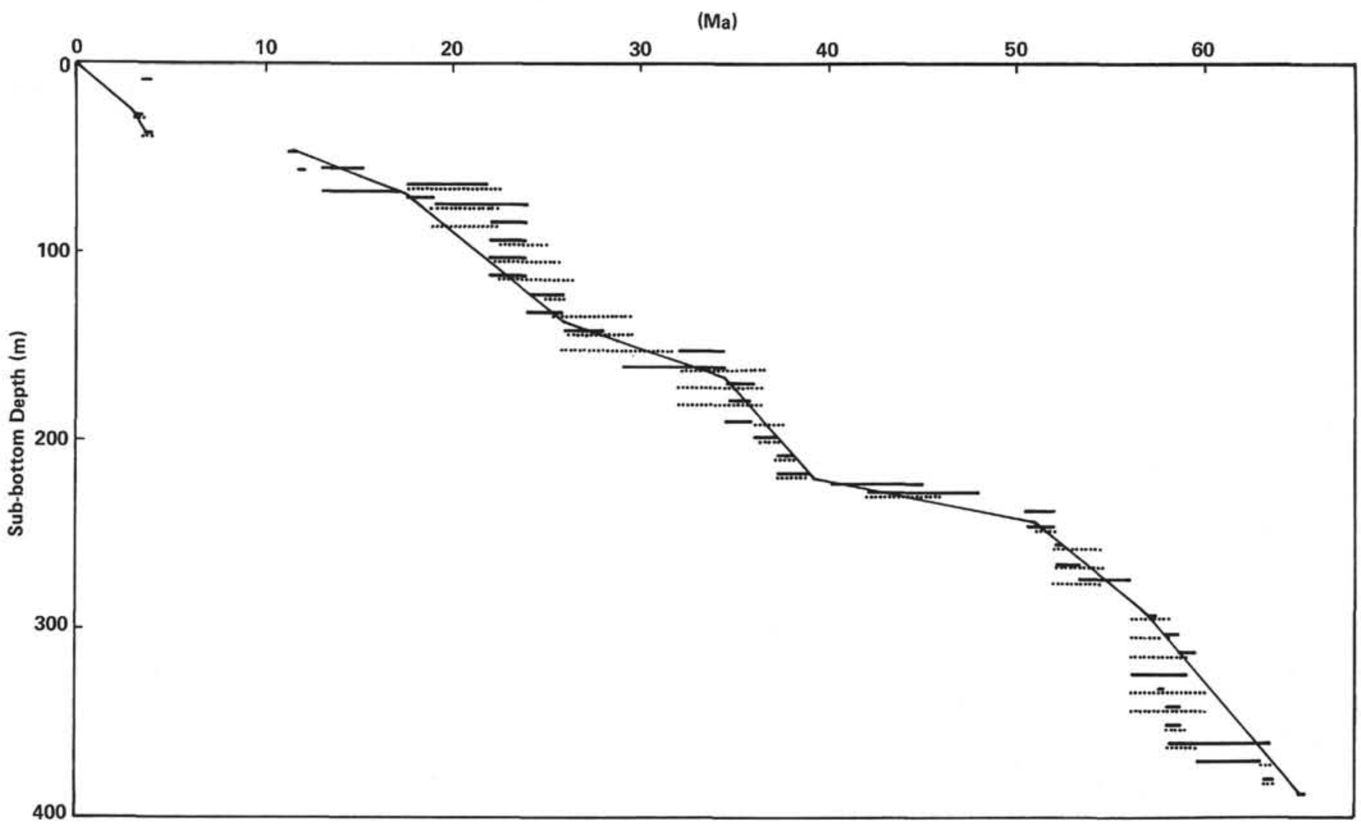

Figure 10. Age-depth plot, Site 529. Horizontal lines represent ranges in ages determined by nannofossils (solid line) and foraminifers (dashed line).

Table 3. Foraminifer and nannofossil data used to generate age–depth plot for Hole 529 (Fig. 10).

Core/Section (interval, level in cm)	Depth below Seafloor	Nannofossil Zone	Foraminifer Zone	Nannofossil Age (m.y.)	Foraminifer Age (m.y.)
1,CC	8.5	NN14	mixed N22 + Pl 1	3.5–4	
2,CC	18.0	NN17	?PL5/6 + N22	2–2.3	
3,CC	27.5	NN15	Pl 2	3.0–3.5	3.3–3.7
4,CC	37.0	NN14	Pl 2	3.5–4	3.3–3.7
5,CC	46.5	NN8	N14	11.6–11.9	11.2–11.9
6,CC	56.0	NN5	N9	13.0–15.3	11.9–12.2
7,CC	65.5	NN3/2	N5/6	17.5–22	17.5–22.5
8,CC	75.0	NN2/1	N5	19–24	19–22.5
9,CC	84.5	NN1	N5	22–24	19–22.5
10,CC	94.0	NN1	N4	22–24	22.5–25
11,CC	103.5	NN1	N4/P22	22–24	22.5–26
12,CC	113.0	NN1	N4/P22	22–24	22.5–26
13-3	122.5	NP25	P22	24–26	25–26
14-6	132.0	NP25	P21/22	24–26	25–30
15,CC	141.5	NP24	P21	26–29	26–30
16,CC	151.0	NP23	P20	29–34.5	26–32
17,CC	160.5	NP23	P18/19	29–34.5	32–36.5
18,CC	170.0	NP22	P18/19	34.5–36	32–36.5
19,CC	179.5	NP22	P18/19	34.5–36	32–36.5
20	189.0	NP22	P17	36.5–36	36.5–37.5
21,CC	198.5	NP21	P16	36–37.2	36.5–37.5
22,CC	208.0	NP20	P16	37.2–38	37.5–38.5
23,CC	217.5	NP19/20	P16	37.2–39.2	37.5–38.5
24,CC	227.0	NP15/16	P12	42–48	42.0–45.7
26 top	236.5	NP12	—	50.5–52	
26,CC	246.0	NP12	P7	50.5–52	51.0–52.0
27,CC	255.5	NP11	P7	52–52.6	52–54.5
28,CC	265.0	NP10/11	P7	52–53.3	52–54.5
29,CC	274.5	NP9	P6	53.3–56	52–54.5
30	no core	—	—	—	—
31,CC	293.5	NP7	P4	56.7–57.4	56.0–58.0
32,CC	303	NP5	P4	57.8–58.6	56.0–58.0
33,CC	312.5	NP4	P3b/4	58.6–59.5	56.0–59.0
36,CC	322	NP7	P3b/4	56.7–57.6	56.0–59.0
35,CC	331.5	NP6	P3/4	57.6–57.8	56.0–60.0
36,CC	341	NP5	P3/4	57.8–58.6	56.0–60.0
37,CC	350.5	NP5	P3b	57.8–58.6	58.0–59.0
38,CC	360	NP3/4	P3a/b	58.6–63	~59.0
39,CC	369.5	NP3	Pla/c	59.5–63	63–63.4
40,CC	379.0	NP2	Pla/c	63–63.5	63–63.4
41,CC	388.5	*M. murus*	*A. mayaroensis*	65–	65–67
8-2, 63	67.63	NN4/5			
8-3, 60	69.10	NN4/5		13–17.5	
8-4, 90	70.90	NN3		17.5–19	
3	20	NN16/17		2.3	
3	25	NN15/16		3.0	

Ma) the estimates are particularly uncertain, but nevertheless the data are more encouraging than the preamble would suggest (Table 4).

It is particularly encouraging that we have a consistent accumulation of foraminifers through the Oligocene, in contrast to Site 528, which although not a great deal deeper showed almost negligible foraminiferal accumulation through the Oligocene.

MAGNETICS

Paleomagnetic samples were obtained in the early Paleocene–Cretaceous section in Cores 32–43. Owing to the limited time available before termination of the leg, these samples were measured later on the cryogenic SRM at the Woods Hole Oceanographic Institution. Because of low and disturbed recovery, this is the poorest quality section obtained on Leg 74. The polarity interpretation appears in the lithostratigraphic summary (Fig. 2) and details are in the sedimentary paleomagnetism chapter (Chave, this volume).

PHYSICAL PROPERTIES

The cylinder technique for determination of bulk density and porosity was used down to Core 29. Below that, in the chalks at the bottom of Lithologic Unit II and in Unit III, the bulk piece method was applied. Shrinkage and vane shear strength were measured and penetration tests performed on plastic sediments down to Core 29. The sediments recovered in cores below were too firm to allow further measurements of these properties. The data obtained are listed in Table 5 and shown as graphs versus depth in Figure 12. Lithologic Unit I is very homogeneous in its physical properties and only shrinkage shows a slight change.

Shear strength is very low because of the low cohesion of the carbonate sediments. Shrinkage decreases from about 6 to 7% of volume at the top of Unit I to about 4% at the bottom. There seems to be a slight decrease of thermal conductivity with depth in Unit I, but the scatter of the data indicates that this trend may not be significant.

Unit II, the transitional unit between ooze and chalk, reveals the effect of increasing diagenesis. Bulk density increases whereas water content and porosity decrease from top to bottom in Unit II. Grain density has no trend, with average values of about 2.7 g/cm^3. Shrinkage decreases in this unit from about 4% of volume at the top to zero at about 270 m below seafloor (Sample 529-29-3, 59–70 cm). It can be assumed that there is no, or only very little, shrinkage in the firm chalks that occur below that depth. Shear strength increases throughout Unit II, showing the increase of diagenesis and cementation with the transition of soft ooze to firm chalk. Its highest values reaches 600 g/cm^2 (=60 kPa). Sonic velocity remains constant throughout the bulk sequence of Unit II, averaging about 1.6 km/s. Only in the lower part of the unit, below 260 m sub-bottom, is there an increase that leads to the distinctly higher values of Unit III below. Thermal conductivity seems to increase slightly with depth in Unit II.

In Unit III, the trends of Unit II continue and intensify. Bulk density increases considerably, and water content and porosity decrease. The data for the top and bottom of Unit III are as follows:

	Top	Bottom
Bulk Density	1.95	2.2
Water Content (%)	23–24	13–15
Porosity (%)	43–45	29–33
Grain Density (g/cm^3)	2.7	2.75

Sonic velocity increases from about 2.0 km/s at the top to about 2.5 km/s at the bottom, with a constant gradient. Thermal conductivity shows a slight increase with depth, the highest values being about 1.9 to 2.0 W/m°C (approx. ≐4.6–4.8 mcal/cm°C s) measured on samples from the bottom of this unit.

SUMMARY AND CONCLUSIONS

Site 529 is on crust of magnetic Anomaly 31–32 age (about mid-Maestrichtian) and is located near the upper part of the western slope of a NNW–SSE-trending block on the Walvis Ridge. This site is part of a transect across the Walvis Ridge into the Angola Basin. One hole was rotary-drilled (44 cores) which gives a complete section

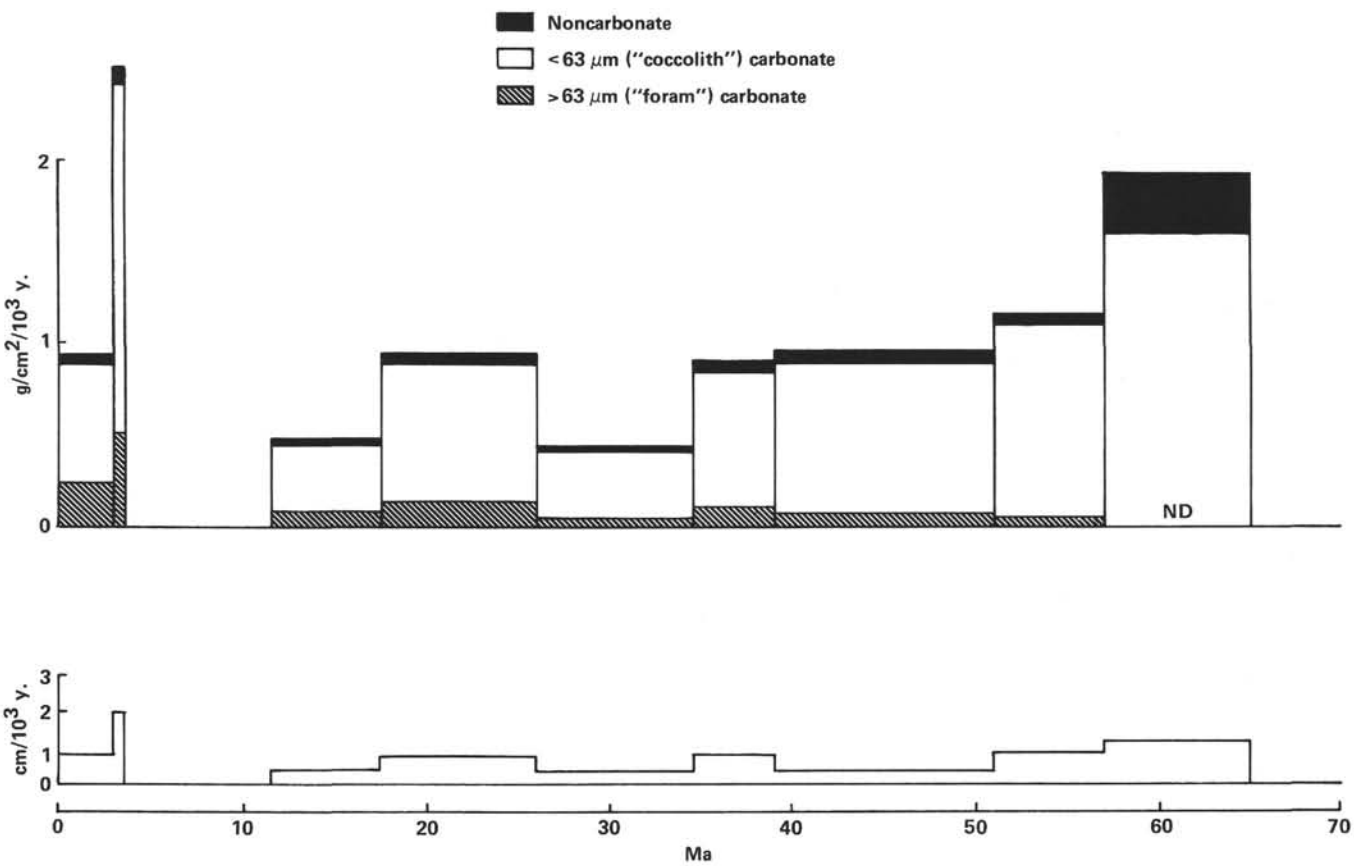

Figure 11. Accumulation rates (cm/10^3 y.), lower graph, and accumulation rates (g/cm^2/10^3 y.) for the noncarbonate fraction, coccoliths (<63 µm), and foraminifers (>63 µm), Site 529.

Table 4. Data used to generate accumulation rates, Hole 529 (Fig. 11).

Time Interval (m.y.)	Accumulation (cm/10^3 y.) av.	Bulk Density (av.)	Grain Density (g/wet cc) av.	Total Accumulation (g/cm^2/10^3 y.)	$CaCO_3$ (av. %)	Accumulation $CaCO_3$	Foram (av. %)	Accumulation (g/cm^2/10^3 y.) Foram	Coccolith	Non-$CaCO_3$
0-3	0.8	1.76	1.17	0.94	95.1	0.89	16.1	0.23	0.66	0.046
3-3.5	~2	1.82	1.26	2.5	96.5	2.4	13.6	~0.5	~1.9	0.09
3.5-11.5	~0.1	1.76	1.20	0.1	not recovered (hiatus)					
11.5-17.9	0.41	1.73	1.15	0.47	94.5	0.44	11.9	0.084	0.36	0.026
17.5-26	0.76	1.80	1.24	0.96	93.9	0.88	9.1	0.12	0.76	0.057
26-36.5	0.36	1.80	1.25	0.43	93.9	0.40	7.3	0.04	0.36	0.026
36.5-39	0.78	1.72	1.15	0.90	93.0	0.86	7.3	0.10	0.76	0.06
39-51	0.36	1.78	1.23	0.96	92.0	0.88	~11	0.07	0.81	0.08
51-57	0.83	1.89	1.38	1.15	96.2	1.1	3.3	0.05	1.05	0.04
57-65	1.2	2.03	1.61	1.93	81.3	1.6	N.D.	N.D.	N.D.	0.36

from the seafloor through the sedimentary layers to a sub-bottom depth of 417.0 m. The basement complex was not encountered. The recovery rate was 74%.

Lithology

Three major sedimentary lithologic units are observed.

Unit I extends from the mud line to a depth of 160 m sub-bottom (late early Oligocene) and consists predominantly of white to yellowish gray homogeneous foraminifer-nannofossil and nannofossil ooze. Primary sedimentary structures are not observed, and bioturbation is very slight. Carbonate content is about 95%. Color changes are associated with minor slump deposits recognized by paleontological evidence.

Unit II extends from 160 to 284 m sub-bottom (late Paleocene) and consists of pinkish gray to very pale orange nannofossil and foraminifer-nannofossil oozes and chalks. The chalk-to-ooze ratio increases with depth. Bioturbation (halo, horizontal, and vertical burrows) as well as primary sedimentary structures are better preserved than in Unit I. Carbonate content is 90%. Diagenetic chert beds and fragments are observed in the bottom part of the unit.

Unit III extends from 284.0 m and continues to the bottom of the hole at 417.0 m sub-bottom (late Maes-

Table 5. Physical properties summary for Site 529.

Core/Section (interval in cm)	Sub-bottom Depth (m approx.)	2-Min. Count GRAPE Density (g/cm³) ∥ To Bedding	2-Min. Count GRAPE Density (g/cm³) ⊥ To Bedding	Gravimetric Data: Wet-Bulk Density (g/cm³ approx.)	Gravimetric Data: Grain Density (g/cm³ approx.)	Gravimetric Data, Salt-Corrected: Wet-Water Content (%)	Gravimetric Data, Salt-Corrected: Porosity (%)	Shrinkage (Vol.%)	Vane Shear Strength ( ) = Remolded (g/cm³)	Penetrometer (mm) Fall Height 0 cm	Penetrometer (mm) Fall Height 1 cm	Sonic Velocity ∥ To Bedding (km/s)	Sonic Velocity ⊥ To Bedding (km/s)	Acoustic Impedance ∥ To Bedding (10^5 g/cm² s)	Acoustic Impedance ⊥ To Bedding (10^5 g/cm² s)	Thermal Conductivity (W/m°C)
1-1, 144–147	1.5					42.6										
1-3, 144–147	4.5					31.4										
1-4, 127–138	5.8			1.79	2.67	30.8	53.6	6.8				1.61		2.89		1.56
1-6, 72–74	8.2					26.7										
2-1, 110–113	9.6					30.5										
2-3, 110–113	12.6					36.4										
2-5, 93–113	15.5			1.72	2.65	34.0	57.1	6.6	66			1.68		2.88		1.52
2-7, 56–59	18.0					32.6										
3-1, 137–140	19.4					36.8										
3-4, 132–140	23.9	1.86										1.64		3.05		1.67
4-1, 140–142	28.9					31.6										
4-3, 140–142	31.9					31.5										
4-5, 140–142	34.9					30.9										
4-7, 47–61	37.0			1.82	2.69	29.3	52.0	6.3	87	4.6	5.2	1.62		2.95		1.49
5,CC, 11–18	37.9			1.76	2.68	32.1	55.2	4.6	56	6.3	6.2	1.61		2.84		1.09
6-1, 84–87	47.4					33.6										
6-3, 84–89	50.4	1.83							19	8.9	10.5	1.57		2.88		1.32
6-5, 84–87	53.4					33.8										
6-7, 62–65	56.0					31.5										
7-2, 40–57	58.0			1.69	2.66	34.4	58.9	5.8	67	10.7	10.6	1.55		2.63		1.04
7-4, 2–4	60.5					34.0										
7-5, 141–144	63.4					40.9										
7-6, 131–144	64.9					23.8			41	5.2	5.9	1.65				1.77
8-1, 122–124	66.7					30.4										
8-2, 109–120	68.1			1.76	2.70	32.8	56.2	4.2	94	4.1	6.9	1.60		2.82		1.54
8-7, 50–52	75.0					34.2										
9-3, 17–19	78.2					33.4										
9-4, 91–104	80.5	1.82							21	9.6	11.0	1.55		2.82		1.19
9-6, 16–18	82.7					31.2										
10-2, 40–42	86.4					27.1										
10-2, 109–120	87.1			1.82	2.72	29.7	52.8	4.8	28	6.3	7.4	1.59		2.89		1.34
10-4, 40–42	89.4					29.0										
11-2, 111–113	96.6					30.2										
11-6, 50–52	102.0					30.2										
12-1, 119–121	104.7					34.4										
12-4, 65–73	108.6			1.73	2.65	33.4	56.4	3.5	62	5.1	6.1	1.68		2.90		1.14
12-4, 120–121	109.2					32.7										
13-2, 60–62	115.1					32.8										
13-4, 98–109	118.5	1.99							103	5.5	6.5	1.62		3.24		1.37
13-5, 60–62	119.6					32.9										
14-2, 60–62	124.6					31.2										
14-4, 60–71	127.7			1.84	2.70	29.0	52.2	6.3	23	8.7	10.9	1.61		2.97		1.32
14-5, 60–62	129.1					28.9										
15-6, 116–118	140.7					33.1										
15-6, 136–143	140.9			1.78	2.76	32.5	56.4	3.5				1.58		2.82		1.47
16-5, 123–132	148.8	1.82							21	8.3	9.4	1.56		2.82		1.13
17-4, 57–60	156.1					31.6										
17-6, 43–51	158.9			1.83	2.71	29.0	51.9	2.3				1.58		2.90		1.52
18-2, 33–36	162.3					27.6										
18-4, 118–131	166.2	2.11							62	7.1	6.9	1.61		3.41		1.52
18-6, 5–8	168.1					34.3										
19-2, 116–119	172.6					33.5										
19-4, 122–139	175.9			1.70	2.69	35.8	59.3	3.4				1.56		2.66		1.18
19-6, 116–119	178.7					32.1										
20-3, 132–135	184.3					32.9										
20-5, 125–136	186.8			1.74	2.69	33.7	57.0	4.4	80	5.7	6.0	1.56		2.71		1.31
20-7, 36–39	188.9					30.6										
21-2, 85–88	191.4					33.0										
21-4, 89–92	194.4					30.9										
21-6, 95–108	197.5	1.91										1.59		3.03		1.30
22-2, 117–129	201.3			1.75	2.65	32.2	55.1	1.9	110	2.8	3.4	1.63		2.85		1.65
22-4, 146–149	204.5					31.8										
22-6, 110–113	207.1					33.8										
23-1, 140–149	209.5			1.80	2.63	29.2	51.3	4.9				1.59		2.86		1.76
23-4, 140–143	273.9					31.4										
23-7, 5–20	277.1					30.9			437	1.8	4.3	1.66				1.72
24-2, 146–149	220.5					31.4										
24-4, 12–20	222.2	1.84							457	2.5	2.7	1.62		2.98		1.44
24-5, 2–5	223.5					32.4										
26-2, 146–148	239.5					27.3										
26-4, 138–140	242.4					28.3										
26-6, 135–148	245.4			1.91	2.72	25.6	47.7	4.3	104	5.6	4.8	1.57		3.00		1.64
27-2, 119–122	248.7					28.1										
27-4, 119–130	251.7			1.88	2.68	26.4	48.4	4.0	223	3.2	3.6	1.57		2.96		1.57
27-6, 119–122	254.7					27.1										
28-3, 146–149	260.0					29.3										
28-5, 146–149	263.0					27.2										
28-6, 39–50	263.4	1.91							294	3.3	3.1	1.59		3.04		1.91
29-1, 25–29	265.3	1.94	2.01	1.93	2.74	25.1	47.1					1.67	1.65	3.22	3.18	
29-1, 145–148	266.5					27.2										
29-3, 59–70	268.6			1.88	2.71	26.6	48.8	0.0	606	3.1	2.4	1.63		3.06		1.73
32-1, 87–99	294.4	2.03	2.05	1.97	2.72	23.0	44.2					1.95	1.94	3.85	3.82	1.61
33-1, 70–80	303.7	1.99	2.00	1.94	2.69	23.7	45.0					1.95	1.90	3.79	3.68	1.55
34-1, 122–134	313.8	2.02	2.03	1.98	2.71	22.6	43.5					2.06	1.97	4.07	3.91	1.70
35-1, 83–99	322.9	2.06	2.12	2.05	2.72	19.5	39.2					2.11	2.03	4.33	4.16	1.64
36-3, 80–92	335.4	2.02	2.10	2.05	2.72	19.8	39.6					2.07	2.01	4.24	4.12	1.51
37-1, 47–57	341.5	2.07	2.03	1.97	2.68	22.4	43.0					2.12	2.02	4.17	3.99	1.67
37-1, 130–132	342.5			2.01	2.72	21.5	42.1									
38-1, 53–61	351.1	2.06	2.10	2.04	2.71	20.0	39.8					2.26	2.19	4.61	4.47	1.70
38-1, 118–120	351.7			2.01	2.70	20.9	41.1									
39-2, 30–42	361.9	2.04	2.11	2.02	2.71	20.5	40.5					2.14	2.05	4.32	4.14	1.65
39-2, 135–137	362.9			2.05	2.72	19.5	39.0									
40-1, 21–33	369.8	2.17	2.16	2.14	2.73	16.4	34.2					2.38	2.27	5.09	4.86	1.77
40-1, 81–83	370.3			2.06	2.73	19.5	40.3									
41-1, 133–144	380.4	2.16	2.20	2.15	2.72	16.1	33.7					2.11	2.02	4.53	4.34	1.73
41-3, 87–89	382.9			2.09	2.78	19.1	39.1									
41-5, 93–95	385.9			1.88	2.82	28.4	52.2									
41,CC, 7–9	388.5			2.15	2.76	16.7	35.0									
42-1, 99–100	389.5			2.20	2.72	14.4	30.9									
42-4, 54–63	393.6	2.21	2.26	2.23	2.74	13.7	29.8					2.61	2.51	5.82	5.60	2.06
42-7, 22–24	397.7			2.21	2.75	14.4	31.1									
43-1, 141–151	399.5	2.24	2.26	2.24	2.75	13.4	29.4					2.48	2.32	5.56	5.20	1.89
43-3, 41–43	401.4			2.23	2.76	13.9	30.2									
43-5, 8–10	404.1			2.17	2.74	15.4	32.7									

