The descriptions of sites, cores, and data included in these site reports were completed within one year of the cruise, but many of the topical chapters that follow were completed at a later date. More data were acquired and authors' interpretations matured during this interval, so readers may find some discrepancies between site reports and topical papers. The timely publication of the *Initial Reports* series, which is intended to report the early results of each leg, precludes incurring the delays that would allow the site reports to be revised at a later stage of production.

2. SITE 606[1]

Shipboard Scientific Party[2]

HOLE 606

Date occupied: 2 July 1983

Date departed: 4 July 1983

Time on hole: 1 day, 6 hr.

Position: 37°20.32′N; 35°29.99′W

Water depth (sea level; corrected m, echo-sounding): 3007

Water depth (rig floor; corrected m, echo-sounding): 3023

Bottom felt (m, drill pipe): 3022.1

Penetration (m): 165.75

Numbers of cores: 18

Total length of cored section (m): 165.75

Total core recovered (m): 154.1

Core recovery (%): 92.9

Oldest sediment cored:
Sub-bottom depth (m): 165.75
Nature: nannofossil ooze
Age: early Pliocene (4.1 Ma)

Basement: not reached

HOLE 606A

Date occupied: 4 July 1983

Date departed: 5 July 1983

Time on hole: 26.5 hr.

Position: 37°20.29′N; 35°30.017′W

Water depth (sea level; corrected m, echo-sounding): 3007

Water depth (rig floor; corrected m, echo-sounding: 3023

Bottom felt (m, drill pipe): 3023.8

Penetration (m): 178.4

Number of cores: 19

Total length of cored section (m): 178.4

Total core recovered (m): 156.3

Core recovery (%): 87.6

Oldest sediment cored:
Sub-bottom depth (m): 178.4
Nature: nannofossil ooze
Age: early Pliocene (4.4 Ma)

Basement: not reached

Principal results: Site 606 consists of two holes located on the upper western flank of the Mid-Atlantic Ridge at 37°20.3′N, 35°30.0′W. Hole 606 was cored with the newly developed APC (advanced piston corer) to a sub-bottom depth of 165.75 m and an age of early Pliocene (4.1 Ma). Hole 606A was APC cored to a sub-bottom depth of 178.4 m and an age of early Pliocene (4.4. Ma). Recovery averaged 92.9% at Hole 606 and 87.6% at Hole 606A. No cores contained contorted layers. Paleomagnetic and lithologic tie lines between the two holes indicate that the composite section is 100% complete. Both holes were relatively homogeneous nannofossil oozes throughout their entire lengths. All calcareous microfossil zones were well represented, with no hiatuses evident at the scale of sampling. Three winnowed foraminiferal sands suggest possible short-term hiatuses. The paleomagnetic stratigraphy is excellent in the Pleistocene, then poor until about 3 Ma, then good to the bottom of each hole. Deposition rates averaged 25 m/m.y. in the late Pleistocene, 37 m/m.y. in the early Pleistocene and late Pliocene, and increased to 62 m/m.y. in the early Pliocene. These rates are consistent with an environment in which pelagic deposition dominates but is enhanced by continuous transportation and redeposition of dominantly contemporaneous sediments by very gentle current activity on the seafloor. These currents move sediment from basement outcrops and high-standing topography to the lower basinal topography, but leave intact an excellent "pelagic" record. The large overpull at the bottom of this section suggests that we encountered considerably more indurated sediments and could indicate a depositional hiatus at the bottom of the section.

BACKGROUND AND OBJECTIVES

Site 606 is located on the upper western flank of the Mid-Atlantic Ridge roughly 300 n. mi. west-northwest of the median valley in the FAMOUS area and 260 n. mi. west-southwest of the Azores (Fig. 1). Rotary coring 18 mi. east-southeast of this site was carried out at Site 335 on Leg 37 (Aumento, Melson, et al., 1977).

Drilling at Site 335 had shown that the sediment sequence consists of a foraminifer-bearing nannofossil ooze, with deposition rates close to 40 m/m.y. Seismic records indicate that in general in this region sediment is deposited preferentially in basins or valleys along the upper ridge, whereas the higher topography is kept free of sediment by current activity along the seafloor. Some degree of acoustic layering is visible in these sediment piles, but previous experience with piston cores indicated that the sediments would be dominantly pelagic, with possi-

[1] Ruddiman, W. F., Kidd, R. B., Thomas, E. et al., *Init. Repts. DSDP*, 94: Washington (U.S. Govt. Printing Office).