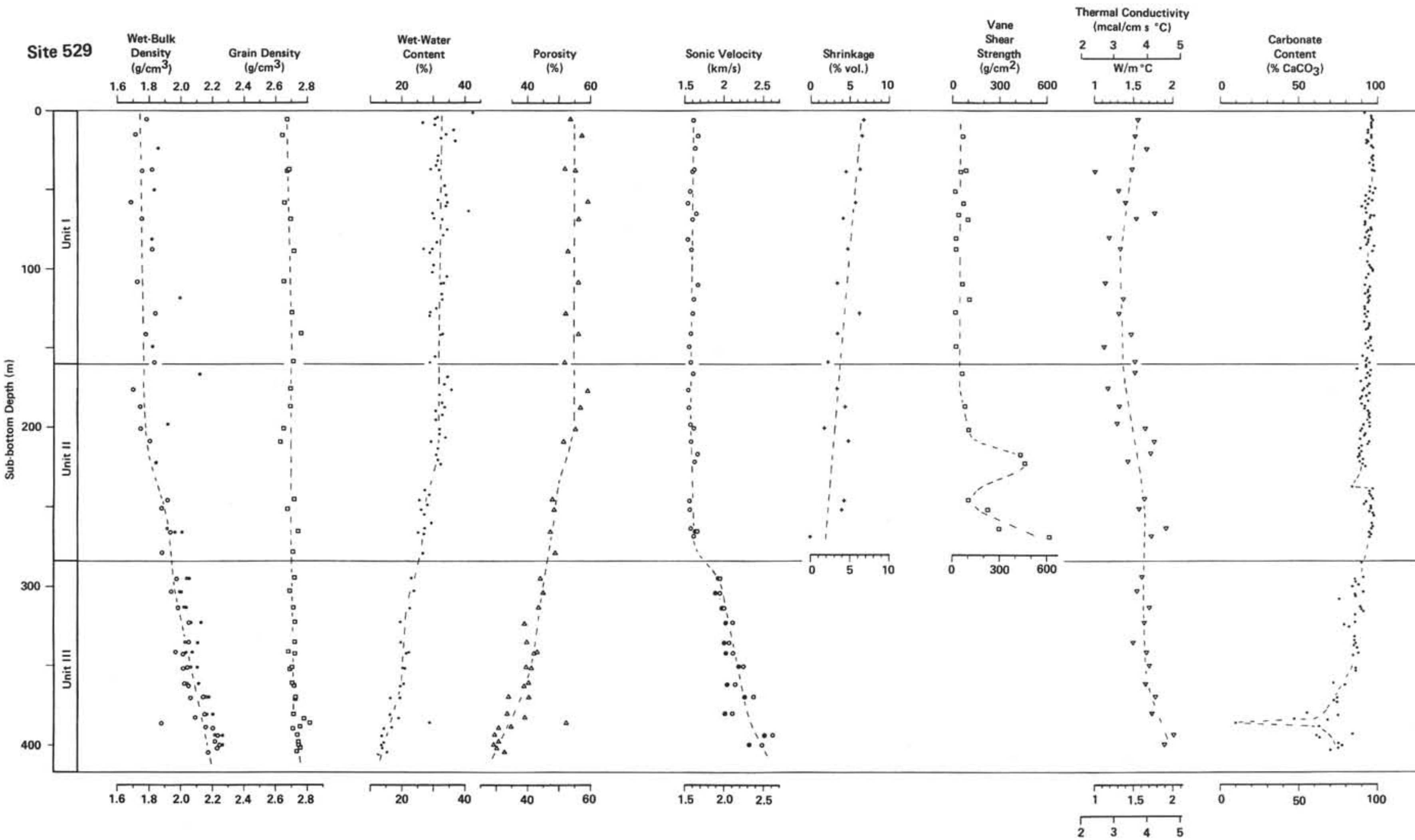

Figure 12. Physical properties plotted versus depth, Site 529.

trichtian) and consists predominantly of very light gray foraminifer–nannofossil and nannofossil chalks. Chert layers are observed in the upper part of the unit. Volcaniclastic sediments alternate with the chalk near the bottom of the unit. Bioturbation is intense, with abundant *Planolites, Chondrites, Zoophycus*, and composite burrows, suggesting that much of the sediment has been reworked. In addition, the preservation of sedimentary structures is excellent. The parallel horizontal and inclined laminations, normal microfaults, current ripples, and flaser bedding indicate the activity of slumping and currents. Carbonate content varies from 10–90% in Unit III.

Seismic Stratigraphy

The seismic stratigraphy is given in Figure 13. The basal stratified reflector probably corresponds to the basement complex (basalt and sediment) as shown and sampled at Sites 525, 528, and 527. We did not drill the basement complex at this site. The reflector at about 0.8 s (two-way travel time) above the basement complex coincides closely with the Cretaceous/Tertiary boundary as in other sites along the transect. At about 0.37 s above the basement complex, the top of a series of stratified reflectors is observed. This top reflector is situated near the top of Unit II (late Oligocene), where the nannofossil chalks are first observed.

Accumulation Rate

It is difficult to estimate accumulation rates in the section recovered at Site 529 because of the common slumps and erosional hiatuses. Our analysis of the data considers these features as "noise" on the long-term trend of sediment accumulation. Treated thus, the average accumulation rates (1–2 $g/cm^2/10^3$ y.) are within the range of rates at other sites of Leg 74. However, the pattern of change in accumulation rates with time show little similarity to these other sites. Only the lower Pliocene maximum in accumulation and the upper Miocene hiatus appear similar to other records in the area.

Biostratigraphy and History of the Walvis Ridge

Site 529 is located near a topographic saddle in the Walvis Ridge. The sediments are dominated by erosional hiatuses, sedimentary structures indicating currents, and repeated stratigraphic sequences suggesting the occurrence of slumped material. These features are preserved in one form or another from the base of the section (upper Maestrichtian) to within the Pleistocene. The largest single hiatus spans the entire upper Miocene. Other smaller hiatuses are indicated by missing biostratigraphic zones in the Pliocene, middle Miocene, middle Oligocene, upper to middle Eocene, middle to lower Eocene, and Paleocene. Some of the hiatuses encountered at Site 529 (e.g., the upper Miocene and Paleocene) may be correlatable with similar events at other sites in the Walvis Ridge transect.

The preservation of the calcareous microfossils is generally moderate throughout the recovered Neogene and Oligocene section. Although they continue to be moderately well preserved down into the Upper Cretaceous, the foraminifers become poorly preserved in the lower Eocene and are totally recrystallized and badly cemented near the base of the section. The few benthic foraminifers that could be extracted from the basal part of the section were not sufficient to give an estimate of the paleodepth; however, estimates based on the crustal cooling curve indicate a paleodepth of approximately 800 m for this site in the Late Cretaceous.

The Cretaceous/Tertiary boundary is well recovered at this site as it is in at other Leg 74 sites except for 526. As at other sites of this transect, the basal sedimentary unit contains common volcanogenic material which extends into the Paleocene. The average accumulation, particularly the noncarbonate fraction, is high during this interval and gradually drops through the Paleogene. The Oligocene is a well-recovered part of the section, particularly the boundary intervals with the Eocene and Miocene, which appear to be more complete and expanded than at other sites.

Paleomagnetic Results

The lower Paleocene to Cretaceous magnetic reversal sequence was obtained. Owing to poor recovery, this site yielded the least complete results. No basement age can be inferred, as the hole was terminated prior to reaching basalt.

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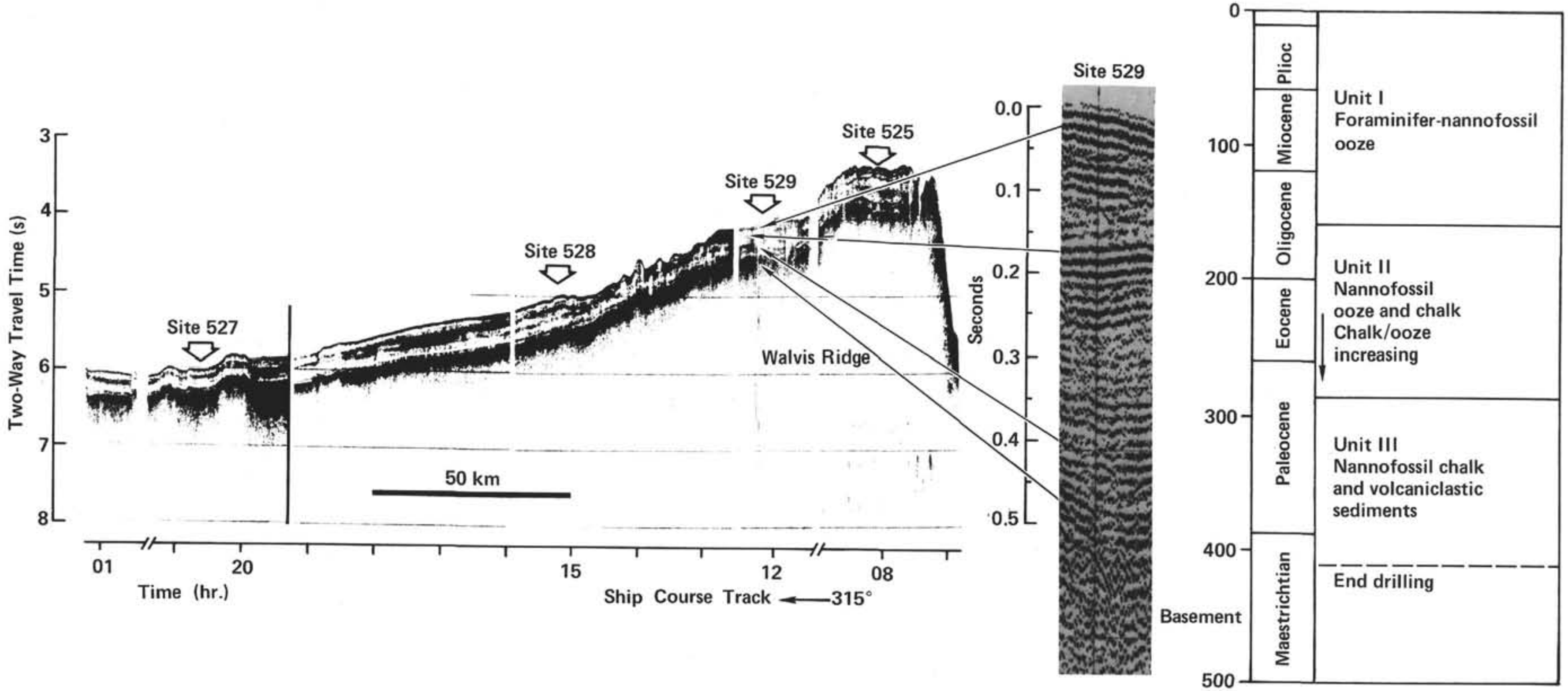
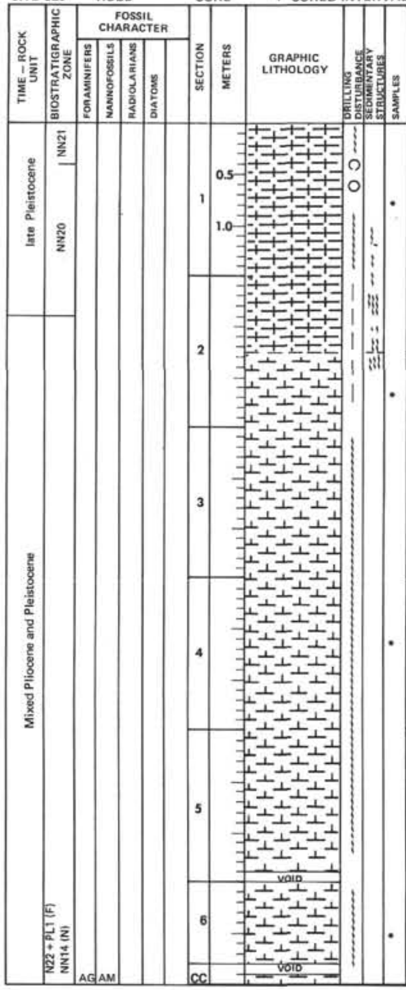


Figure 13. Correlation between seismic profiles and lithostratigraphy, Site 529.

SITE 529 HOLE CORE 1 CORED INTERVAL 0.0–8.5 m



LITHOLOGIC DESCRIPTION

5Y 7/2

N9

N9 +
10YR 8/6
5YR 8/1

5YR 8/1

10YR 8/6

N9 +
10YR 8/6

10YR 8/2

N9 +
5YR 8/1

N9

FORAMINIFER NANNOFOSSIL TO NANNOFOSSIL OOZE

This core contains a highly deformed yellowish gray (5Y 7/2) and white (N9) foraminifer nannofossil to nannofossil ooze. A color change in Section 2 at 80 cm accompanies the change in lithologies from foraminifer nannofossil ooze above to nannofossil ooze below. At and around this contact are biogenic sedimentary structures. From Section 2 downwards the core is more multicolored with pinkish gray to yellowish gray highly deformed layers.

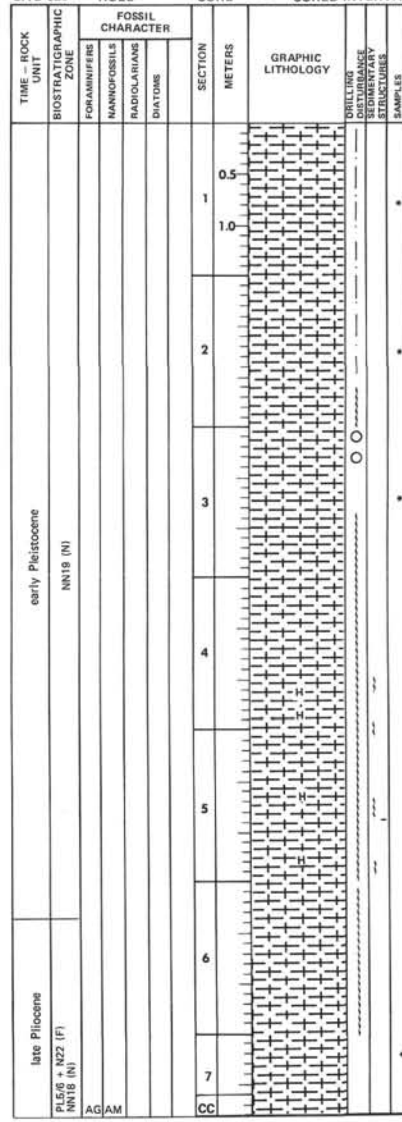
SMEAR SLIDE SUMMARY:

	1-80	2-125	4-65	6-60
	D	M	M	D
Composition:				
Quartz	–	–	–	TR
Heavy minerals	TR	–	–	–
Volcanic glass	–	TR	–	TR
Palagonite	TR	TR	–	–
Carbonate unspecified	–	–	TR	TR
Foraminifers	25	5	20	1
Calcareous nannofossils	74	94	79	99
Echinoids •	TR	–	–	–
Dinoflagellates	1	1	1	TR
Ostracods	TR	–	–	–

ORGANIC CARBON AND CARBONATE:

	1-96	2-96	3-96	4-96	5-96
Organic carbon	–	–	–	–	–
Carbonate	92	96	96	97	96

SITE 529 HOLE CORE 2 CORED INTERVAL 8.5–18.0 m



LITHOLOGIC DESCRIPTION

N9

N9, 10YR 8/6
5YR 8/1, 5YR 7/2

5YR 8/1

N9

2.5Y 7/2

FORAMINIFER NANNOFOSSIL OOZE

This core contains a multicolored but dominantly white (N9) to light gray (2.5Y 7/2) foraminifer nannofossil ooze.

Some halo burrows are observed but primary sedimentary structure, if they existed, have been obliterated beyond recognition.

SMEAR SLIDE SUMMARY:

	1-80	2-80	3-80	7-30
	D	D	D	D
Composition:				
Feldspar	–	–	TR	–
Heavy minerals	–	TR	TR	–
Volcanic glass	–	1	5	–
Palagonite	1	1	–	–
Carbonate unspecified	–	TR	–	–
Foraminifers	15	20	25	10
Calcareous nannofossils	84	78	70	90

ORGANIC CARBON AND CARBONATE:

	1-35	2-35	3-35	4-35	5-35	6-35	7-35
Organic carbon	–	–	–	–	–	–	–
Carbonate	98	96	94	94	96	96	93

SITE 529 HOLE CORE 3 CORED INTERVAL 18.0–27.5 m

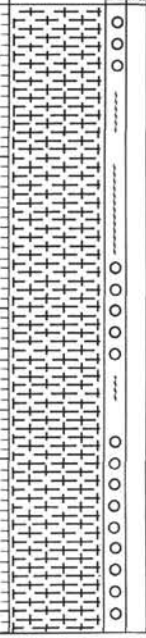
TIME – ROCK UNIT | BIOSTRATIGRAPHIC ZONE | FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION

Time-rock unit: late Pliocene; early Pliocene

Biostratigraphic zone: NN16 (N); PL2 (F) NN15 (N)

Fossil character: AG AM

Sections: 1, 2, 3, 4, CC (0.5, 1.0 m)



10YR 8/2

N9

10YR 8/2

N9

N8

10YR 8/2

FORAMINIFER NANNOFOSSIL OOZE

This core contains a soupy to highly disturbed very pale orange (10YR 8/2) to white (N9) homogeneous foraminifer nannofossil ooze. No primary or secondary sedimentary structures are preserved.

SMEAR SLIDE SUMMARY:

	2-100	4-100
	D	D
Composition:		
Quartz	TR	–
Carbonate unspecified	TR	1
Foraminifers	10	12
Calcareous nannofossils	85	87
Dinoflagellates	1	1

ORGANIC CARBON AND CARBONATE:

	1-35	2-35	3-35	4-35
	D	D	D	D
Organic carbon	–	–	–	–
Carbonate	94	93	96	97

SITE 529 HOLE CORE 4 CORED INTERVAL 27.5–37.0 m

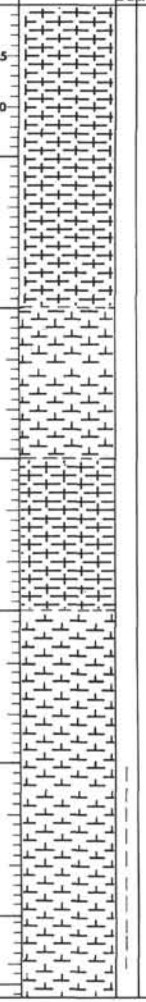
TIME – ROCK UNIT | BIOSTRATIGRAPHIC ZONE | FOSSIL CHARACTER (FORAMINIFERS, NANNOFOSSILS, RADIOLARIANS, DIATOMS) | SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES | LITHOLOGIC DESCRIPTION

Time-rock unit: early Pliocene

Biostratigraphic zone: NN15 (N); PL2 (F) NN14 (N)

Fossil character: AG AM

Sections: 1, 2, 3, 4, 5, 6, 7, CC (0.5, 1.0 m)



N9

FORAMINIFER NANNOFOSSIL AND NANNOFOSSIL OOZE

This core contains a white (N9) homogeneous foraminifer nannofossil to nannofossil ooze.

No sedimentary structures are present. However, Section 7 at the bottom contains some very pale orange (10YR 8/2) laminae. *In the bottom 10 cm they are slightly distorted.*

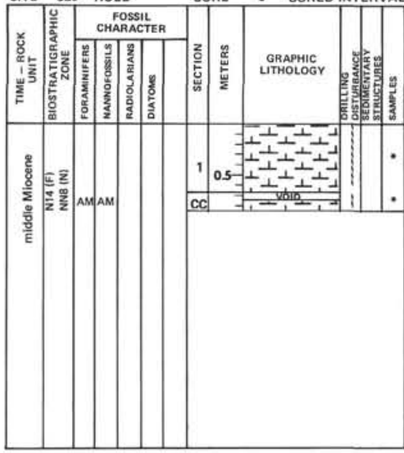
SMEAR SLIDE SUMMARY:

	1-80	2-80	3-80	4-60	7-40
	D	D	D	D	D
Composition:					
Quartz	–	–	–	2	–
Heavy minerals	–	–	–	TR	–
Volcanic glass	TR	1	5	TR	TR
Palagonite	TR	–	TR	TR	TR
Carbonate unspecified	–	–	–	–	TR
Foraminifers	15	10	3	15	5
Calcareous nannofossils	85	89	92	83	95
Ostracods	TR	–	–	–	–
Dinoflagellates	–	TR	TR	–	TR

ORGANIC CARBON AND CARBONATE:

	1-11	2-11	3-11	4-11	5-11	7-11
Organic carbon	–	–	–	–	–	–
Carbonate	97	96	97	95	97	97

SITE 529 HOLE CORE 5 CORED INTERVAL 37.0–46.5 m



LITHOLOGIC DESCRIPTION

5GY 8/1

NANNOFOSSIL OOZE

A highly disturbed homogeneous yellowish gray (5GY 8/1) nannofossil ooze was recovered.

No structures are observed.

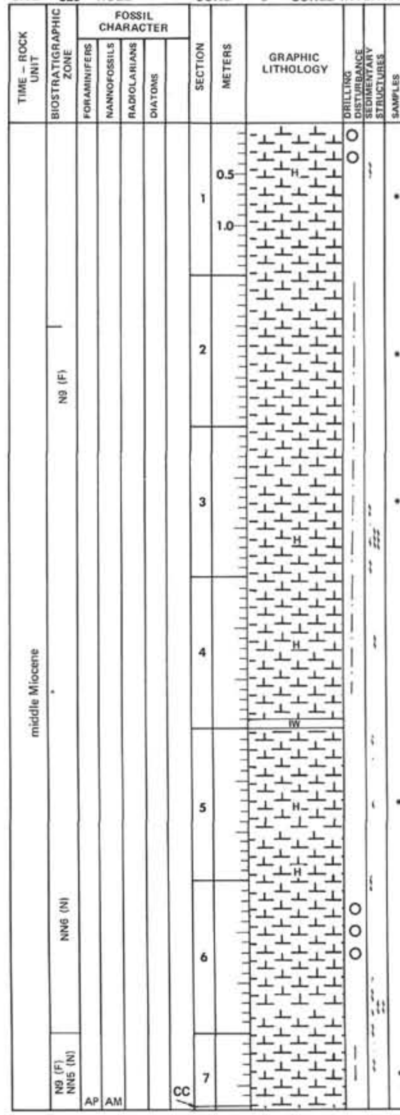
SMEAR SLIDE SUMMARY:

	1-33	CC
	D	D
Composition:		
Volcanic glass	TR	TR
Pyrite	TR	TR
Carbonate unspecified	–	TR
Foraminifers	7	2
Calcareous nannofossils	93	98

ORGANIC CARBON AND CARBONATE:

	1-10
Organic carbon	–
Carbonate	98

SITE 529 HOLE CORE 6 CORED INTERVAL 46.5–56.0 m



LITHOLOGIC DESCRIPTION

5Y 8/1

NANNOFOSSIL OOZE

This core contains a homogeneous yellowish gray (5Y 8/1) nannofossil ooze. Some halo burrows are preserved which are pinkish gray (5YR 8/1) to light gray (N7).

No primary sedimentary structures are present.

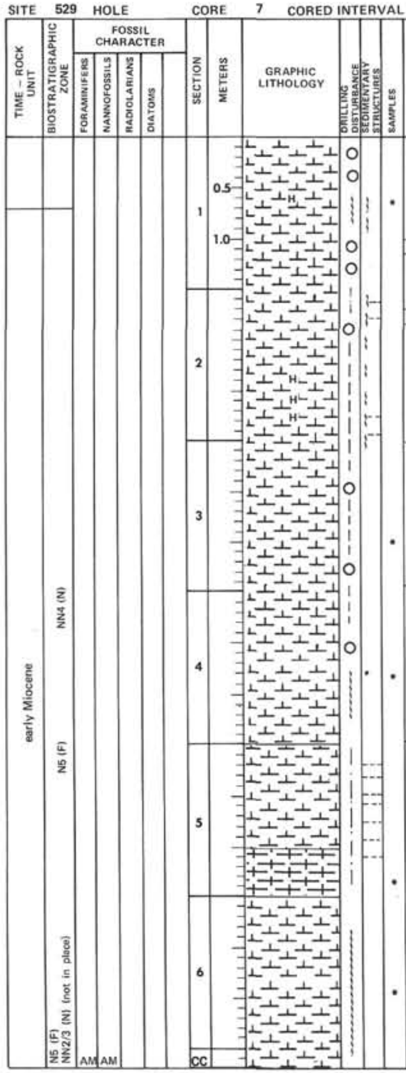
SMEAR SLIDE SUMMARY:

	1-80	2-80	3-80	5-80	7-40
	D	D	D	D	D
Composition:					
Heavy minerals	–	–	–	TR	TR
Volcanic glass	TR	TR	–	TR	TR
Palagonite	TR	TR	TR	–	TR
Pyrite	–	TR	–	–	–
Foraminifers	3	2	1	7	3
Calcareous nannofossils	97	98	99	93	97

ORGANIC CARBON AND CARBONATE:

	1-65	2-65	3-65	4-65	5-65	6-65	7-65
Organic carbon	–	–	–	–	–	–	–
Carbonate	95	98	95	95	92	94	96

SITE 529 HOLE CORE 7 CORED INTERVAL 56.0–65.5 m



LITHOLOGIC DESCRIPTION

5Y 8/1

5YR 8/1

5Y 8/1

10YR 8/2

5Y 8/1

10YR 8/3

2.5Y 7/2

N9 to 5YR 8/1

10YR 8/2

NANNOFOSSIL OOZE

This core contains a predominantly yellowish gray (5Y 8/1) nannofossil ooze. At approximately 100 cm in Section 5 a sandy foraminifer nannofossil ooze is present. Paleontologic evidence suggests that this sandy interval marks the top of a slumped area that extends to 60 cm in Section 2 of Core 8 (color change).

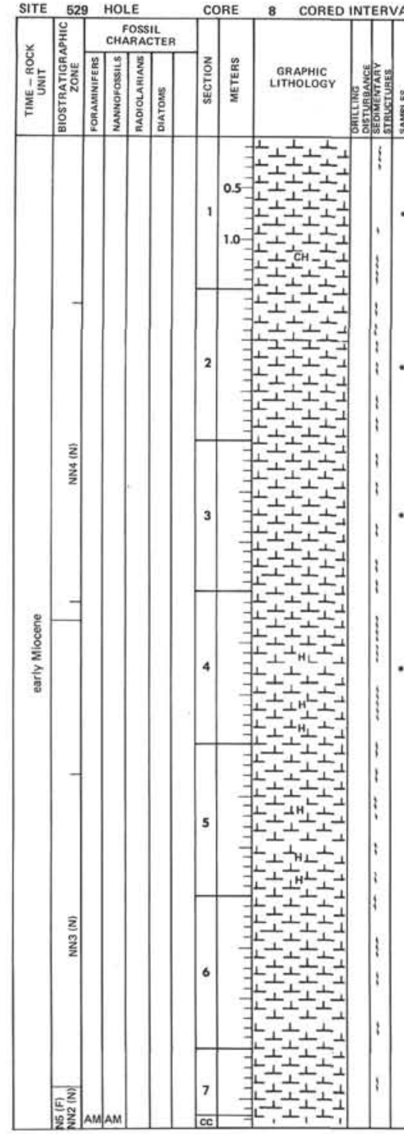
SMEAR SLIDE SUMMARY:

	1-80	3-100	4-85	5-140	6-100
	D	D	M	D	D
Composition:					
Quartz	–	TR	–	–	–
Feldspar	TR	–	–	TR	–
Volcanic glass	1	–	–	TR	TR
Palagonite	TR	TR	TR	–	–
Pyrite	–	–	5	–	–
Carbonate unspecified	–	–	TR	–	–
Foraminifers	7	3	5	20	5
Calcareous nannofossils	79	96	90	80	99
Calcareous dinoflagellates	2	1	–	–	TR
Echinoids	–	–	–	–	TR

ORGANIC CARBON AND CARBONATE:

	1-70	2-70	3-70	4-70	5-70	6-70
Organic carbon	–	–	–	–	–	–
Carbonate	92	94	90	92	93	96

SITE 529 HOLE CORE 8 CORED INTERVAL 65.5–75.0 m



LITHOLOGIC DESCRIPTION

5Y 8/1

2.5Y 7/2

10YR 6/4

5Y 8/1

NANNOFOSSIL OOZE

The core consists of a predominantly pale yellowish gray (5Y 8/1) nannofossil ooze. The core appears undisturbed with slight bioturbation. Halo burrows are present. Section 2 at 60 cm shows a color change from a light gray (2.5Y 7/2) to a light yellowish brown (10YR 6/4).

No primary sedimentary structures are preserved.

The top of Core 8 to 60 cm in Section 2 is interpreted to be a slump based on paleontological evidence.

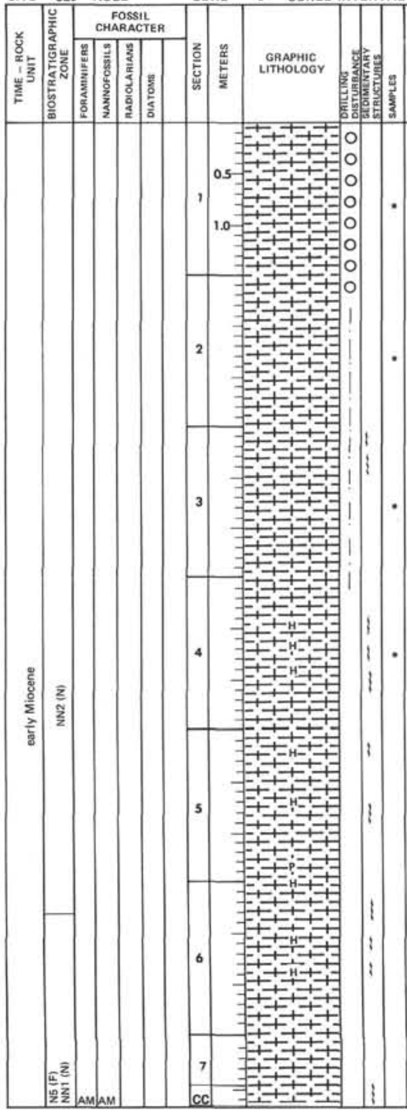
SMEAR SLIDE SUMMARY:

	1-80	2-80	3-80	4-80
	M	M	M	M
Composition:				
Feldspar	TR	–	–	–
Heavy minerals	TR	TR	TR	–
Volcanic glass	–	TR	TR	TR
Palagonite	TR	–	TR	TR
Pyrite	–	TR	TR	–
Carbonate unspecified	TR	1	–	–
Foraminifers	3	TR	2	5
Calcaroeus nannofossils	97	100	98	95
Dinoflagellates	–	–	–	TR

ORGANIC CARBON AND CARBONATE:

	1-2	2-2	3-2	4-2	5-2	6-2	7-2
Organic carbon	–	–	–	–	–	–	–
Carbonate	98	95	92	92	92	96	97

SITE 529 HOLE CORE 9 CORED INTERVAL 75.0–84.5 m



LITHOLOGIC DESCRIPTION

10YR 8/2

FORAMINIFER NANNOFOSSIL OOZE

This core contains a homogeneous slightly bioturbated very pale orange (10YR 8/2) foraminifer nannofossil ooze.

Biogenic sedimentary structures are found in Sections 4 through the Core-Catcher. Halo burrows are the most dominant ichnogenera present.

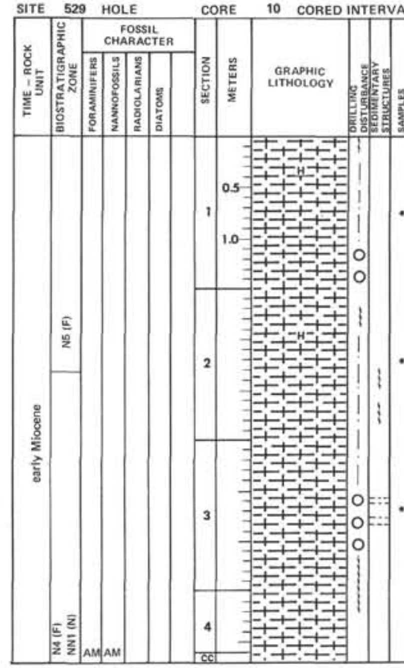
SMEAR SLIDE SUMMARY:

	1-80	2-80	3-80	4-80
	D	D	D	D
Composition:				
Heavy minerals	TR	–	–	TR
Volcanic glass	–	–	–	TR
Palagonite	TR	TR	–	TR
Foraminifers	20	20	15	25
Calcareous nannofossils	80	80	94	75
Calcareous dinoflagellates	TR	–	–	–

ORGANIC CARBON AND CARBONATE:

	1-2	2-2	3-2	4-2	5-2	6-2	7-2
Organic carbon	–	–	–	–	–	–	–
Carbonate	94	93	95	92	94	94	93

SITE 529 HOLE CORE 10 CORED INTERVAL 84.5–94.0 m



LITHOLOGIC DESCRIPTION

5YR 8/1

FORAMINIFER NANNOFOSSIL OOZE

This core consists of a pinkish gray (5YR 8/1) to pinkish white (7.5YR 8/2) foraminifer nannofossil ooze. Bioturbation is localized with halo burrows being recognized. Faint horizontal laminations are present in Section 3.

SMEAR SLIDE SUMMARY:

	1-80	2-80	3-80
	D	D	D
Composition:			
Feldspar	TR	–	–
Heavy minerals	TR	TR	TR
Volcanic glass	TR	–	2
Palagonite	–	–	1
Carbonate unspecified	2	–	5
Foraminifers	15	10	25
Calcareous nannofossils	83	88	66
Calcareous dinoflagellates	TR	1	1

7.5YR 8/2

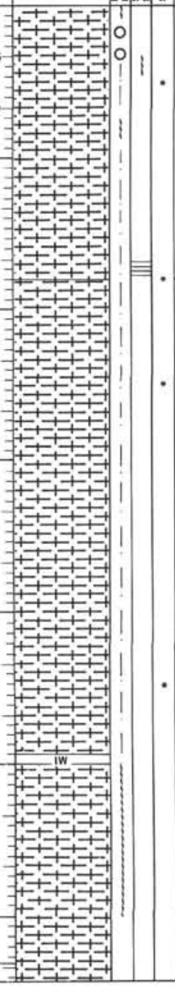
ORGANIC CARBON AND CARBONATE:

	1-40	2-40	3-40
Organic carbon	–	–	–
Carbonate	98	89	97

SITE 529 HOLE CORE 11 CORED INTERVAL 94.0–103.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
early Miocene	N4 (F) NN1 (N)	AM	AM			1, 2, 3, 4, 5, 6, 7, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5YR 8/2

5R 8/2

5YR 8/1

5Y 8/1

10YR 7/3

FORAMINIFER NANNOFOSSIL OOZE

A homogeneous pinkish white (5YR 8/2) pinkish gray (5YR 8/1) to yellowish gray (5Y 8/1) foraminifer nannofossil ooze is present.

Some lighter pinkish gray to white mottles are present but they are highly contorted. They may have been burrows.

Section 2 at 125 cm is a contact between a pinkish gray and yellowish gray foraminifera nannofossil ooze. The percent of foraminifer increase with this boundary change.

SMEAR SLIDE SUMMARY:

	1-80 D	2-130 D	3-80 D	5-80 D
Composition:				
Quartz	1	–	–	–
Heavy minerals	–	–	TR	–
Volcanic glass	–	1	–	1
Carbonate unspecified	–	–	–	2
Foraminifers	15	25	35	30
Calcareous nannofossils	84	74	63	60
Calcareous dinoflagellates	–	1	1	1

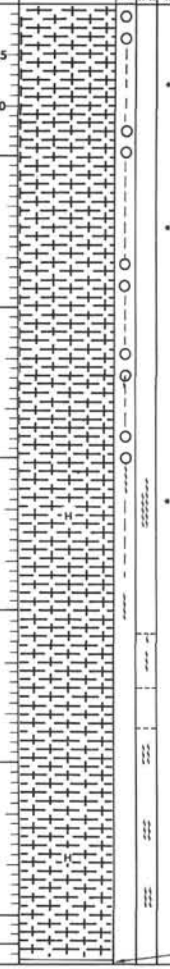
ORGANIC CARBON AND CARBONATE:

	1-138	2-138	3-138	4-138	5-138	6-138
Organic carbon	–	–	–	–	–	–
Carbonate	94	95	96	97	97	94

SITE 529 HOLE CORE 12 CORED INTERVAL 103.5–113.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
Oligocene	N4 (F) NN1 (N)	AM	AM			1, 2, 3, 4, 5, 6, 7, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5Y 8/1

5YR 8/1

5Y 8/1

5YR 8/1

5Y 8/1

5YR 8/1

5Y 8/1

FORAMINIFER NANNOFOSSIL OOZE

The core contains a yellowish gray (5Y 8/1) grading to and alternating with a pinkish gray (5YR 8/1) foraminifer nannofossil ooze.

Section 4 contains a high bioturbated zone. The burrows are pinkish gray which suggest that the pinkish gray layers that alternate with the yellowish gray zones are completely bioturbated.

No other sedimentary structures are found.

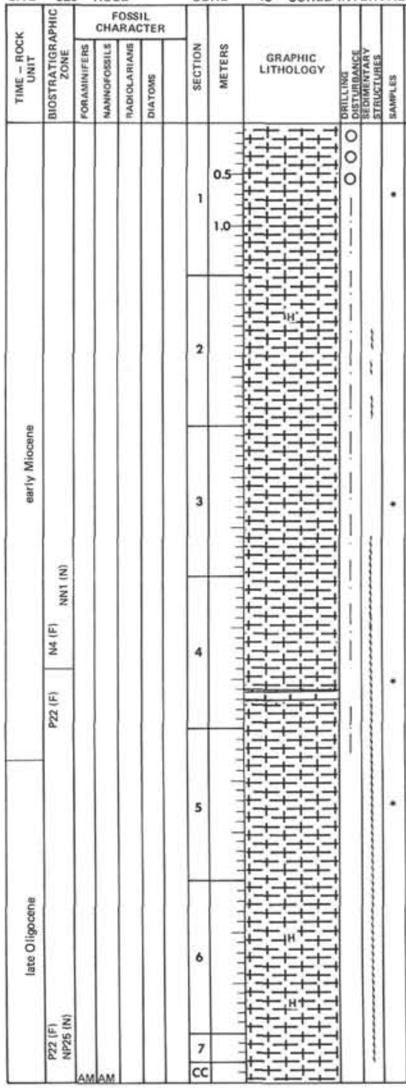
SMEAR SLIDE SUMMARY:

	1-80 D	2-80 D	4-50 D
Composition:			
Heavy minerals	TR	–	–
Volcanic glass	1	–	–
Foraminifers	40	19	30
Calcareous nannofossils	58	80	70
Calcareous dinoflagellates	1	1	3

ORGANIC CARBON AND CARBONATE:

	1-130	4-130	5-130	6-130
Organic carbon	–	–	–	–
Carbonate	93	92	95	94

SITE 529 HOLE CORE 13 CORED INTERVAL 113.0–122.5 m



LITHOLOGIC DESCRIPTION

5Y 8/1

FORAMINIFER NANNOFOSSIL OOZE

A yellowish gray (5Y 8/1) slightly bioturbated foraminifer nannofossil ooze was recovered.

Mottles which are probably biogenic in origin are scattered throughout.

No other sedimentary structures are present.

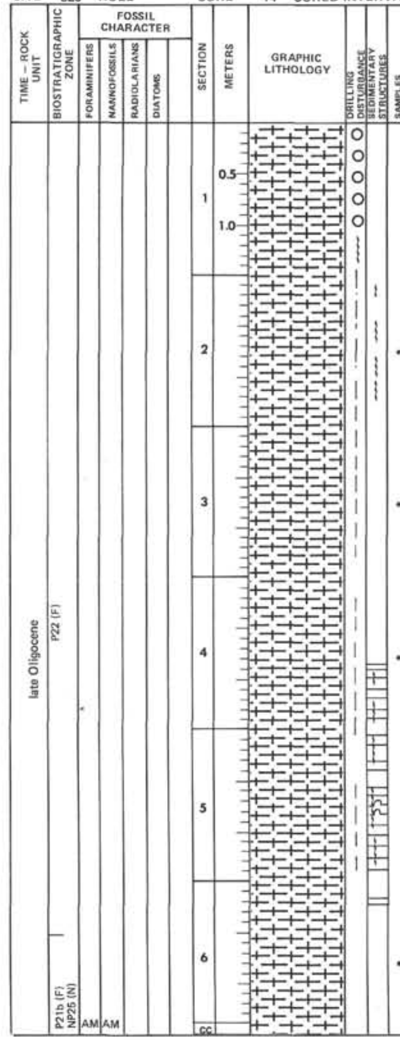
SMEAR SLIDE SUMMARY:

	1-80	3-80	4-110	5-80
	D	D	D	D
Composition:				
Heavy minerals	TR	1	1	1
Caly	–	–	–	TR
Volcanic glass	–	–	1	1
Foraminifers	35	35	25	25
Calcareous nannofossils	64	63	67	72
Calcareous dinoflagellates	1	1	1	1

ORGANIC CARBON AND CARBONATE:

	1-40	2-40	3-40	4-40	5-40	6-40
Organic carbon	–	–	–	–	–	–
Carbonate	94	92	95	94	95	94

SITE 529 HOLE CORE 14 CORED INTERVAL 122.5–132.0 m



LITHOLOGIC DESCRIPTION

5Y 8/1

FORAMINIFER NANNOFOSSIL OOZE

This core contains a pinkish gray (5YR 8/1) to light olive gray (5Y 6/1) foraminifer nannofossil ooze.

The first four sections to 90 cm of Section 4 are variegated and homogenized with some mottling visible. From Section 4 (90 cm) to Section 6 (30 cm) horizontal multicolored laminations are observed. In between these laminations are two areas of high mottled or contorted beds.

Dark (black) crusty burrows or nodules are found in several places in the core.

5YR 8/1

SMEAR SLIDE SUMMARY:

	2-80	3-80	4-80	6-80
	D	D	D	D
Composition:				
Heavy minerals	–	–	TR	–
Clay	–	–	–	2
Volcanic glass	–	TR	1	2
Palagonite	–	–	–	1
Foraminifers	15	15	20	30
Calcareous nannofossils	85	84	78	62
Calcareous dinoflagellates	2	1	1	3

5Y 6/1

ORGANIC CARBON AND CARBONATE:

	2-40	3-40	4-40	5-40	6-40
Organic carbon	–	–	–	–	–
Carbonate	92	93	94	92	93

5YR 8/1

5Y 8/1

5Y 6/1

5YR 8/1

5Y 8/1

5Y 7/2

5YR 8/1

5Y 8/1

SITE 529 HOLE CORE 15 CORED INTERVAL 132.0–141.5 m

TIME-ROCK UNIT: late Oligocene

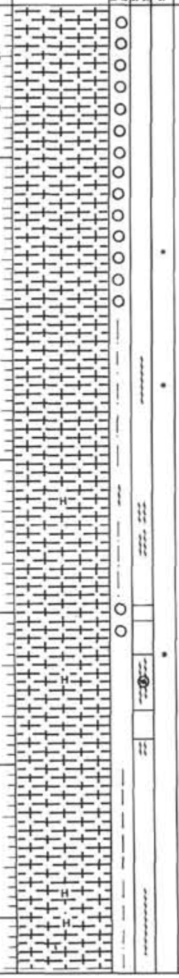
BIOSTRATIGRAPHIC ZONE: P21a | P21b; NP25 (N); NP22 (N); P21a (F) NP24/23 (N)

FOSSIL CHARACTER: FORAMINIFERS AM; NANNOFOSSILS AM; RADIOLARIANS; DIATOMS

SECTION: 1, 2, 3, 4, 5, 6, 7, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5YR 8/1

Mn-nodule

5Y 8/1

FORAMINIFER NANNOFOSSIL OOZE

A mottled dominantly pinkish gray (5YR 8/1) foraminifer nannofossil ooze was recovered.

The mottling is biogenic in origin with halo burrows identified.

Minor alternation of color occurs in Section 5 where the sediment alternates from soupy to more consolidated oozes. Burrows are preserved in the more consolidated areas.

SMEAR SLIDE SUMMARY:

	2-100 D	3-80 D	5-50 D
Composition:			
Volcanic glass	TR	–	1
Palagonite	–	–	TR
Foraminifers	25	35	40
Calcareous nannofossils	75	65	58
Calcareous dinoflagellates	TR	–	1

ORGANIC CARBON AND CARBONATE:

	1-40	2-40	3-40	4-40	5-40	6-40
Organic carbon	–	–	–	–	–	–
Carbonate	92	95	95	94	93	–

SITE 529 HOLE CORE 16 CORED INTERVAL 141.5–151.0 m

TIME-ROCK UNIT: late Oligocene

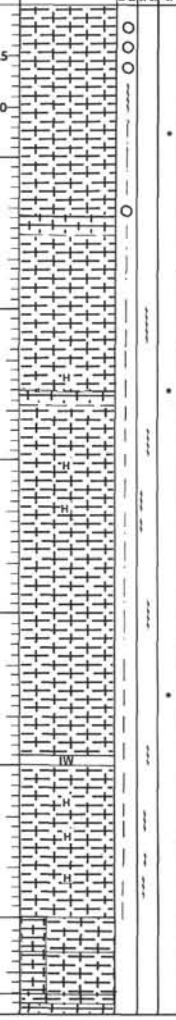
BIOSTRATIGRAPHIC ZONE: NP23/24 (N); P21a; P20 (F) NP 23/24 (N)

FOSSIL CHARACTER: FORAMINIFERS AM; NANNOFOSSILS AM; RADIOLARIANS; DIATOMS

SECTION: 1, 2, 3, 4, 5, 6, 7, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5YR 8/1

FORAMINIFER NANNOFOSSIL OOZE

A homogeneous, pinkish gray (5YR 8/1) foraminifer nannofossil ooze was recovered. The lower sections are bioturbated with halo burrows identified.

SMEAR SLIDE SUMMARY:

	1-120 D	3-80 D	5-80 D
Composition:			
Heavy minerals	TR	–	TR
Clay	TR	–	TR
Volcanic glass	1	–	TR
Foraminifers	15	10	75
Calcareous nannofossils	83	90	84
Calcareous dinoflagellates	1	–	1

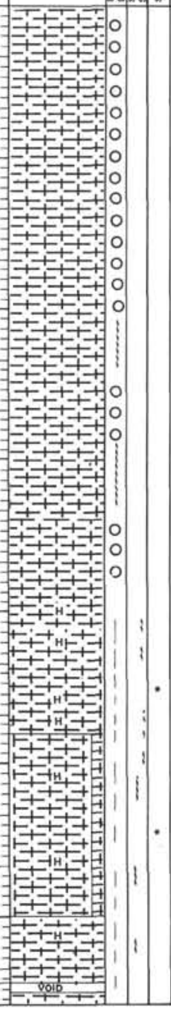
ORGANIC CARBON AND CARBONATE:

	1-104	2-40	3-40	4-40	5-40	6-40	7-40
Organic carbon	–	–	–	–	–	–	–
Carbonate	96	96	95	93	96	94	97

SITE 529 HOLE CORE 17 CORED INTERVAL 151.0–160.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
early Oligocene	P20 (F)					1	0.5, 1.0
						2	
						3	
						4	
						5	
						6	
						7	
	P19–18 (F) NP23/24 (N)	AP	AM			CC	

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5YR 8/1

FORAMINIFER NANNOFOSSIL OOZE WITH MINOR CHALKY ZONES

This core consists of a highly disturbed to soupy pinkish gray (5YR 8/1) foraminifer nannofossil ooze.

Halo burrows are identified toward the bottom of the core.

Chalky zones are present in Sections 5 and 6.

Iron from the drill pipe has contaminated the first four sections.

SMEAR SLIDE SUMMARY:

	5-80	6-80
	D	D
Composition:		
Volcanic glass	TR	–
Foraminifers	30	15
Calcareous nannofossils	70	82
Calcareous dinoflagellates	TR	3

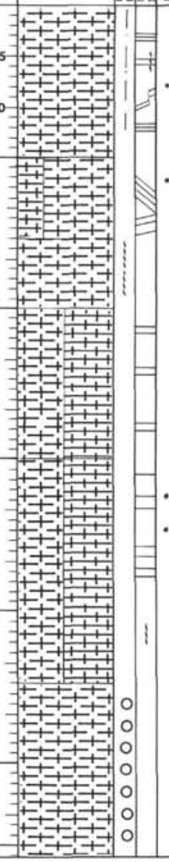
ORGANIC CARBON AND CARBONATE:

	3-18	4-18	5-18	6-18	7-18
Organic carbon	–	–	–	–	–
Carbonate	91	94	93	95	93

SITE 529 HOLE CORE 18 CORED INTERVAL 160.5–170.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
Oligocene						1	0.5, 1.0
						2	
						3	
						4	
						5	
	P19–18 (F) NP22 (N)	AP	AM			6	
						CC	

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5Y 7/2

10R 8/2

10YR 6/2

10R 8/2

10YR 6/2

10R 8/2

10YR 6/2

5YR 8/1

FORAMINIFER NANNOFOSSIL OOZE AND CHALK

This core contains a grayish orange pink (10R 8/2) foraminifer nannofossil ooze and pale yellowish brown (10YR 6/2) foraminifer nannofossil chalk with minor ooze. Inclined and parallel bedding along with microfaults could possibly indicate a slump feature from Section 1 through Section 5 (approximately 10 cm). Preliminary smear slide inspection of pink and brown layers indicate that the latter is richer in calcareous dinoflagellates and discoasters than the former.

SMEAR SLIDE SUMMARY:

	1-80	2-30	4-45	4-80
	D	D	D	D
Composition:				
Clay	–	–	–	TR
Volcanic glass	TR	TR	TR	TR
Foraminifers	15	10	10	25
Calcareous nannofossils	85	85	65	74
Calcareous dinoflagellates	TR	5	25	1

ORGANIC CARBON AND CARBONATE:

	1-18	2-18	3-18	4-18	5-18	6-18
Organic carbon	–	–	–	–	–	–
Carbonate	93	87	96	94	95	93

SITE 529 HOLE CORE 19 CORED INTERVAL 710.0–179.5 m

TIME – ROCK UNIT: early Oligocene

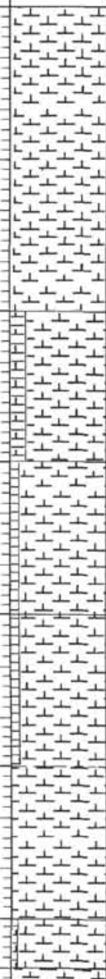
BIOSTRATIGRAPHIC ZONE: P18/19 (F) NP22 (N)

FOSSIL CHARACTER: FORAMINIFERS AM; NANNOFOSSILS AM; RADIOLARIANS; DIATOMS

SECTION: 1, 2, 3, 4, 5, 6, 7, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

10YR 8/2

10R 8/2

5R 8/2

10R 8/2

LITHOLOGIC DESCRIPTION

NANNOFOSSIL OOZE WITH MINOR CHALK

This core contains a homogeneous, slightly deformed very pale orange (10YR 8/2) nannofossil ooze.

Thin bands or beds of nannofossil chalk alternate irregularly with the ooze.

Section 6 contains some fine-grained laminations and wavy bedding.

Slight bioturbation exists but individual ichnogenera identification cannot be made.

SMEAR SLIDE SUMMARY:

	1-80	5-80
	D	D
Composition:		
Palagonite	TR	TR
Foraminifers	5	3
Calcareous nannofossils	95	97
Others	TR	–
Dinoflagellates	–	TR

ORGANIC CARBON AND CARBONATE:

	1-30	2-30	3-30	4-30	5-30	6-30	7-30
Organic carbon	–	–	–	–	–	–	–
Carbonate	90	95	94	92	91	95	93

SITE 529 HOLE CORE 20 CORED INTERVAL 179.5–189.0 m

TIME – ROCK UNIT: early Oligocene

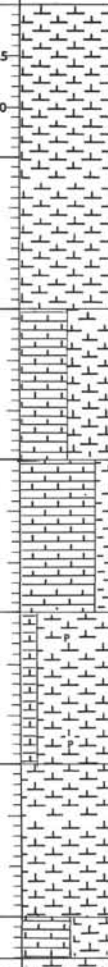
BIOSTRATIGRAPHIC ZONE: P18–19 (F); P17 (F) NP21 (N)

FOSSIL CHARACTER: FORAMINIFERS AM; NANNOFOSSILS AM; RADIOLARIANS; DIATOMS

SECTION: 1, 2, 3, 4, 5, 6, 7, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES

10R 8/2

5R 8/2

10R 8/2

5YR 7/2
N9

5YR 8/2

5YR 7/2
5R 8/2

LITHOLOGIC DESCRIPTION

NANNOFOSSIL OOZE AND CHALK

A homogeneous grayish orange pink (10R 8/2) chalk was recovered.

The first two sections are ooze and are highly disturbed. Chalk and ooze alternate somewhat regularly, approximately 20–30 cm. The chalks also show that biologic organisms were active and grazing in the area. The chalks in Section 5 show good preservation of ichnogenera, expecially planolites.

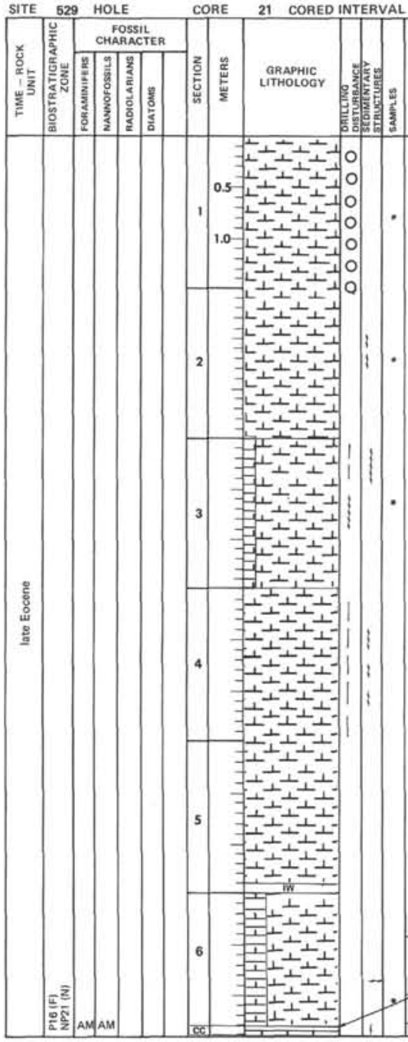
SMEAR SLIDE SUMMARY:

	1-80	2-80	3-80
	D	D	D
Composition:			
Quartz	–	TR	TR
Heavy minerals	TR	–	TR
Palagonite	TR	–	TR
Foraminifers	3	TR	8
Calcareous nannofossils	97	100	91
Dinoflagellates	–	TR	1

ORGANIC CARBON AND CARBONATE:

	1-35	2-35	3-35	4-35	5-35	6-35	7-35
Organic carbon	–	–	–	–	–	–	–
Carbonate	94	89	90	90	92	92	94

SITE 529 HOLE CORE 21 CORED INTERVAL 189.0–198.5 m



LITHOLOGIC DESCRIPTION

10R 8/2
5YR 8/1
10R 8/2
5R 8/2
5YR 8/1
VOID
N9 + 5YR 8/1
N9

NANNOFOSSIL OOZE AND CHALK

Sections 1 and 2 contain a highly disturbed grayish orange pink (10R 8/2) nannofossil ooze with one chalk layer at 80–90 cm in Section 2. Section 3 contains an alternating series of pinkish gray ooze and intercalated grayish orange pink (5YR 7/2) chalk layers.

Sections 4 and 5 are nannofossil ooze. Section 6 is an alternating series of ooze and chalk. Some faint wavy laminations occur at 104–119 cm and suggest minor current activity.

Biogenic sedimentary structures are not well preserved.

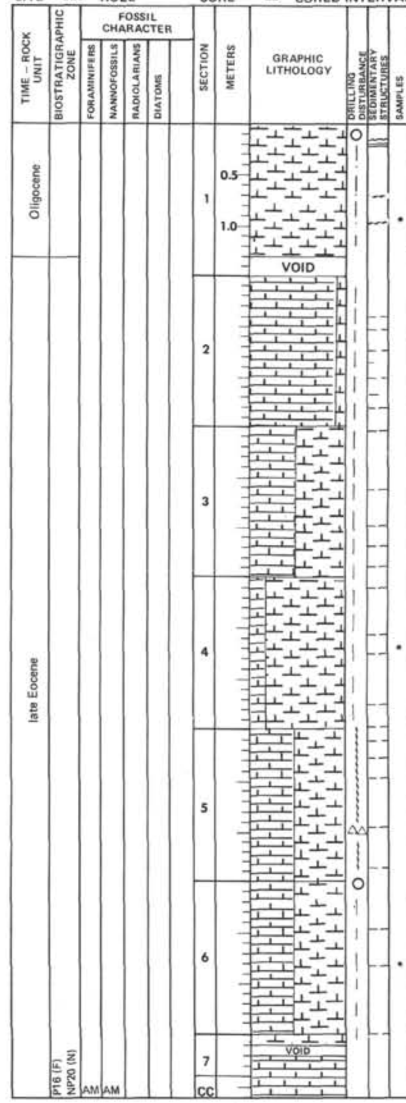
SMEAR SLIDE SUMMARY:

	1-80	2-80	3-80	6-112
	D	D	D	D
Composition:				
Quartz	–	TR	–	TR
Heavy minerals	–	–	TR	–
Volcanic glass	–	TR	–	–
Palagonite	TR	–	TR	–
Carbonate unspecified	–	–	TR	–
Foraminifers	–	5	5	–
Calcareous nannofossils	100	95	94	100
Dinoflagellates	–	TR	1	–

ORGANIC CARBON AND CARBONATE:

	1-124	2-124	3-124	4-124	5-124	6-124
Organic carbon	–	–	–	–	–	–
Carbonate	95	95	95	94	95	91

SITE 529 HOLE CORE 22 CORED INTERVAL 198.5–208.0 m



LITHOLOGIC DESCRIPTION

10R 6/2
10R 8/2
5YR 8/3
5Y 8/3
5Y 8/2
5Y 8/3
5Y 8/2

NANNOFOSSIL OOZE AND CHALK

Core 22 contains an alternating sequence of nannofossil ooze and chalk. The contacts between the ooze and chalk are gradational. The ooze-chalk sequence repeats about every 25–30 cm.

Section 1 at about 125 cm contains the Oligocene (NP21)–Eocene (NP20) boundary.

Biogenic sedimentary structures were not identified.

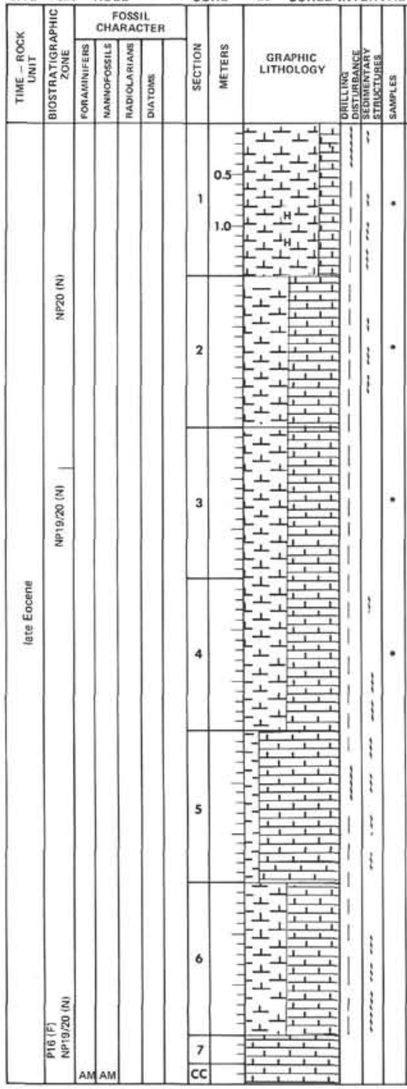
SMEAR SLIDE SUMMARY:

	2-90	4-80	6-80
	D	D	D
Composition:			
Quartz	–	TR	TR
Heavy minerals	TR	–	–
Volcanic glass	TR	–	TR
Pyrite	–	TR	–
Carbonate unspecified	3	2	TR
Foraminifers	7	7	5
Calcareous nannofossils	89	89	95
Dinoflagellates	1	2	TR

ORGANIC CARBON AND CARBONATE:

	1-33	2-33	3-33	4-33	5-33	6-33
Organic carbon	–	–	–	–	–	–
Carbonate	95	90	89	92	92	89

SITE 529 HOLE CORE 23 CORED INTERVAL 208.0–217.5 m



LITHOLOGIC DESCRIPTION

5YR 8/1

NANNOFOSSIL OOZE AND CHALK

Core 23 contains a dominantly pinkish gray (5YR 8/1) sequence of nannofossil ooze and chalks. Boundaries between the two lithologies are gradational at the top of the core and become sharp in Section 6. Within the chalky layer, mottles, interpreted to be biogenic in origin are observed. Halo burrows are recognized.

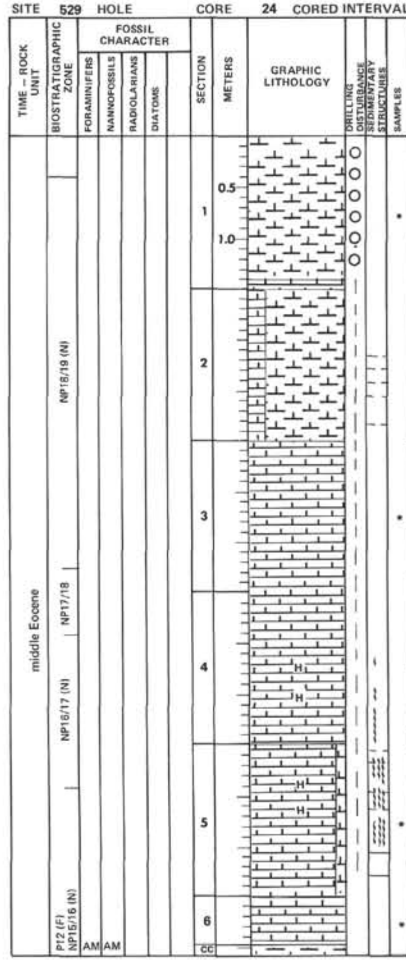
SMEAR SLIDE SUMMARY:

	1-80 D	2-80 D	3-80 D	4-80 D
Composition:				
Quartz	–	–	TR	–
Feldspar	–	–	–	TR
Heavy minerals	–	–	TR	–
Volcanic glass	–	TR	–	TR
Palagonite	–	TR	–	–
Carbonate unspecified	TR	–	–	3
Foraminifers	2	1	–	TR
Calcareous nannofossils	93	93	100	96
Fish remains	–	–	–	TR
Dinoflagellates	5	5	TR	1

ORGANIC CARBON AND CARBONATE:

	1-33	2-33	3-33	4-33	5-33	6-33	7-33
Organic carbon	–	–	–	–	–	–	–
Carbonate	95	94	90	88	90	89	89

SITE 529 HOLE CORE 24 CORED INTERVAL 217.5–227.0 m



LITHOLOGIC DESCRIPTION

7.5YR 8/2

NANNOFOSSIL CHALK AND OOZE

This core contains a multicolored sequence of nannofossil chalks and ooze. Contacts between the chalk and ooze become sharper with increasing depth. The dominant colors are a pale yellow (5Y 8/3) and a very pale brown (10YR 8/4).

Preservation of trace fossil is excellent in Sections 4 and 5. Halo burrows are identified. Other ichnogenera are present but mottling is so intense that positive identifications cannot be made.

7.5YR 7/2

10YR 8/3

5YR 8/3

10YR 8/3

10YR 8/4

5Y 8/3

5Y 8/1

10YR 7/2

SMEAR SLIDE SUMMARY:

	1-80 D	3-80 D	5-80 D	6-30 D
Composition:				
Feldspar	–	–	TR	–
Heavy minerals	TR	TR	–	–
Volcanic glass	–	TR	–	–
Palagonite	–	TR	TR	TR
Pyrite	TR	TR	–	TR
Foraminifers	5	8	3	7
Calcareous nannofossils	94	91	96	92
Dinoflagellates	1	1	1	1

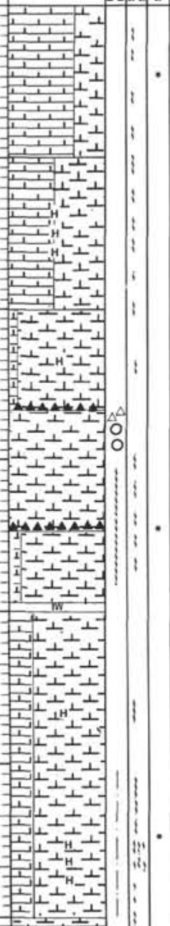
ORGANIC CARBON AND CARBONATE:

	2-33	3-33	4-33	5-33	6-33
Organic carbon	–	–	–	–	–
Carbonate	88	91	89	91	93

Note: Core 25, 227.0–236.5 m: No recovery.

SITE 529 HOLE CORE 26 CORED INTERVAL 236.5–246.0 m

TIME-ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES
early Eocene	NP12 (N); P7 (F) NP12 (N)	AM	AM			1, 2, 3, 4, 5, 6, 7, CC	0.5, 1.0				



LITHOLOGIC DESCRIPTION

5Y 7/2, 5Y 7/3, 5Y 6/2, 5Y 8/1, and N9

5Y 8/1

NANNOFOSSIL CHALK AND OOZE WITH TWO CHERT LAYERS

This core contains an alternating sequence of light gray (5Y 7/2) to light olive gray (5Y 6/2) chalks and yellowish gray (5Y 8/1) oozes. Biogenic sedimentary structures are well preserved with halo burrows most noticeable and easily identified.

Two chert layers are found in Sections 3 and 4. The cherts are a dusky brown (5YR 2/2) with white rinds. XRD analysis shows them to be composed of microcrystalline quartz and cristobalite.

SMEAR SLIDE SUMMARY:

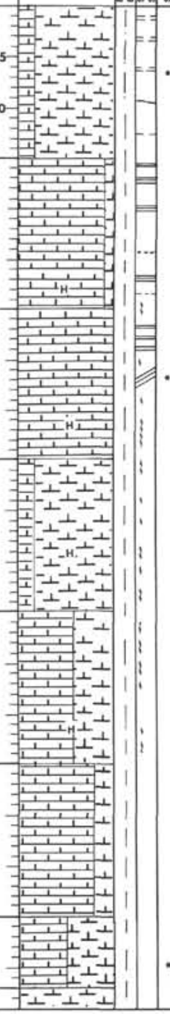
	1-80 D	4-80 D	6-80 D
Composition:			
Quartz	TR	–	–
Volcanic glass	–	–	TR
Palagonite	–	TR	–
Carbonate unspecified	TR	–	TR
Foraminifers	TR	2	–
Calcareous nannofossils	100	97	100
Dinoflagellates	–	1	TR

ORGANIC CARBON AND CARBONATE:

	1-7	2-7	3-7	4-7	5-7	6-7
Organic carbon	–	–	–	–	–	–
Carbonate	84	97	95	95	96	97

SITE 529 HOLE CORE 27 CORED INTERVAL 246.0–255.5 m

TIME-ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES
Eocene	NP12 (N); P7 (F) NP10/11 (N)	CP	AM			1, 2, 3, 4, 5, 6, 7, CC	0.5, 1.0				



LITHOLOGIC DESCRIPTION

5Y 8/1 to 5Y 7/2
5Y 7/2
5Y 8/4
5Y 8/3
5Y 8/1
5Y 6/3 to 5Y 5/3
N9
5Y 8/2
5Y 6/3
5Y 8/2
5Y 8/1
5Y 7/2
5Y 8/1
5Y 7/2
5Y 8/1
5Y 7/2
5Y 8/1
5Y 7/2

NANNOFOSSIL CHALK AND OOZE

A multicolored sequence of yellowish gray (5Y 8/1) to pale yellow (5Y 8/4) nannofossil chalks and oozes. Horizontal and inclined laminations are present in Sections 2 and 3. Halo burrows and planolites are ichnogenera which were identified. Bioturbation in general is slight to moderate.

A chert nodule is present in Section 7. It is composed of cristobalite and microcrystalline quartz.

SMEAR SLIDE SUMMARY:

	1-70 M	3-70 M	7-40 M
Composition:			
Quartz	TR	–	–
Volcanic glass	–	TR	–
Palagonite	TR	–	–
Foraminifers	1	TR	1
Calcareous nannofossils	99	100	99
Dinoflagellates	–	TR	TR

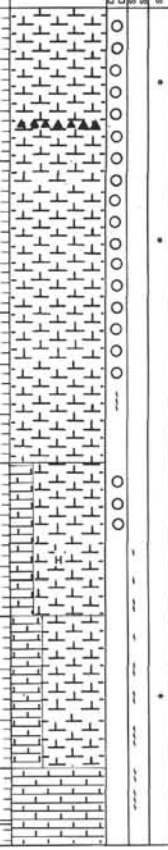
ORGANIC CARBON AND CARBONATE:

	1-4	2-4	3-4	4-4	5-4	6-4	7-4
Organic carbon	–	–	–	–	–	–	–
Carbonate	93	92	98	95	95	97	98

SITE 529 HOLE CORE 28 CORED INTERVAL 255.5–365.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
early Eocene	P7 (F) NP10/11 (N)	CP	AP			1, 2, 3, 4, 5, 6, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

10YR 8/2

N8

N8, 10YR 6/2

NANNOFOSSIL OOZE AND CHALK WITH A CHERT LAYER

Sections 1–3 contain a homogeneous very pale orange (10YR 8/2) nannofossil ooze. A chert nodule or layer is present at 120 cm. It is dusky brown (5YR 2/2) with a white (N9) exterior.

Sections 4 through Core-Catcher contain ooze alternating with chalk. Chalks and oozes alternate approximately every 10 cm with the chalk showing a sharp upper contact with a lower gradational contact.

Bioturbation is slight with halo burrows the only positively identified trace fossil.

SMEAR SLIDE SUMMARY:

	1-80 D	2-80 D	5-80 D
Composition:			
Volcanic glass	TR	–	TR
Palagonite	–	TR	–
Carbonate unspecified	TR	–	–
Foraminifers	1	TR	–
Calcareous nannofossils	99	100	100
Fish remains	TR	–	–
Dinoflagellates	TR	–	TR

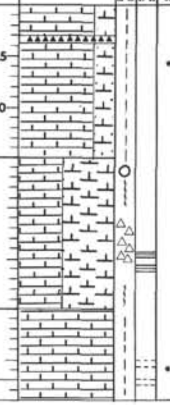
ORGANIC CARBON AND CARBONATE:

	4-1	5-1	6-1
Organic carbon	–	–	–
Carbonate	97	97	96

SITE 529 HOLE CORE 29 CORED INTERVAL 265.0–274.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
late Paleocene	P6a (F) NP9 (N)	AP	AP			1, 2, 3, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

10R 8/2

10YR 6/2

10R 8/2

5YR 8/1

7.5YR 8/2

10R 8/2

NANNOFOSSIL CHALK AND OOZE WITH A CHERT LAYER

This core contains an alternating sequence of predominantly grayish orange pink (10R 8/2) nannofossil chalk and ooze.

A chert layer is present in Section 1 at 30–34 cm.

Chalk fragments in Section 2 show fine parallel laminations.

No biogenic sedimentary structures were noticed.

SMEAR SLIDE SUMMARY:

	1-60 D	3-60 D
Composition:		
Quartz	TR	–
Volcanic glass	TR	–
Palagonite	–	TR
Foraminifers	2	TR
Calcareous nannofossils	97	100
Dinoflagellates	1	TR

ORGANIC CARBON AND CARBONATE:

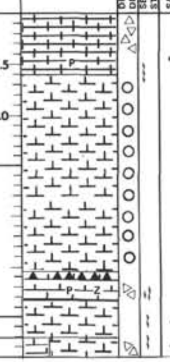
	1-16	2-16	3-16
Organic carbon	–	–	–
Carbonate	95	96	95

NOTE: Core 30, 274.5–284.0 m – No recovery.

SITE 529 HOLE CORE 31 CORED INTERVAL 274.5–284.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
late Paleocene	NP9 (N); P6a (F) NP8 (N)	AP	AP			1, 2, 3, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

5YR 8/1

10YR 5/4

5YR 8/1

FORAMINIFER NANNOFOSSIL CHALK, NANNOFOSSIL OOZE/CHALK AND CHERT

The top 63 cm of Section 1 contain a foraminifer nannofossil chalk. It is brecciated with soupy ooze surrounding it. Planolites and other unidentifiable trace fossil are found in the brecciated chalks.

The remainder of the recovered core is a nannofossil ooze with a chert layer occurring at 120 cm of Section 2 sandwiched between Nannofossil chalk. In the chalk zoophycus and planolites are recognized.

The color is dominantly a pinkish grey (5YR 8/1).

SMEAR SLIDE SUMMARY:

	1-40 D	3-15 D	CC D
Composition:			
Volcanic glass	–	TR	TR
Palagonite	–	TR	–
Carbonate unspecified	2	–	–
Foraminifers	15	2	TR
Calcareous nannofossils	81	98	100
Dinoflagellates	2	TR	–

ORGANIC CARBON AND CARBONATE:

	1-30
Organic carbon	–
Carbonate	90

SITE 529 HOLE CORE 32 CORED INTERVAL 293.5–303.0 m

TIME – ROCK UNIT: late Paleocene

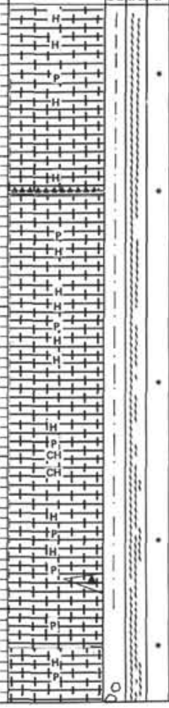
BIOSTRATIGRAPHIC ZONE: NP6 (N); Sediments slumped; P4 (F) NP5 (N)

FOSSIL CHARACTER: FORAMINIFERS RP; NANNOFOSSILS AM; RADIOLARIANS; DIATOMS

SECTION: 1, 2, 3, 4, 5, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES / POLARITY



LITHOLOGIC DESCRIPTION

5YR 8/2

10YR 5/4

7.5YR 8/2

FORAMINIFER NANNOFOSSIL CHALK

This core contains a moderate to highly bioturbated foraminifer nannofossil chalk. The dominant color is pinkish white (7.5YR 8/2). Planolites and halo burrows are identified.

Parallel horizontal and sub-horizontal lamination are present.

A micro normal fault (top of Section 1) and fractures occur in Sections 3 and 5. Sections 5 and Core-Catcher appear to be brecciated. *Whether this is due to drilling or* is real is questionable. This core may represent a slumped sequence. The microfault indicates post depositional tension was present at sometime.

A chert layer occurs in Section 2 at 45 cm, with a chert intraclast (displaced?) in Section 4.

SMEAR SLIDE SUMMARY:

	1-80	2-40	3-80	4-82	5-40
	D	D	D	D	D
Composition:					
Heavy minerals	1	TR	TR	TR	TR
Clay	2	TR	–	–	–
Volcanic glass	–	1	–	2	TR
Palagonite	2	TR	TR	1	–
Carbonate unspecified	10	10	10	10	10
Foraminifers	20	14	45	15	35
Calcareous nannofossils	63	75	43	72	54
Calcareous dinoflagellates	2	–	2	1	1

ORGANIC CARBON AND CARBONATE:

	1-40	2-9	3-8	4-6	5-6
Organic carbon	–	–	–	–	–
Carbonate	91	86	86	88	84

SITE 529 HOLE CORE 33 CORED INTERVAL 303.0–312.5 m

TIME – ROCK UNIT: late Paleocene

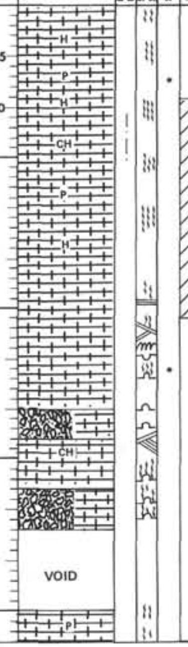
BIOSTRATIGRAPHIC ZONE: NP5 (N) (slumped); NP4 (N); NP3 (N); P3a/b (F) NP4 (N)

FOSSIL CHARACTER: FORAMINIFERS FP; NANNOFOSSILS AM; RADIOLARIANS; DIATOMS

SECTION: 1, 2, 3, 4, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES / POLARITY



LITHOLOGIC DESCRIPTION

N8

5YR 8/1

5Y 6/1

N8

FORAMINIFER NANNOFOSSIL CHALK

This core contains a predominantly very light gray (N8) foraminifer nannofossil chalk.

Starting at the bottom of Section 2 and continuing through Section 4 a series of sedimentary structures suggests a slump or turbidity current deposit.

Beautifully inclined and parallel laminations, current ripples, and flazer bedding is present. Underneath this a high contorted breccia occurs. The breccia includes rotated fragments which have annealed into the surrounding sediment. The bottom of Section 3 contains inclined and horizontal layers which also appear rotated. The breccia continues into Section 4.

Biogenic sedimentary structures are preserved throughout the sections.

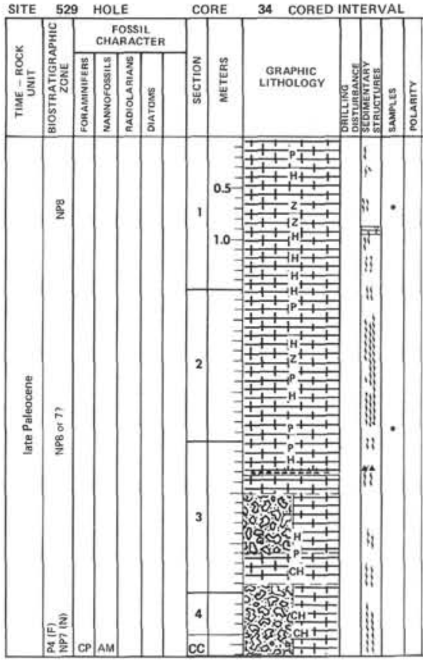
SMEAR SLIDE SUMMARY:

	1-80	3-65
	D	D
Composition:		
Clay	1	–
Volcanic glass	1	3
Palagonite	2	–
Foraminifers	25	20
Calcareous nannofossils	69	77
Calcareous dinoflagellates	2	TR

ORGANIC CARBON AND CARBONATE:

	1-4	2-7	3-7	4-7
Organic carbon	–	–	–	–
Carbonate	91	86	86	76

SITE 529 HOLE CORE 34 CORED INTERVAL 312.5–322.0 m



LITHOLOGIC DESCRIPTION

N8
very light gray

FORAMINIFER NANNOFOSSIL CHALK

This core contains a very light gray (N8) highly bioturbated foraminifer nannofossil chalk. Some horizontal flazer type bedding is observed. Chert is found in Section 3 at 35 cm.

From Section 3 (50 cm) through the Core-Catcher exists an alternating sequence of brecciated chalk and non-brecciated chalk. These are interpreted to represent small slump features.

The biostratigraphic result support this supposition.

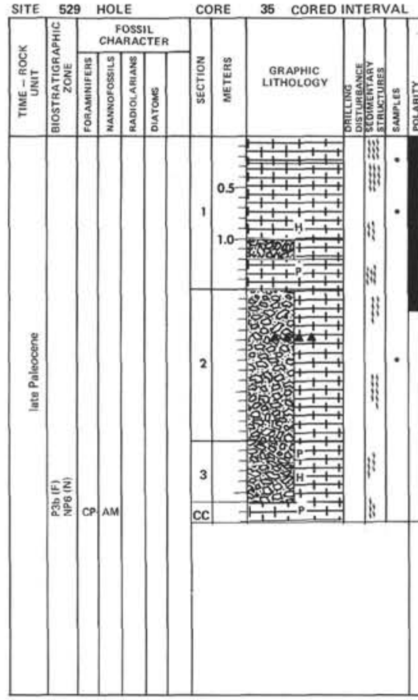
SMEAR SLIDE SUMMARY:

	1-80	2-140
	D	D
Composition:		
Heavy minerals	TR	TR
Volcanic glass	1	TR
Palagonite	1	TR
Carbonate unspecified	10	–
Foraminifers	35	40
Calcareous nannofossils	51	57

ORGANIC CARBON AND CARBONATE:

	1-6	2-6	3-6	4-6
Organic carbon	–	–	–	–
Carbonate	89	90	91	86

SITE 529 HOLE CORE 35 CORED INTERVAL 322.0–331.5 m



LITHOLOGIC DESCRIPTION

10YR 4/2

N8

FORAMINIFER NANNOFOSSIL CHALK AND BRECCIATED FORAMINIFER NANNOFOSSIL CHALK

The core contains a very light gray (N8) foraminifer nannofossil chalk which alternates with a brecciated foraminifer nannofossil chalk. The brecciated areas are interpreted to represent slumped layers.

Chert is present in Section 2.

The top of Section 1 contains a reworked volcanogenic dark yellowish brwon (10YR 4/2) layer, possibly an ash.

Bioturbation is intense and is easily recognized in the non-brecciated areas. Large horizontal and sub-horizontal burrows along with planolites and halo burrows are identified.

SMEAR SLIDE SUMMARY:

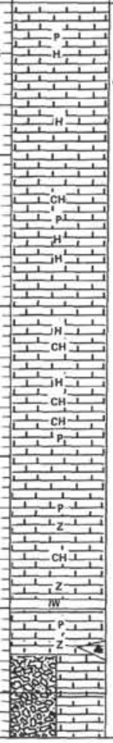
	1-26	1-80	2-80
	M	D	D
Composition:			
Quartz (Volcanic)	15	–	–
Feldspar	20	2	–
Volcanic glass (rock fragments)	20	–	2
Palagonite	–	2	TR
Carbonate unspecified	10	10	10
Foraminifers	–	12	15
Calcareous nannofossils	35	74	71
Calcareous dinoflagellates	–	2	2

ORGANIC CARBON AND CARBONATE:

	1-2	2-2	3-2
Organic carbon	–	–	–
Carbonate	86	79	82

SITE 529 **HOLE** **CORE** 36 **CORED INTERVAL** 331.5–341.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	POLARITY
	P4 (F) NP5 (N)	CP	AM			1, 2, 3, 4, 5, 6	0.5, 1.0					



NB to 5YR 8/1

N8

Chert nodule

LITHOLOGIC DESCRIPTION

NANNOFOSSIL CHALK

This core contains a very light gray (N8) highly bioturbated nannofossil chalk. Biogenic sedimentary structures are well preserved. Most are horizontal to sub-horizontal.

A brecciated zone occurs in Sections 5 and 6. Also present in Section 5 is a chert nodule. The brecciated zone may be a slump.

SMEAR SLIDE SUMMARY:

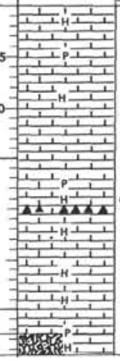
	1-80	3-80	5-13
	D	D	M
Composition:			
Quartz	–	TR	15
Feldspar	–	TR	–
Heavy minerals	–	TR	–
Volcanic glass	1	1	1
Palagonite	TR	1	–
Carbonate unspecified	10	6	5
Foraminifers	8	5	15
Calcareous nannofossils	77	87	64
Calcareous dinoflagellates	4	–	–

ORGANIC CARBON AND CARBONATE:

	1-70	2-70	3-70	4-70	5-59
Organic carbon	–	–	–	–	–
Carbonate	85	85	86	85	86

SITE 529 **HOLE** **CORE** 37 **CORED INTERVAL** 341.0–350.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	POLARITY
late Paleocene	P3b (F) NP5 (N)	CP	AM			1, 2, 3, CC	0.5, 1.0					



N8

LITHOLOGIC DESCRIPTION

NANNOFOSSIL CHALK

A very light gray (N8) nannofossil chalk was recovered. Biogenic mottling is intense. Halo burrows and planolites are abundant along with other horizontal and vertical burrows.

A chert layer is present in Section 1. It is burrowed.

Recrystallization and lithification processes have just about destroyed any foraminifers that were once present.

SMEAR SLIDE SUMMARY:

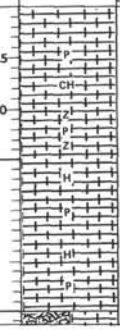
	1-80	2-80
	D	D
Composition:		
Heavy minerals	TR	1
Volcanic glass	1	1
Carbonate unspecified	30	20
Foraminifers	5	5
Calcareous nannofossils	64	71
Calcareous dinoflagellates	–	2

ORGANIC CARBON AND CARBONATE:

	1-41	2-41
Organic carbon	–	–
Carbonate	88	84

SITE 529 **HOLE** **CORE** 38 **CORED INTERVAL** 350.0–360.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	POLARITY
late Paleocene	P3b (F) NP3/4 (N)	AP	AM			1, 2, CC	0.5, 1.0					



N8

LITHOLOGIC DESCRIPTION

FORAMINIFER NANNOFOSSIL CHALK

A very light gray (N8) highly bioturbated foraminifer nannofossil chalk is present.

Biogenic sedimentary structures are abundant and well preserved.

Foraminifer and calcareous dinoflagellates are well preserved in smear slides.

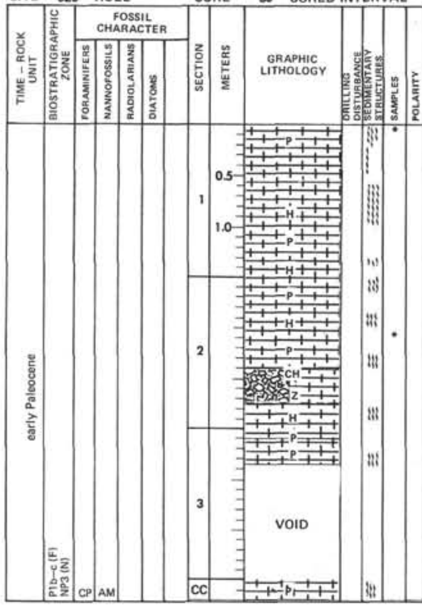
SMEAR SLIDE SUMMARY:

	1-80	2-80
	D	D
Composition:		
Heavy minerals	2	2
Volcanic glass	1	1
Palagonite	1	1
Carbonate unspecified	–	1
Foraminifers	20	15
Calcareous nannofossils	61	75
Calcareous dinoflagellates	15	5

ORGANIC CARBON AND CARBONATE:

	1-50	2-50
Organic carbon	–	–
Carbonate	86	86

SITE 529 HOLE CORE 39 CORED INTERVAL 360.0–369.5 m



LITHOLOGIC DESCRIPTION

5Y 8/1
5Y 6/1
5Y 8/1
5Y 6/1

FORAMINIFER NANNOFOSSIL CHALK

A multicolored, but predominantly yellowish gray (5Y 8/1) and light olive gray (5Y 6/1) foraminifer nannofossil chalk was recovered. Mottling, attributed to biogenic organisms is intense. Composite burrows, halo burrows, and planolites are identified. Large horizontal to sub-horizontal burrows are also present.

A brecciated zone occurs in Section 2 at 90–120 cm

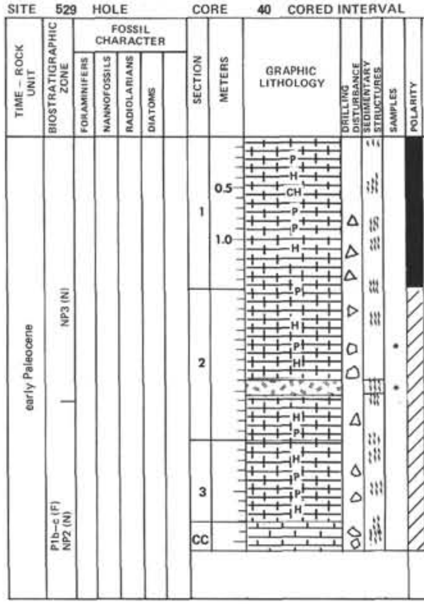
SMEAR SLIDE SUMMARY:

	1-10	2-60
	M	D
Composition:		
Quartz	2	TR
Heavy minerals	TR	–
Volcanic glass	3	3
Palagonite	–	1
Carbonate unspecified	5	–
Foraminifers	10	20
Calcareous nannofossils	75	76
Calcareous dinoflagellates	5	–

ORGANIC CARBON AND CARBONATE:

	1-11	2-11
Organic carbon	–	–
Carbonate	72	79

SITE 529 HOLE CORE 40 CORED INTERVAL 369.5–379.0 m



LITHOLOGIC DESCRIPTION

2.5Y 7/2
2.5Y 6/2
5Y 8/1
5Y 6/1
5G 4/1

BRECCIATED FORAMINIFER NANNOFOSSIL CHALK

This core contains a highly bioturbated light gray (2.5Y 7/2) to light olive gray (5Y 6/1) foraminifer nannofossil chalk. The core from midway in Section 1 to the Core-Catcher is brecciated. This is interpreted to be due to drilling because of the low recovery.

A greenish gray volcanic ash layer is present in Section 2. It is highly bioturbated and has been reworked.

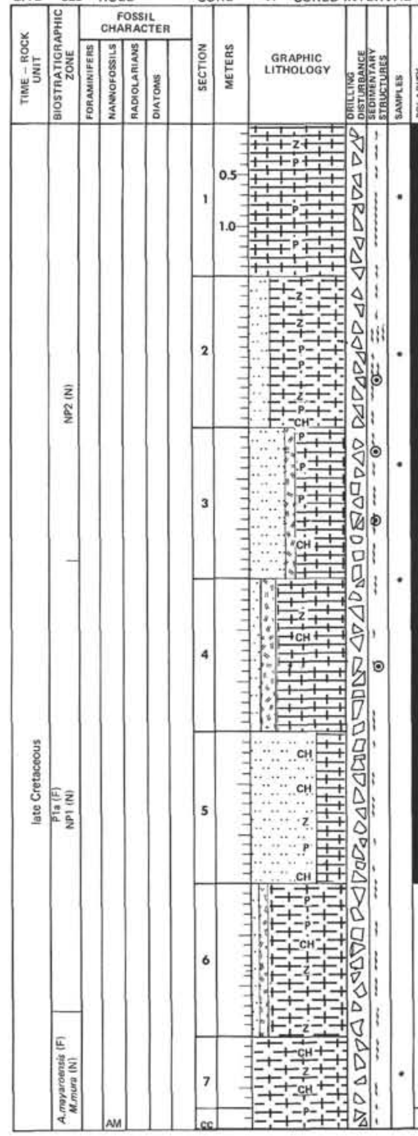
SMEAR SLIDE SUMMARY:

	2-65	2-94
	D	M
Composition:		
Quartz	5	5
Volcanic glass	2	77
Palagonite	1	15
Carbonate unspecified	5	1
Foraminifers	10	–
Calcareous nannofossils	74	2
Calcareous dinofigellates	3	–

ORGANIC CARBON AND CARBONATE:

	1-19	2-19	3-19
Organic carbon	–	–	–
Carbonate	74	72	74

SITE 529 HOLE CORE 41 CORED INTERVAL 379.0–385.5 m



LITHOLOGIC DESCRIPTION

5Y 6/1
N8
5Y 6/1
N8
5Y 6/1 +
N8 +
10YR 4/2
5Y 6/1,
N8 and
10YR 4/2
5Y 6/1,
10YR 4/2,
10YR 6/2
10YR 7/2,
10YR 4/2,
10YR 6/2
10YR 6/2

FORAMINIFER NANNOFOSSIL CHALK AND VOLCANICLASTIC ASH AND SILTSTONE

This core contains an alternating sequence of a light olive gray (5Y 6/1) to very light gray (N8) foraminifer nannofossil ooze, a dark yellowish brown (10YR 6/2) nannofossil volcaniclastic siltstone and a dusky blue (5PB 9/2) volcanic ash.

Biogenic sedimentary structures are well preserved. The organisms that produced these structures have reworked much of the sediments.

The entire core is brecciated, most likely due to drilling. The volcaniclastic layers are brecciated to a greater extent and in many instances have ash at the base. However, the volcaniclastic layers have been transported to the site either by currents or slumping.

The Tertiary–Cretaceous boundary is located in Section 6 at approximately 130 cm.

SMEAR SLIDE SUMMARY:

	1-80	2-80	3-40	4-10	7-40
	D	D	M	M	D
Texture:					
Sand	–	–	10	–	–
Silt	–	–	70	–	–
Clay	–	–	20	–	–
Composition:					
Quartz	3	–	30	15	–
Feldspar	TR	–	–	–	–
Heavy minerals	TR	–	5	TR	–
Volcanic glass	1	TR	40	50	–
Palagonite	1	–	–	–	TR
Pyrite	TR	–	2	TR	–
Foraminifers	15	TR	–	–	–
Calcareous nannofossils	80	100	23	35	100
Dolomite	TR	–	–	–	–

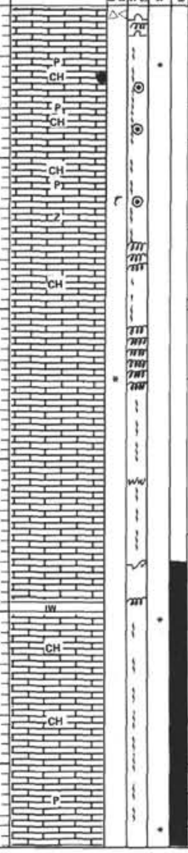
ORGANIC CARBON AND CARBONATE:

	1-9	2-21	3-61	4-20	5-55	6-103	7-67
Organic carbon	–	–	–	–	–	–	–
Carbonate	55	75	47	68	10	63	70

SITE 529 HOLE CORE 42 CORED INTERVAL 388.5–398.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
late Cretaceous	*A. mayaroensis* (F) *M. mura* (N)	AF	AM			1, 2, 3, 4, 5, 6, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES / POLARITY



LITHOLOGIC DESCRIPTION

5Y 6/1
5G 8/1
5Y 8/1
N8
5Y 6/1
5Y 6/1
N8
5Y 4/1 and 5Y 6/1
N8
5Y 6/1, N8, 10YR 7/2, and 5B 9/1
5Y 6/1, 5B 9/1, N8 and 10YR 7/1
10YR 6/2, 10YR 4/2, 5B 9/1
N8
5Y 4/1

NANNOFOSSIL LIMESTONE

This core contains a light olive gray (5Y 6/1) to light greenish gray (5G 8/1) highly bioturbated limestone. Superb examples of convolute bedding, contorted beds, overturned folds, faults, and drag folds are observed. These features are interpreted to be the result of slumping but some of the convolute laminations may be the result of liquification due to weight of overlying sediments.

Mollusk shells are observed in Sections 3 and 4, as well as parallel laminations, wavy bedding, and flazer bedding. These indicate that currents were operative in the area.

Biogenic sedimentary structures are well preserved.

SMEAR SLIDE SUMMARY:

	1-70	3-70	5-15	CC
	D	D	M	D
Composition:				
Quartz	–	–	–	TR
Feldspar	–	TR	TR	–
Heavy minerals	–	TR	TR	–
Clay	–	–	–	2
Volcanic glass	5	TR	2	20
Palagonite	2	TR	10	–
Pyrite	–	TR	–	–
Foraminifers	TR	TR	–	–
Calcareous nannofossils	93	100	88	80

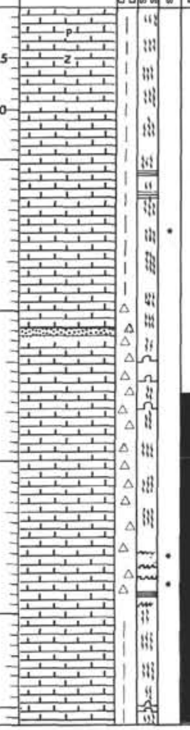
ORGANIC CARBON AND CARBONATE:

	1-41	2-51	3-101	4-8	5-20
Organic carbon	–	–	–	–	–
Carbonate	68	63	84	61	63

SITE 529 HOLE CORE 43 CORED INTERVAL 398.0–407.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
late Cretaceous	*A. mayaroensis* (F) *M. mura* (N)	PF	AM			1, 2, 3, 4, 5, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES / POLARITY



LITHOLOGIC DESCRIPTION

10YR 7/2 to 10YR 8/1 to 10YR 6/2
10YR 7/2 to 10YR 8/1 to 10YR 8/2
10YR 7/2 10YR 8/1 10YR 8/2
10YR 7/2 10YR 8/1
10YR 8/2
10YR 6/2

INDURATED NANNOFOSSIL CHALK

The recovered core contains a very indurated light gray (10YR 7/2) highly bioturbated nannofossil chalk.

The gray color alternates with a white (10YR 8/1) throughout the core. Patterns repeat about every 40 cm. Ichnogenera are well preserved with zoophycus, chrondrites, composite, and halo burrows identified.

A small volcaniclastic layer is present in Section 3.

Load casts and slump fold are present but not to the extent as in the previous core.

SMEAR SLIDE SUMMARY:

	2-80	4-95	4-126
	D	D	D
Composition:			
Quartz	TR	2	
Feldspar	–	TR	
Heavy minerals	–	1	–
Clay	–	–	TR
Volcanic glass	–	1	–
Palagonite	–	TR	–
Pyrite	–	TR	–
Carbonate unspecified	TR	2	TR
Foraminifers	–	1	TR
Calcareous nannofossils	100	93	100
Hematite	–	–	TR

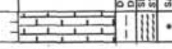
ORGANIC CARBON AND CARBONATE:

	1-10	2-10	3-10	4-10
Organic carbon	–	–	–	–
Carbonate	75	77	75	70

SITE 529 HOLE CORE 44 CORED INTERVAL 407.5–417.0 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
						1	

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

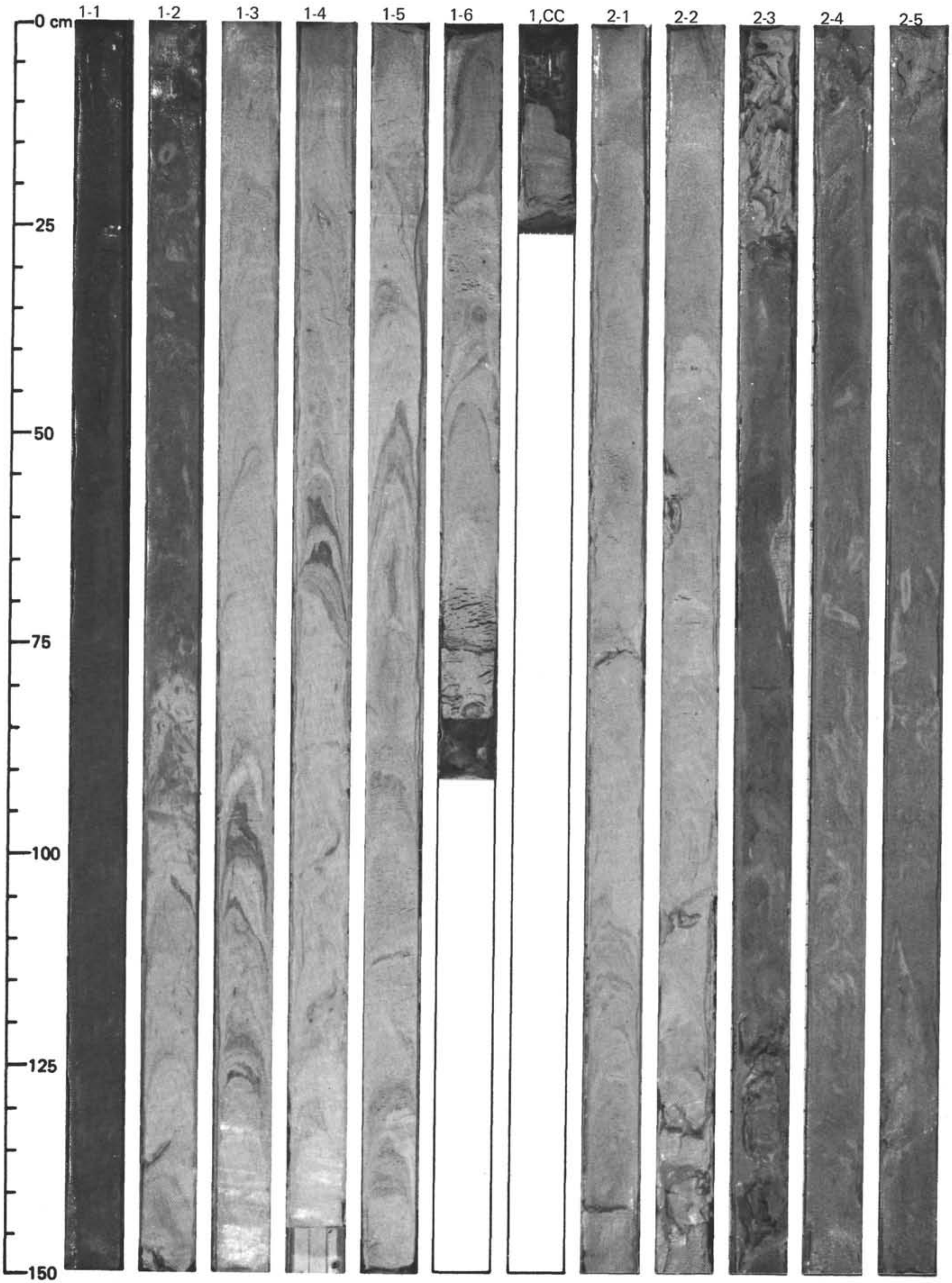
10YR 6/2

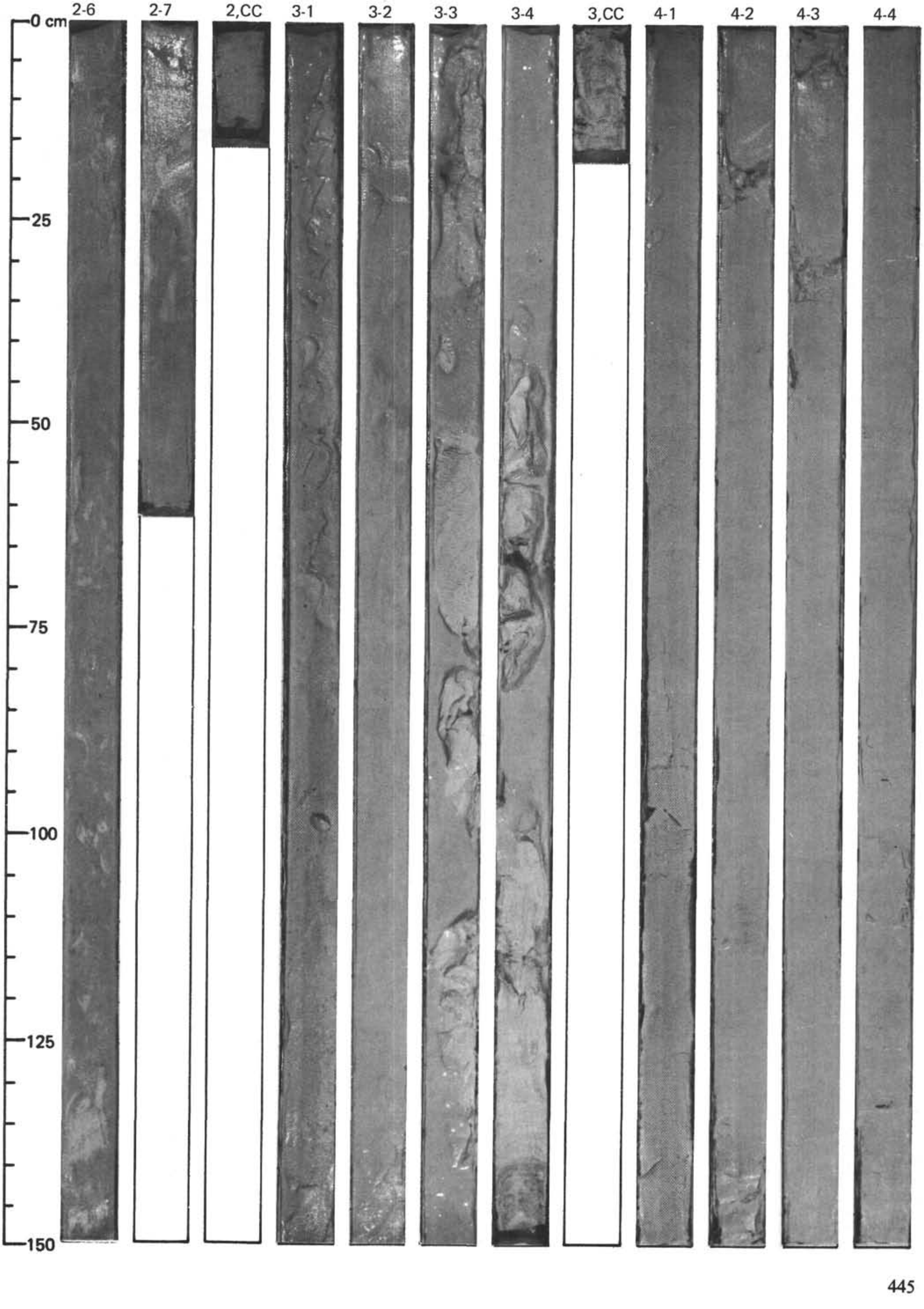
NANNOFOSSIL CHALK

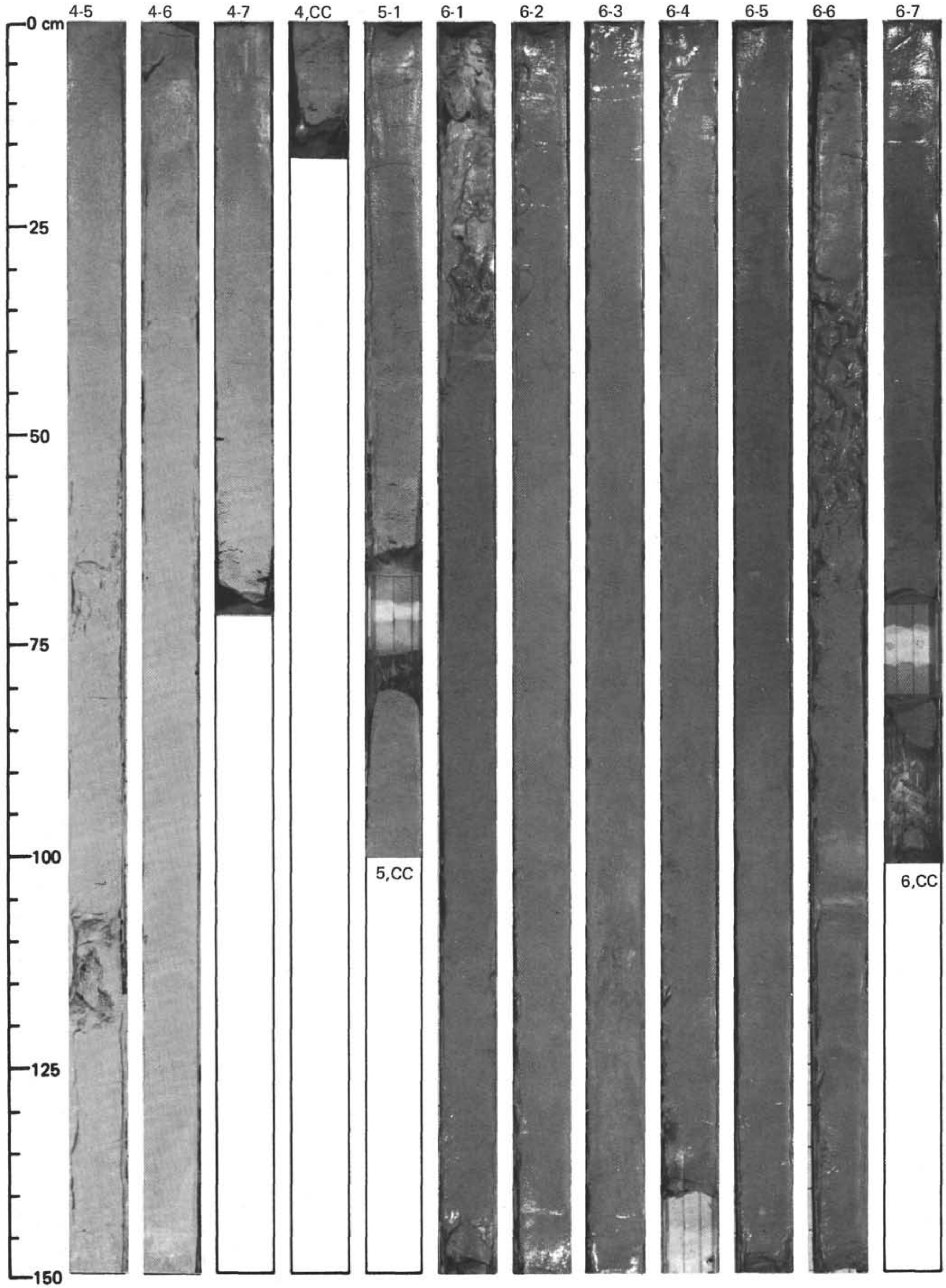
The last core drilled on Leg 74 contains a pale brown nannofossil chalk. The 25 cm recovered chalk is highly bioturbated with excellent preservation of ichnogenera.

SMEAR SLIDE SUMMARY:

	1-15
	D
Composition:	
Quartz	1
Clay	5
Palagonite	TR
Foraminifers	TR
Calcareous nannofossils	94


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


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


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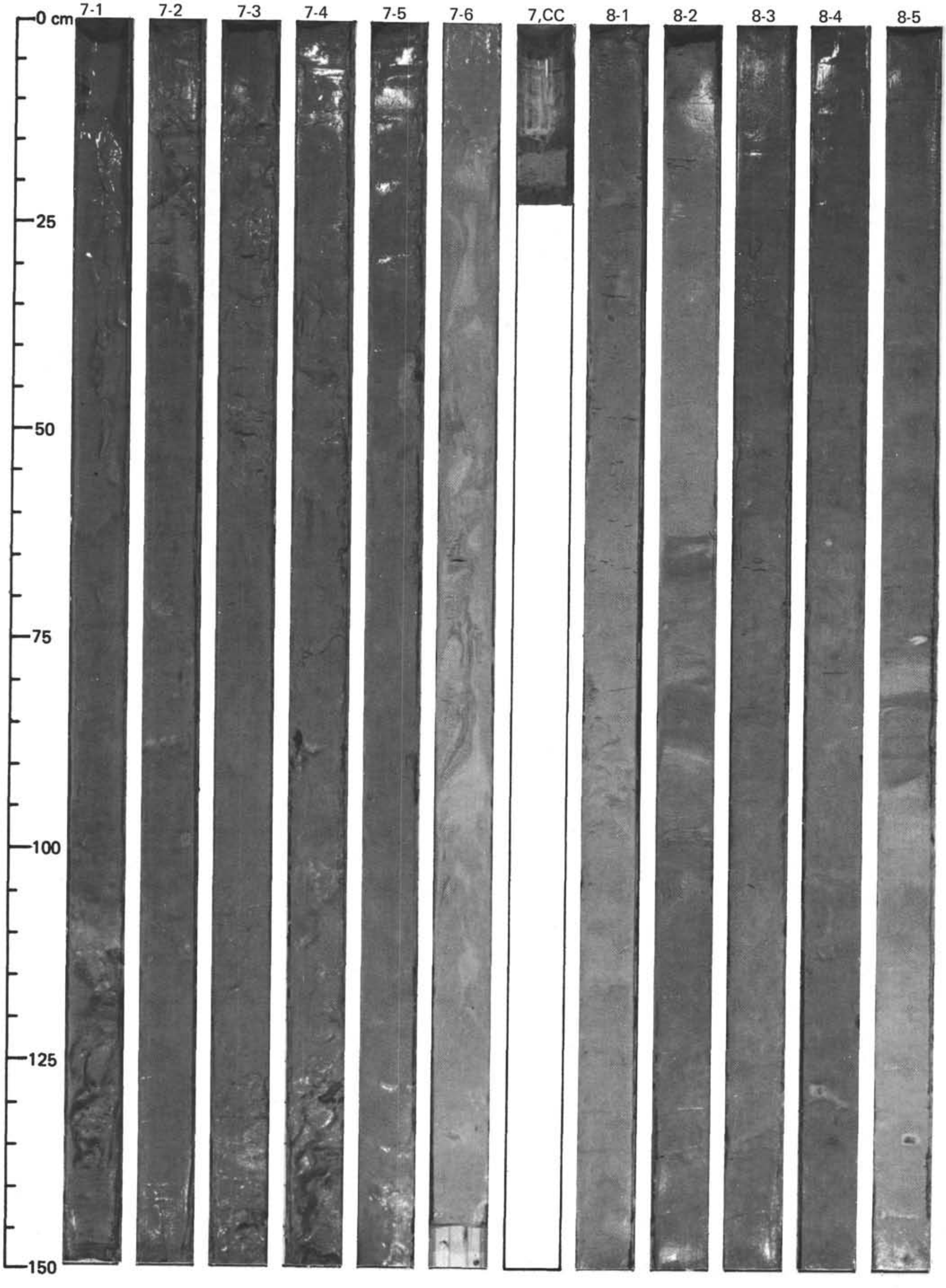
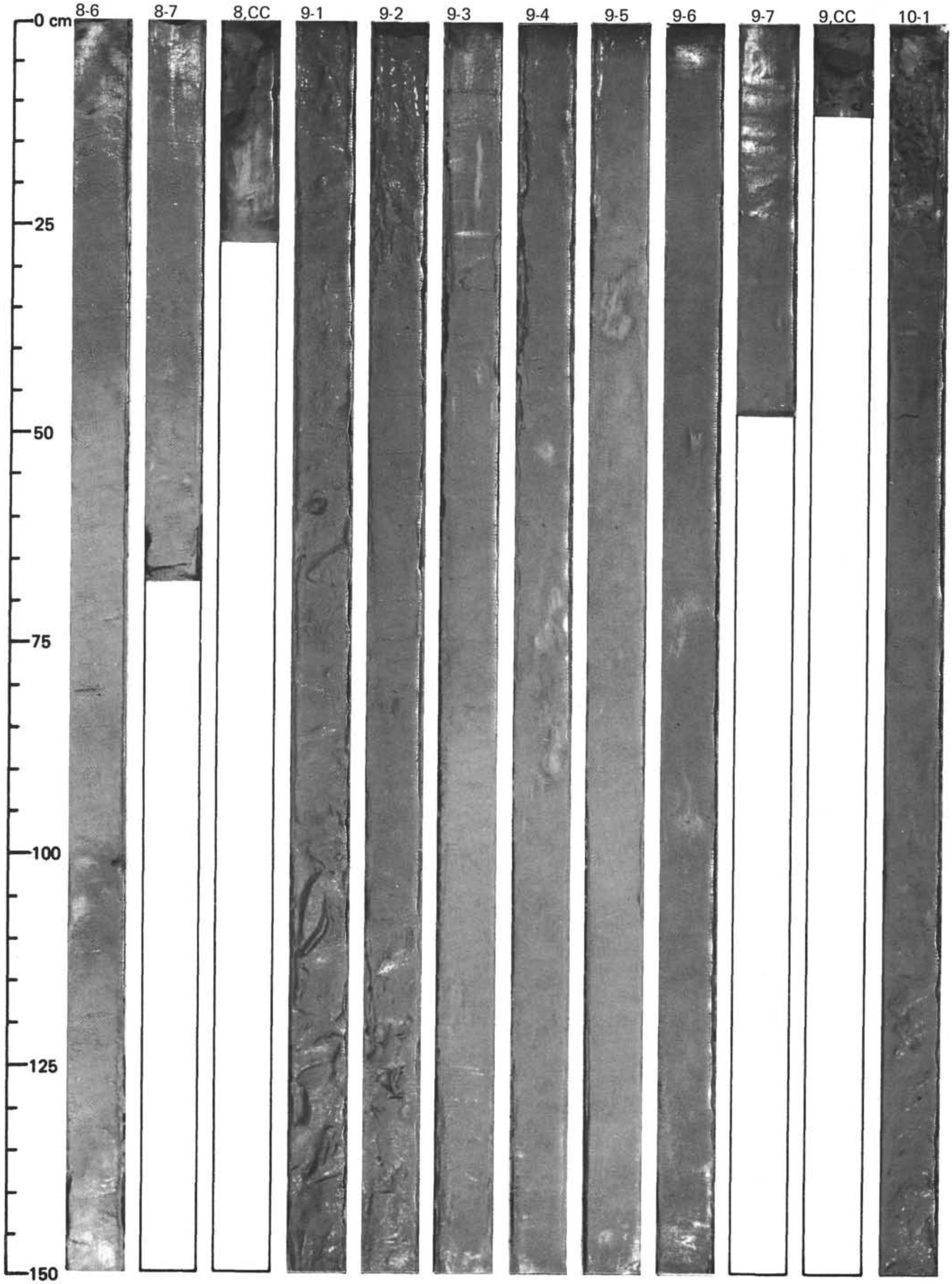
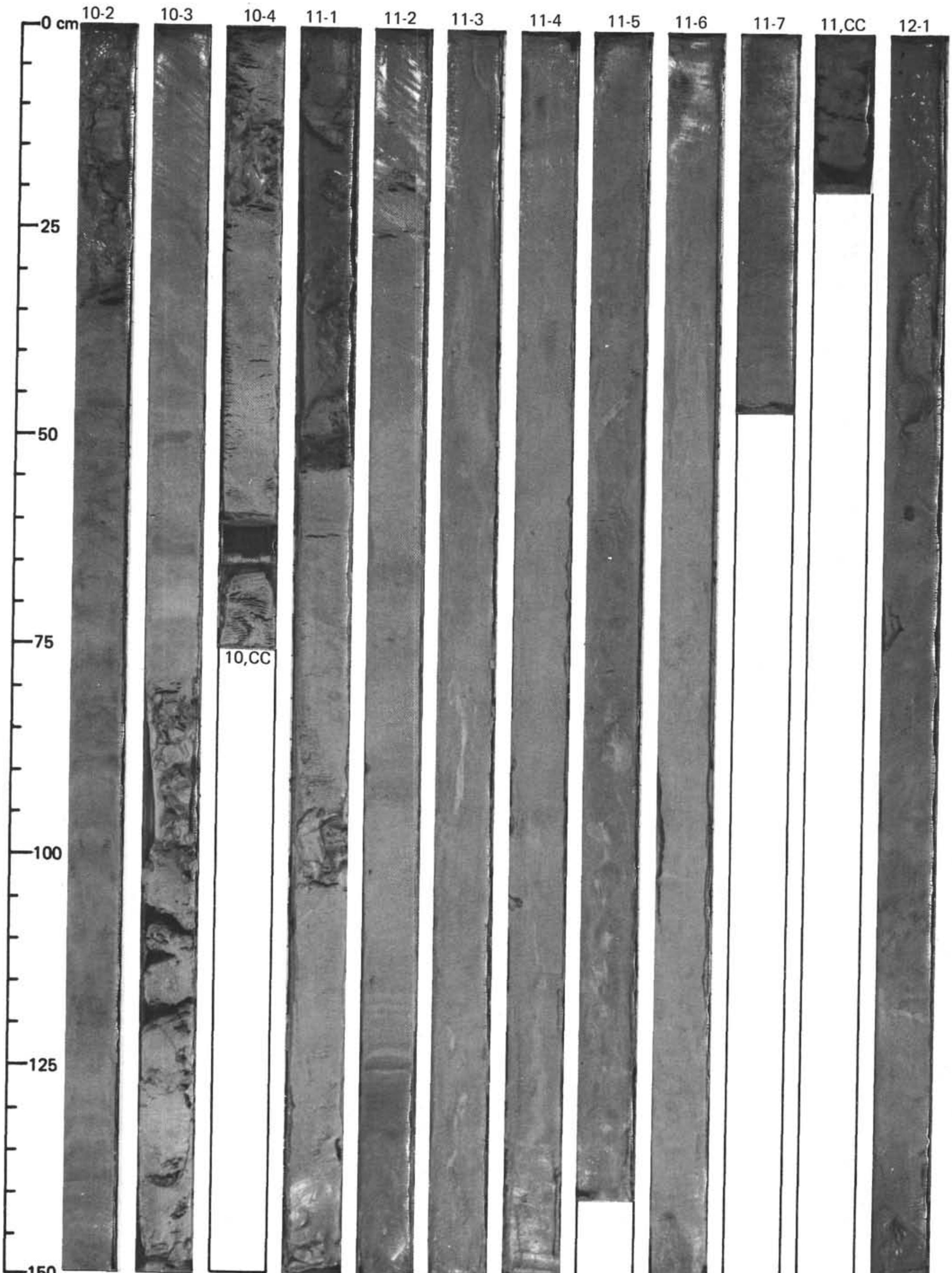
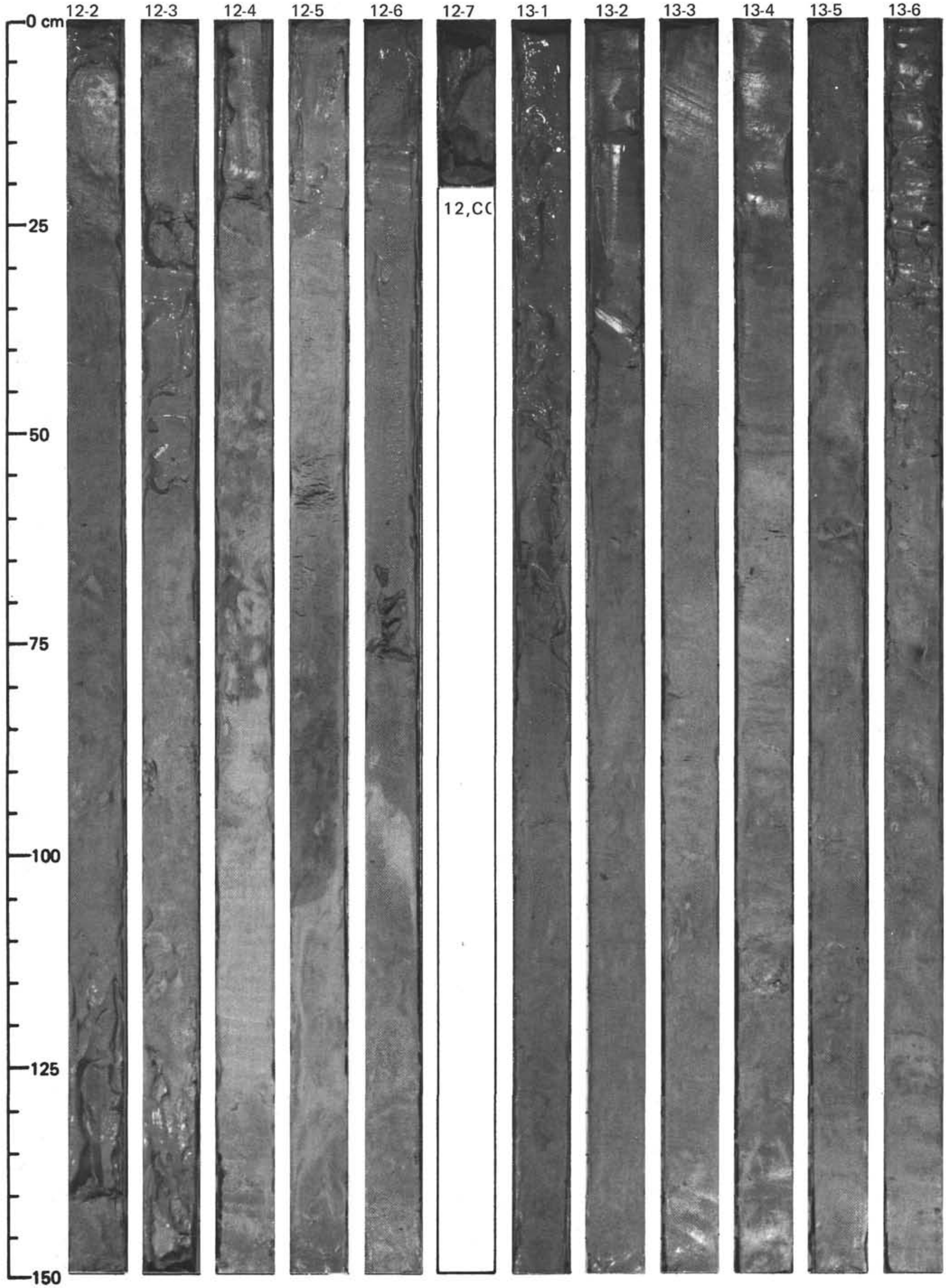
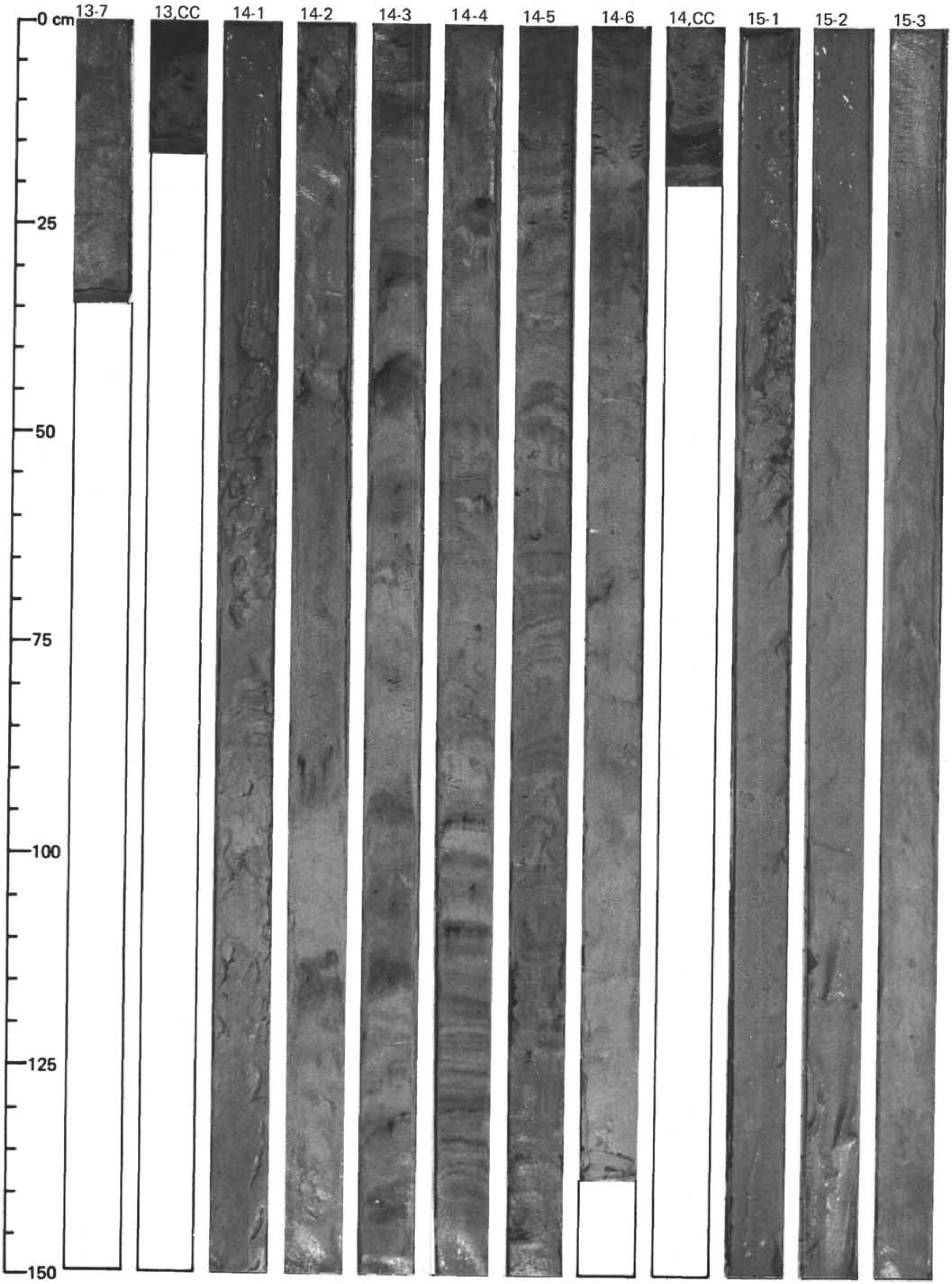
125
150
4-5
4-6
4-7
4,CC
5-1
6-1
6-2
6-3
6-4
6-5
6-6
6-7
5,CC
6,CC


0 cm
25
50
75
100
125
150
7-1
7-2
7-3
7-4
7-5
7-6
7,CC
8-1
8-2
8-3
8-4
8-5


0 cm
25
50
75
100
125
150
8-6
8-7
8,CC
9-1
9-2
9-3
9-4
9-5
9-6
9-7
9,CC
10-1


0 cm
25
50
75
100
125
150
10-2
10-3
10-4
10,CC
11-1
11-2
11-3
11-4
11-5
11-6
11-7
11,CC
12-1


0 cm
25
50
75
100
125
150
12-2
12-3
12-4
12-5
12-6
12-7
12,CC
13-1
13-2
13-3
13-4
13-5
13-6


0 cm
25
50
75
100
125
150
13-7
13,CC
14-1
14-2
14-3
14-4
14-5
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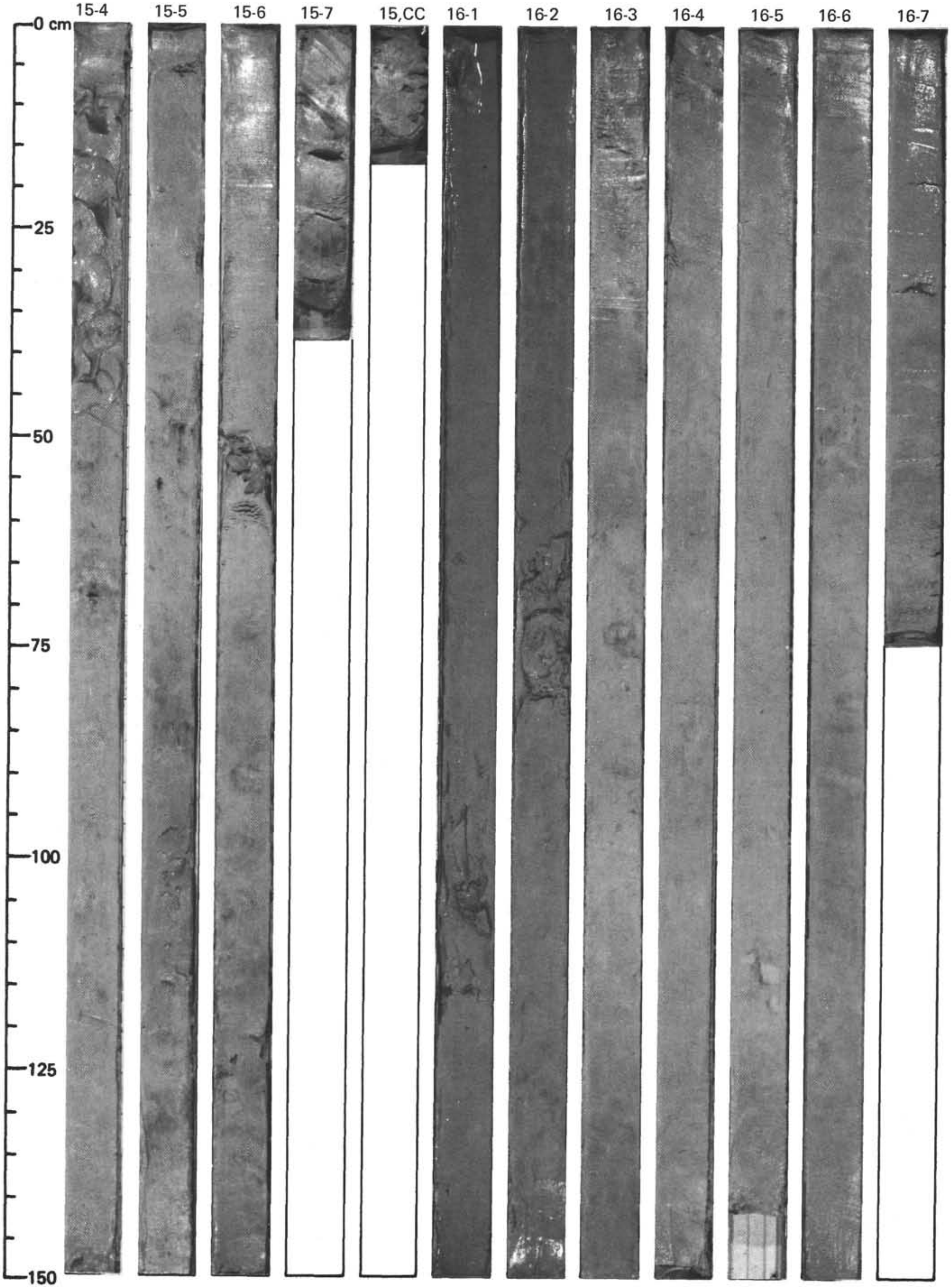
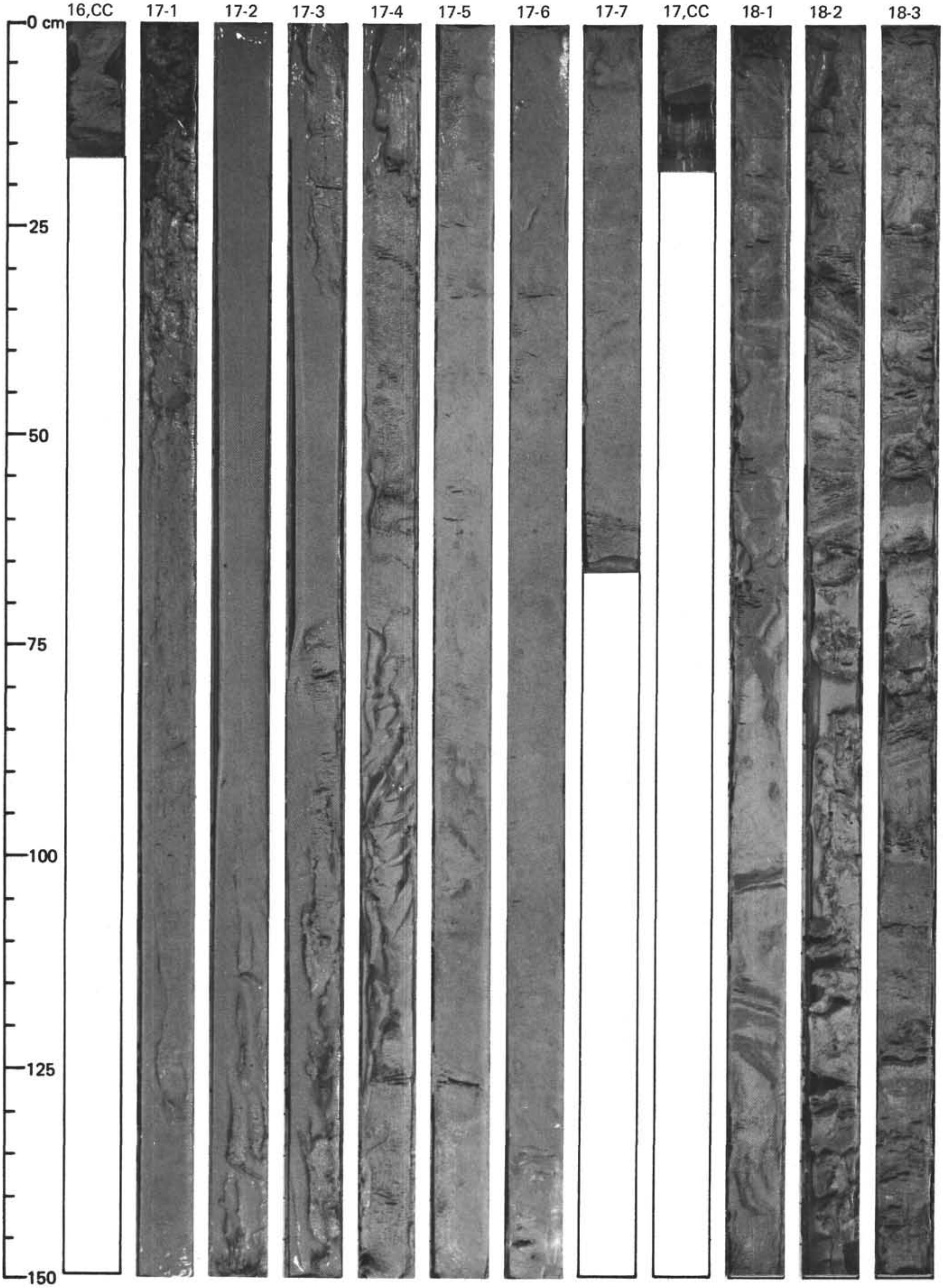
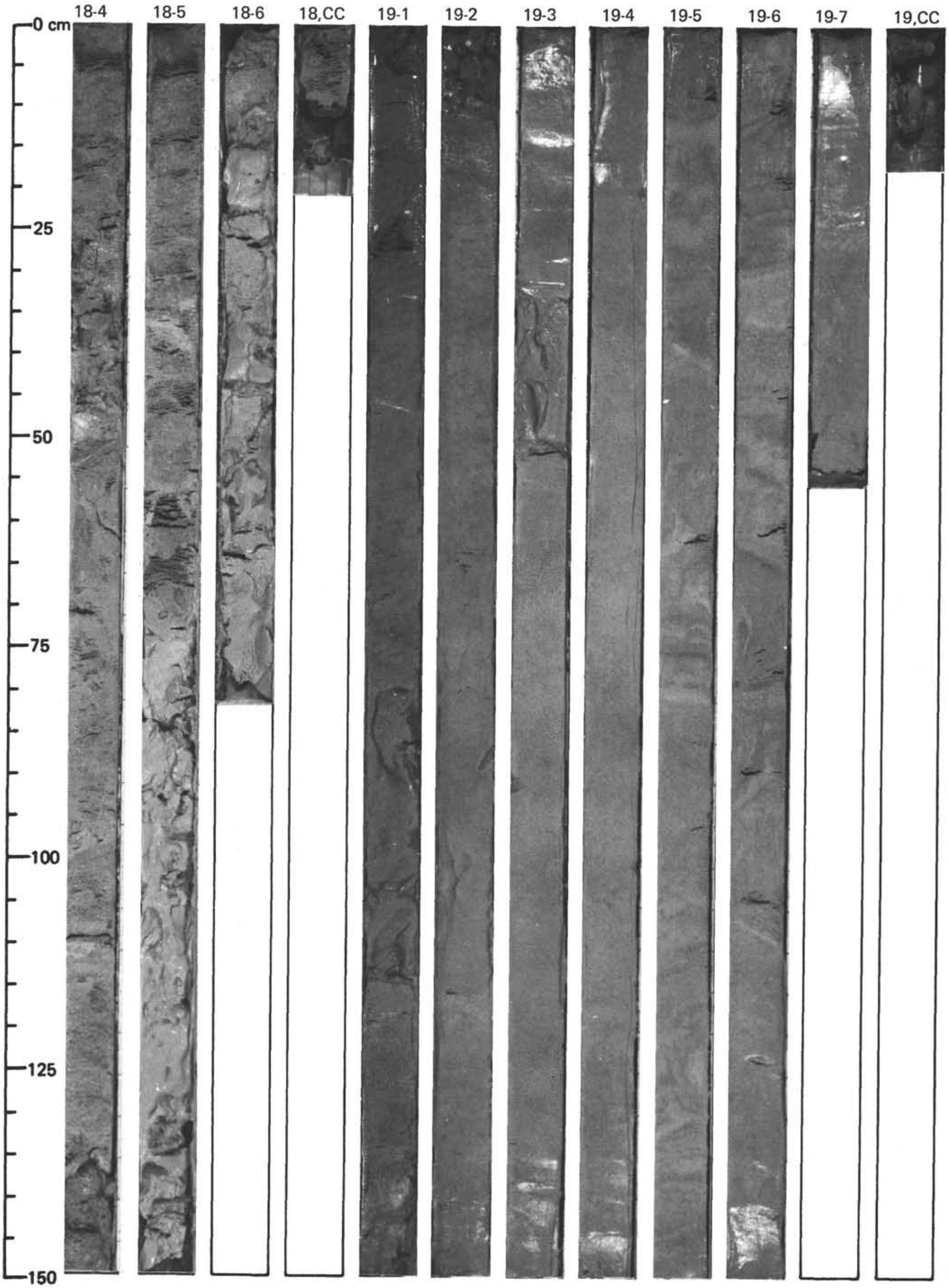
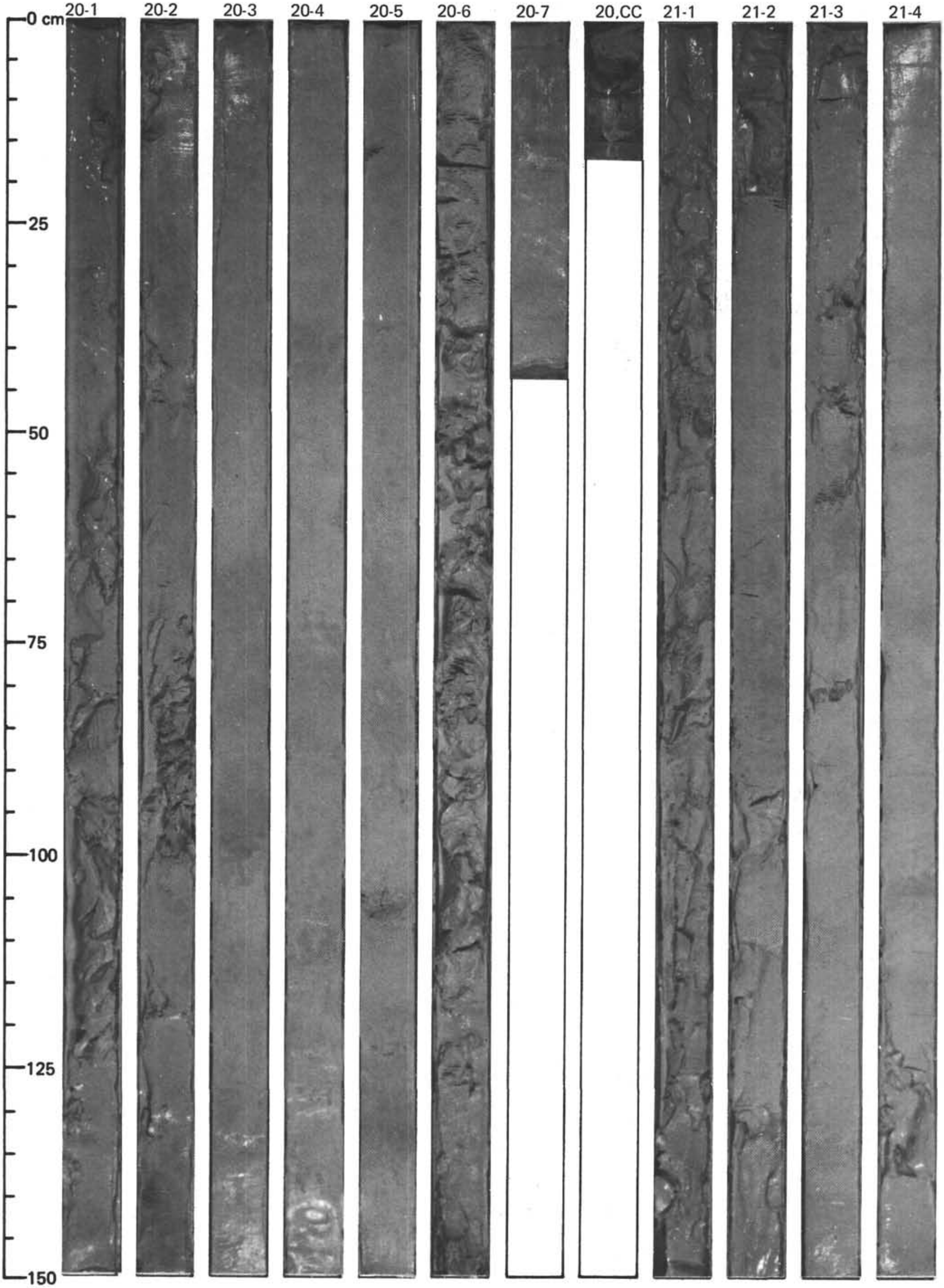
14,CC
15-1
15-2
15-3


15-4
15-5
15-6
15-7
15,CC
16-1
16-2
16-3
16-4
16-5
16-6
16-7
0 cm
25
50
75
100
125
150


16,CC
17-1
17-2
17-3
17-4
17-5
17-6
17-7
17,CC
18-1
18-2
18-3
0 cm
25
50
75
100
125
150


18-4
18-5
18-6
18,CC
19-1
19-2
19-3
19-4
19-5
19-6
19-7
19,CC
0 cm
25
50
75
100
125
150


0 cm
25
50
75
100
125
150
20-1
20-2
20-3
20-4
20-5
20-6
20-7
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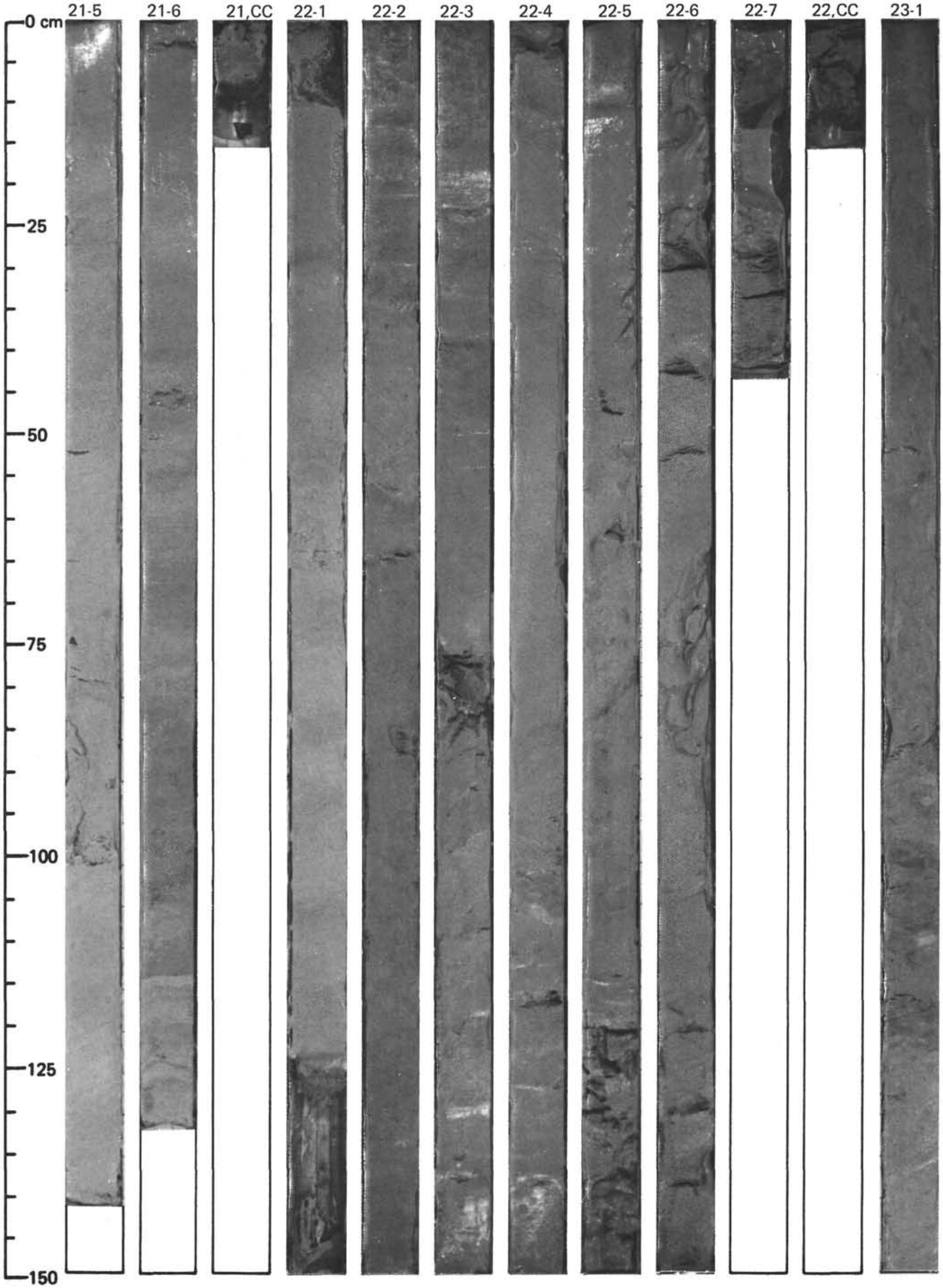
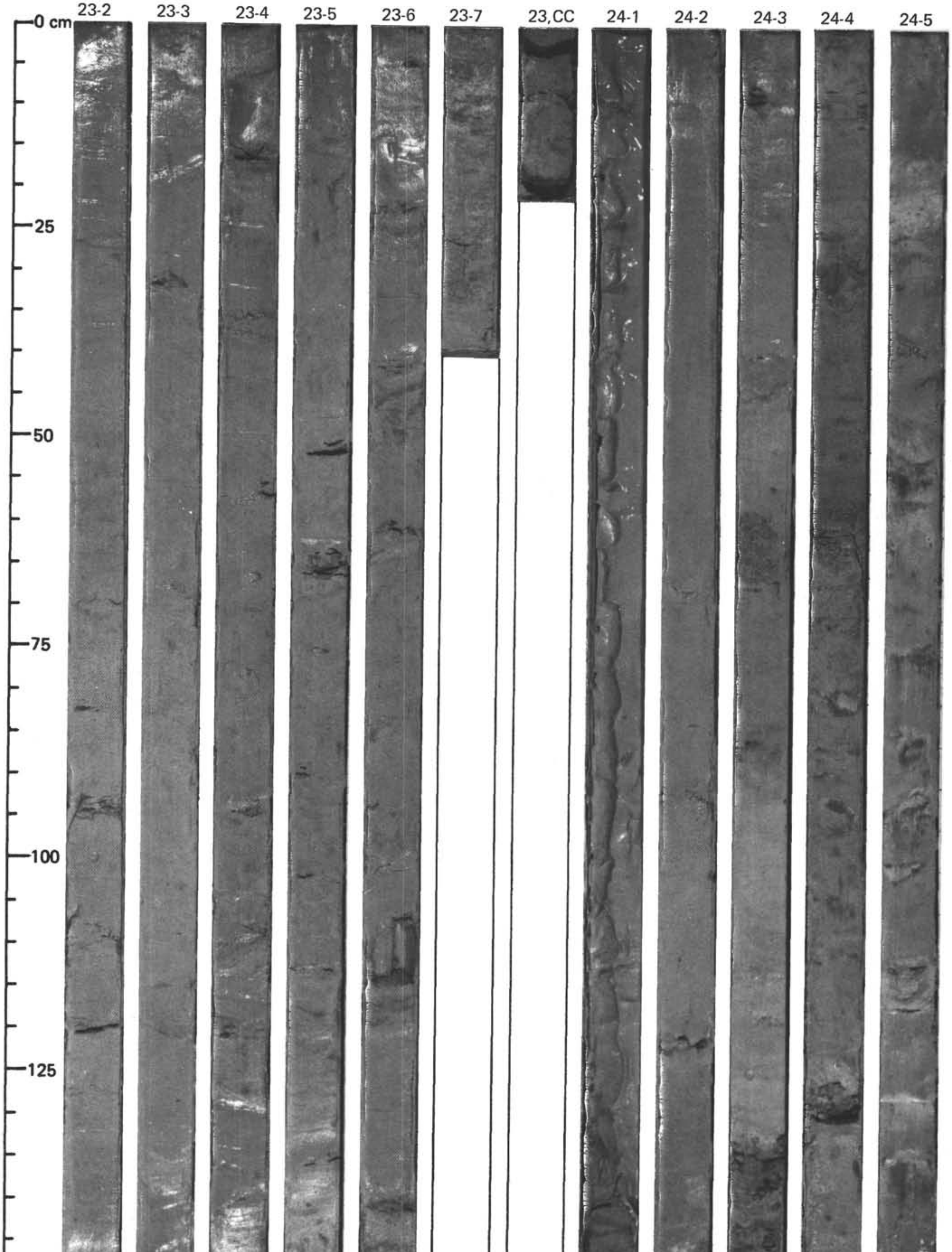
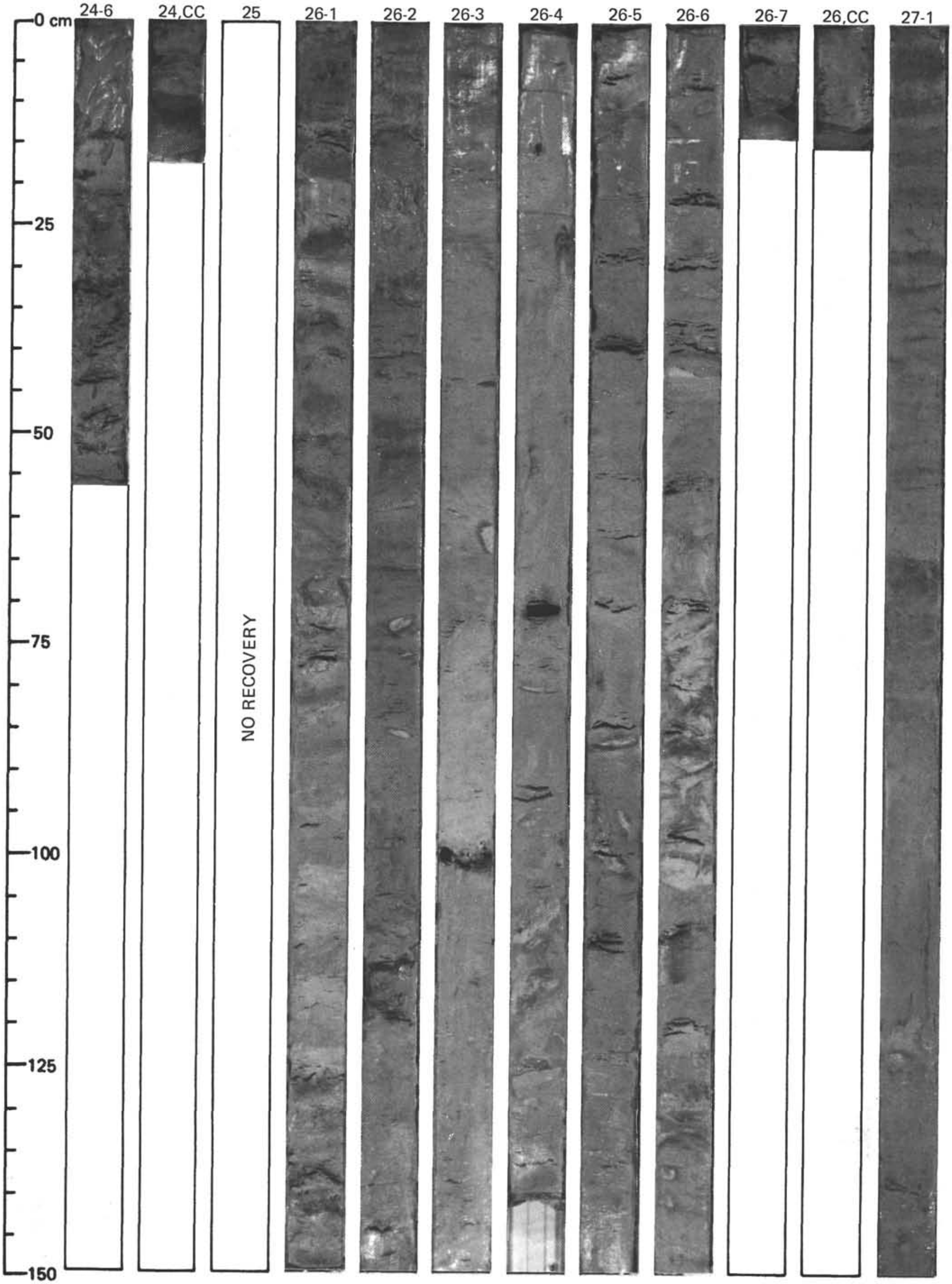
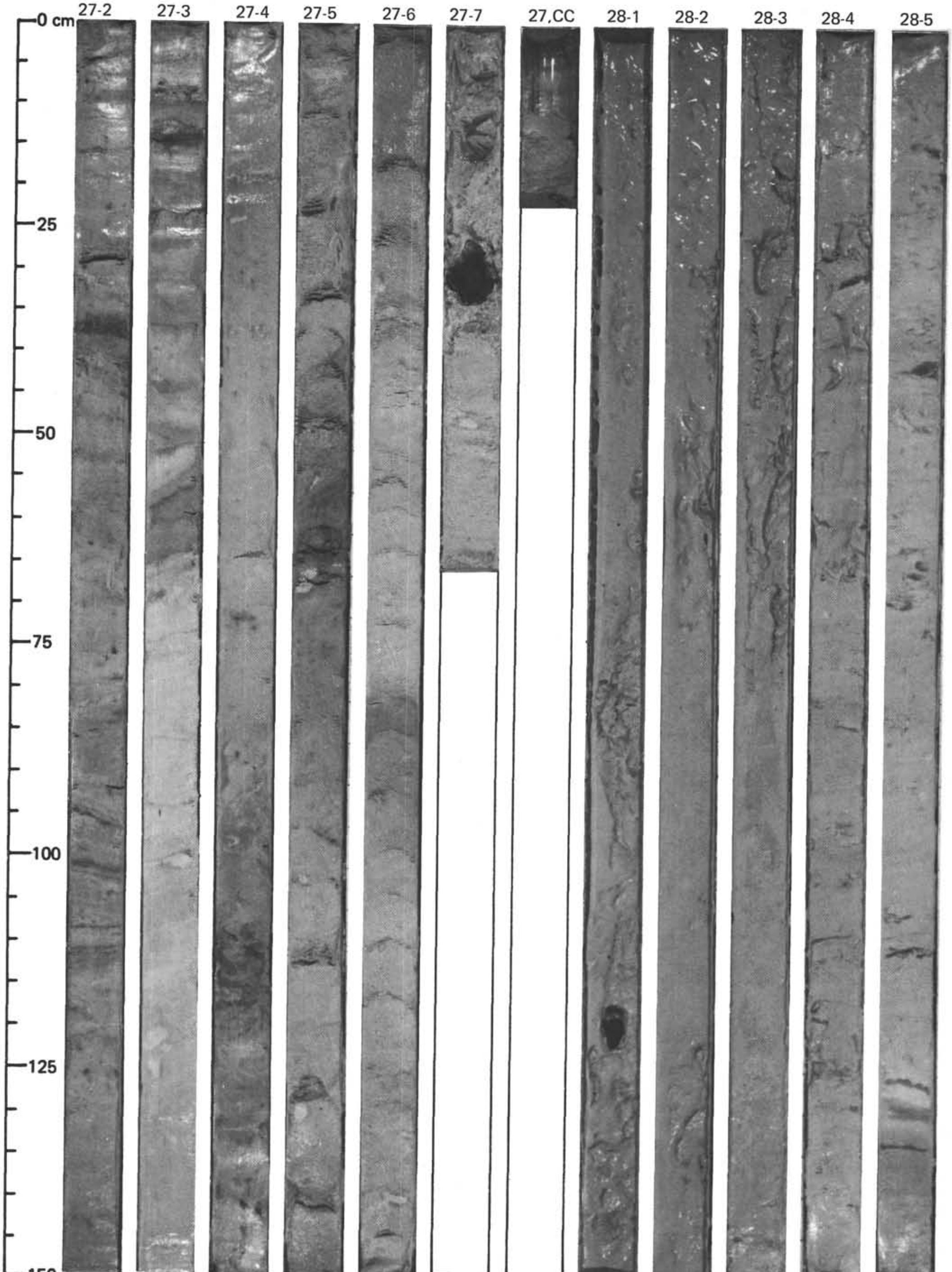
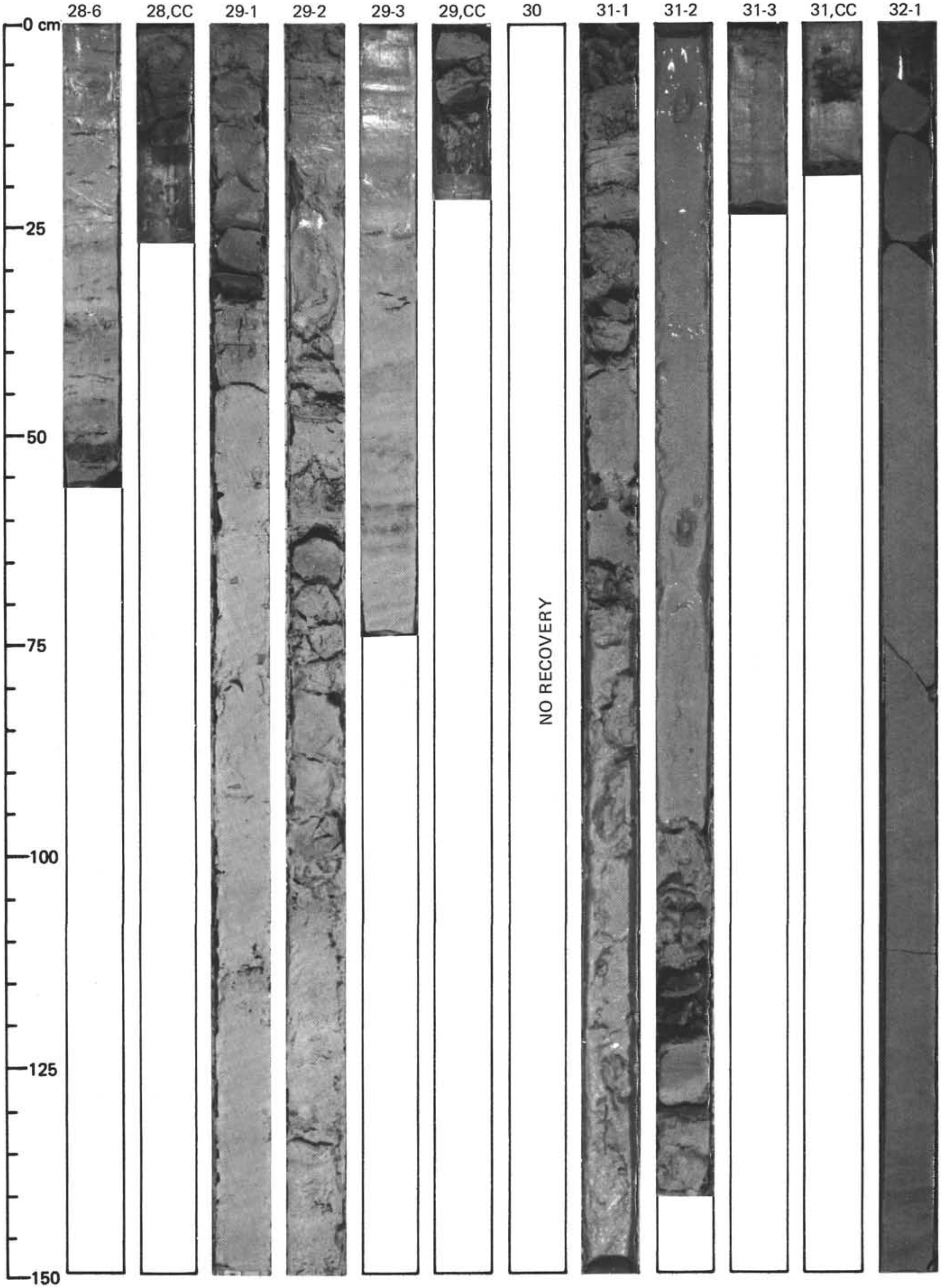
21-1
21-2
21-3
21-4

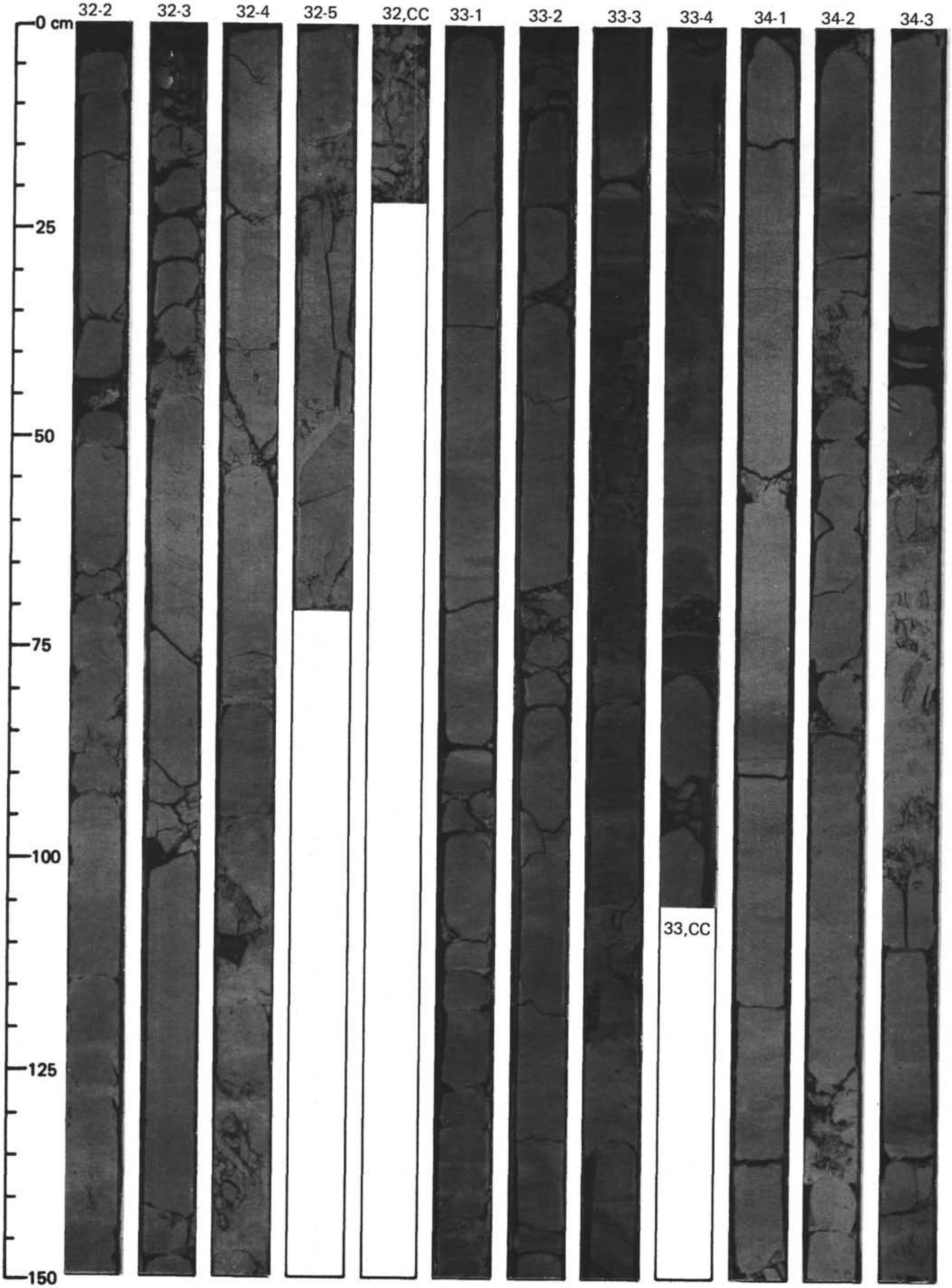

0 cm
25
50
75
100
125
150
21-5
21-6
21,CC
22-1
22-2
22-3
22-4
22-5
22-6
22-7
22,CC
23-1

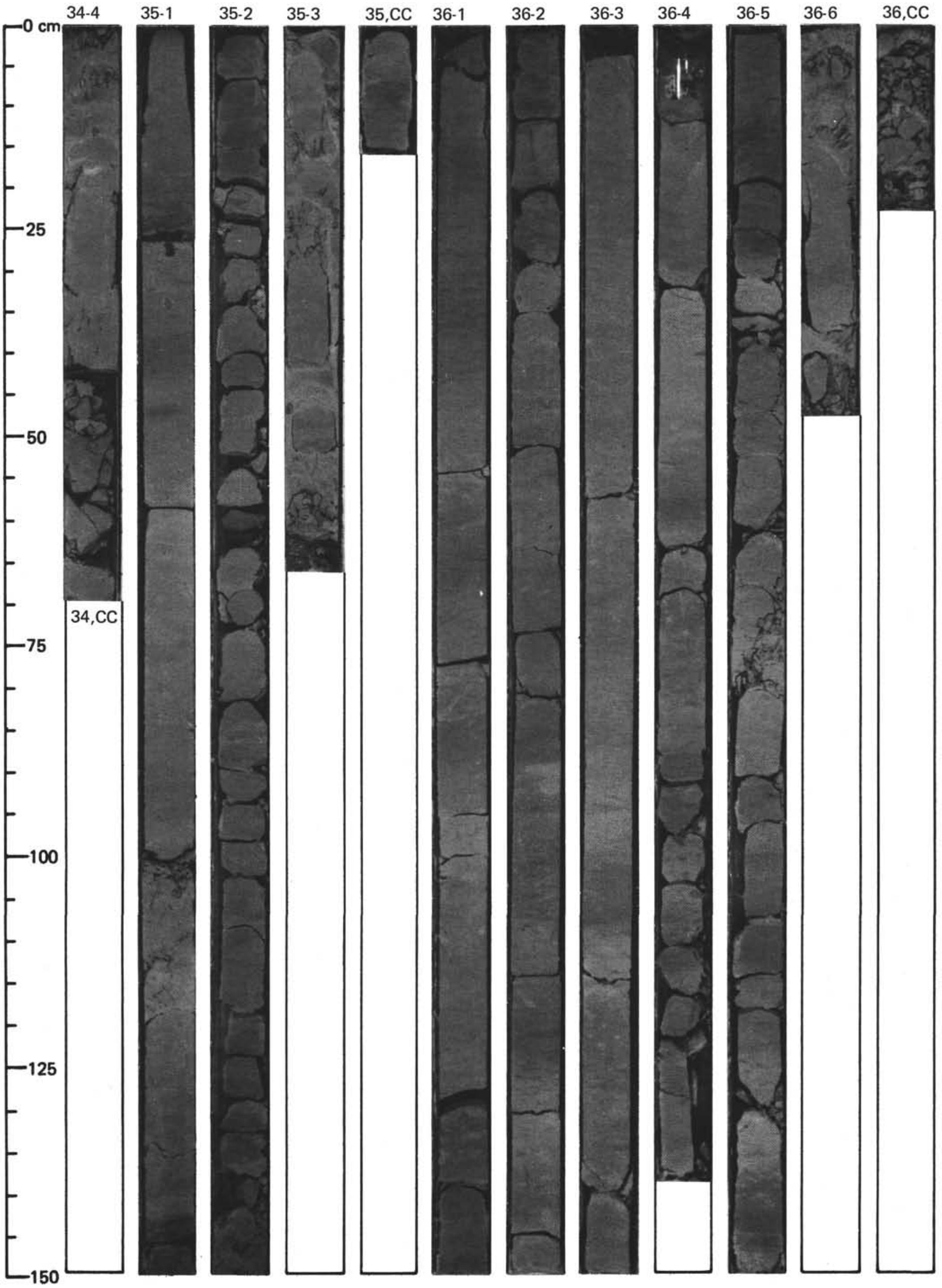

0 cm
25
50
75
100
125
150
23-2
23-3
23-4
23-5
23-6
23-7
23,CC
24-1
24-2
24-3
24-4
24-5

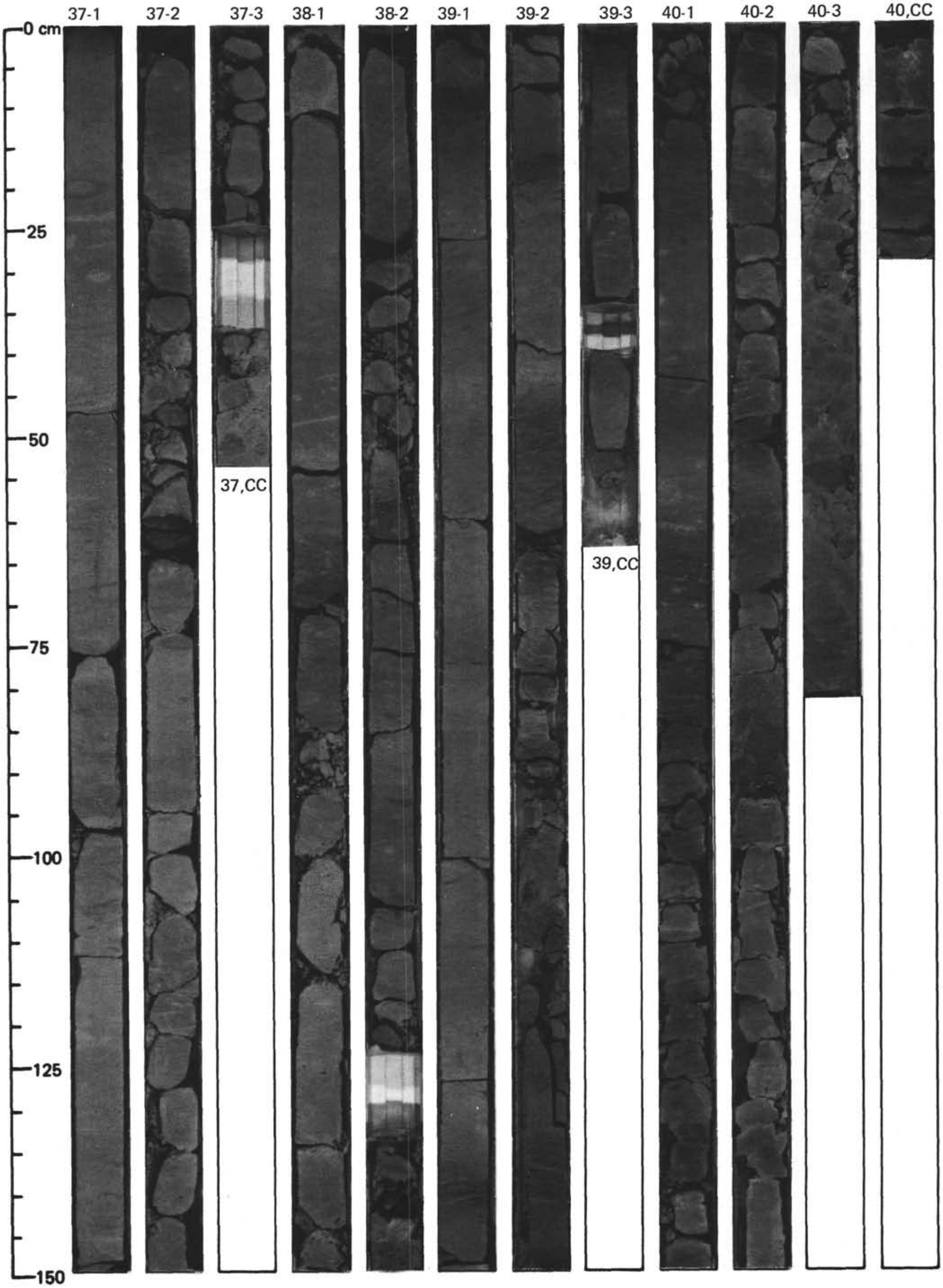

0 cm
25
50
75
100
125
150
24-6
24,CC
25
NO RECOVERY
26-1
26-2
26-3
26-4
26-5
26-6
26-7
26,CC
27-1

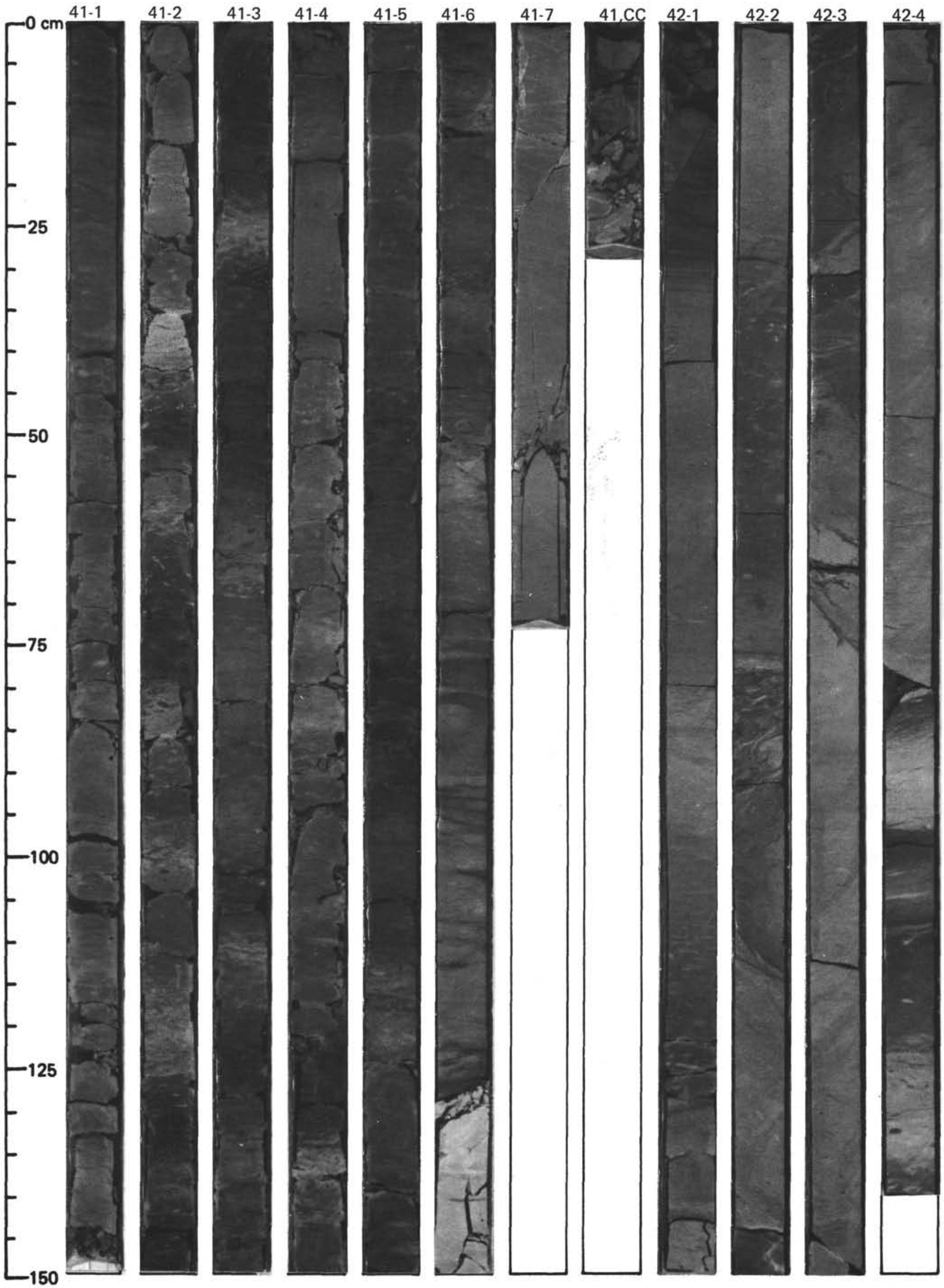

0 cm
25
50
75
100
125
150
27-2
27-3
27-4
27-5
27-6
27-7
27,CC
28-1
28-2
28-3
28-4
28-5

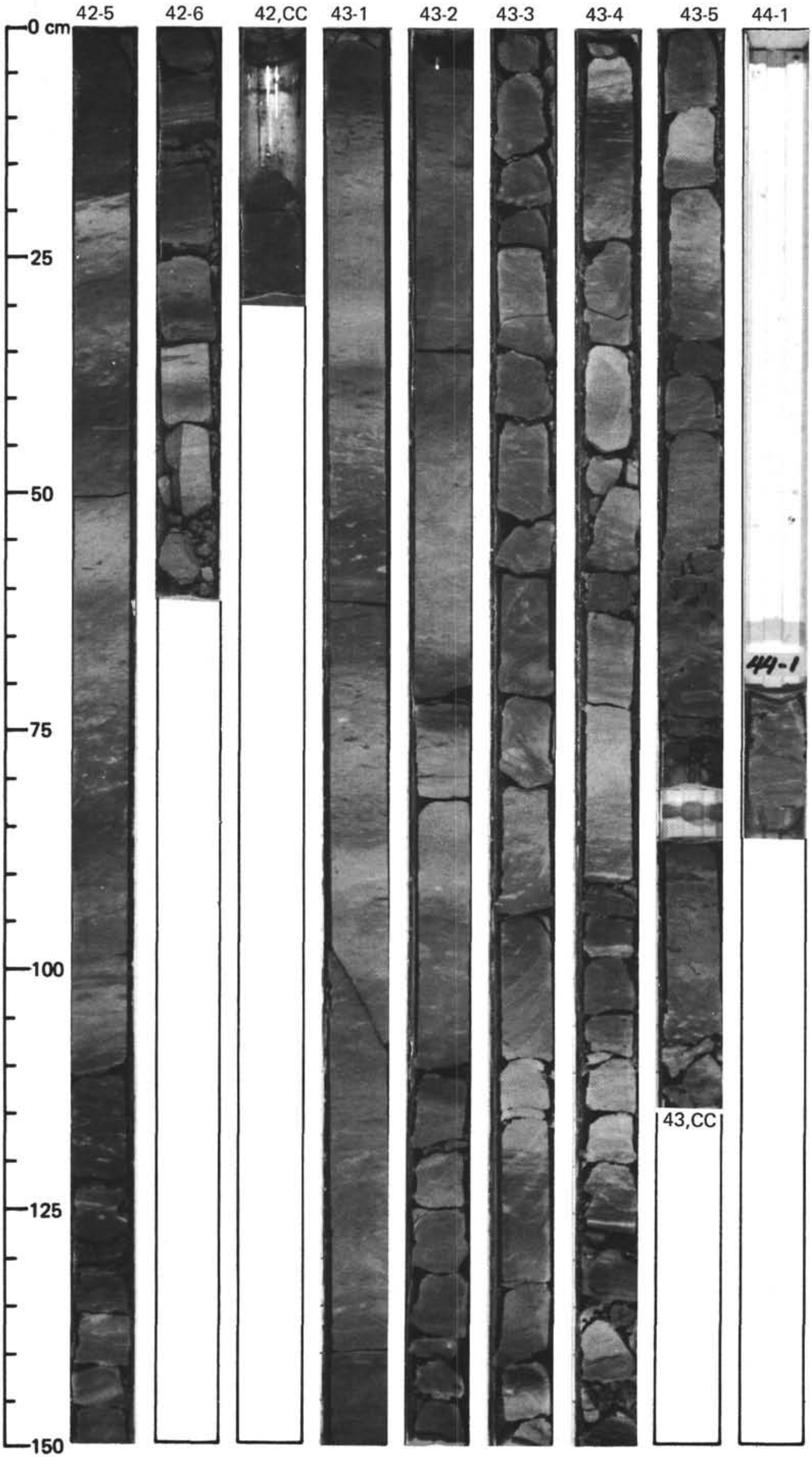

28-6
28,CC
29-1
29-2
29-3
29,CC
30
31-1
31-2
31-3
31,CC
32-1
0 cm
25
50
75
100
125
150
NO RECOVERY


32-2
32-3
32-4
32-5
32,CC
33-1
33-2
33-3
33-4
34-1
34-2
34-3
0 cm
25
50
75
100
125
150
33,CC


34-4
35-1
35-2
35-3
35,CC
36-1
36-2
36-3
36-4
36-5
36-6
36,CC
0 cm
25
50
75
100
125
150
34,CC


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


0 cm
25
50
75
100
125
150
41-1
41-2
41-3
41-4
41-5
41-6
41-7
41,CC
42-1
42-2
42-3
42-4


0 cm
25
50
75
100
125
150
42-5
42-6
42,CC
43-1
43-2
43-3
43-4
43-5
44-1
43,CC
44-1