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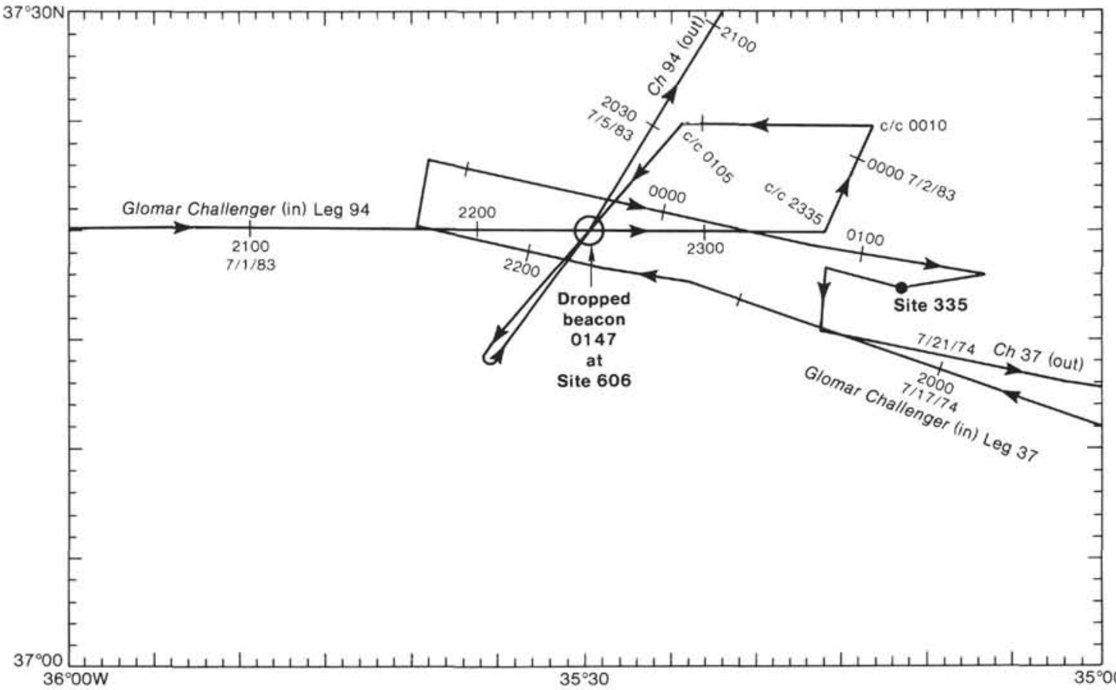

Figure 1. Track chart of *Glomar Challenger* for Legs 94 and 37 in the vicinity of Site 606. Time is in GMT (Greenwich Mean Time).

bly occasional interbedded local pelagic turbidites. Site 606 was selected on a gentle sedimentary high in a basin with sediments that appeared more transparent and less ponded than in adjacent basins, thus minimizing the chance of downslope deposition (Figs. 2 and 3). It was thus chosen primarily for its thick upper Neogene sequence and dominantly pelagic deposition.

Site 606, which lies in the northern part of the modern-day subtropical gyre, anchors the southern extreme of the North Atlantic late Neogene paleoenvironmental transect. Upper Quaternary piston cores in this area show a relatively modest degree of glacial–interglacial change in lithology (% $CaCO_3$) and in faunal and floral assemblages compared to the higher-amplitude variations farther to the north. This region was thus selected both to delimit the southernmost extreme of high-amplitude Neogene paleoceanographic changes and to define the late Neogene response of the more stable parts of the subtropical gyre circulation. It also was selected to produce a more complete upper Neogene biostratigraphic record in $CaCO_3$-rich sediments than has hitherto been available from this area.

Other paleoenvironmental objectives included establishing an undisturbed record for paleomagnetic studies, including detailed examination of polarity transitions; a record of Neogene carbonate dissolution; and a long stable isotopic sequence. All of these paleoclimatic objectives involving detailed records address the overriding problem of cyclical variations in the Earth's climate at orbital time scales.

OPERATIONS

Glomar Challenger departed Norfork, Virginia at 1652 GMT on Thursday, 23 June 1983 in relatively calm weather. We cleared the last Norfork buoy (NCD) at 1954 hr. [3] and headed into the North Atlantic after a brief pause from 2045 to 2103 hr. on 24 June to test the thrusters. Aboard were the normal complement of 45 GMI (Global Marine Inc.) personnel plus 29 technical staff and scientists.

The vessel proceeded without delay along a heading of 090° (±002°) toward Site 606 on the Mid-Atlantic Ridge. The weather was unusually favorable, with light winds and following seas and currents for the entire transit. Because of favorable conditions, the anticipated transit time of 9.4 days was reduced to 8.1 days. Underway to Site 606, routine geophysical data were collected with a 12-kHz echo sounder, a 3.5-kHz reflection profiler, a magnetometer, and an air-gun seismic profiling system. As we neared the first site, the air guns were replaced with the water-gun system, which has generally given higher quality seismic records (penetration, resolution, suppression of bubble pulse) than the air guns. In this case, there appeared to be little difference between the two systems, although the marginal performance of one of the recorders (carbon smears from the stylus at moderate to high gain) made the comparison difficult. In any case, the seismic records were adequate for our needs.

During the final two days of approach to Site 606, close inspection of the seismic records taken on *Challenger* Leg 37 at Site 335 showed evidence suggestive of a slight bottom-current influence (a smoother surface and slightly higher reflectivity than adjacent sediments). Because of this, the decision was made to shift the location of Site 606 some 13 n. mi. to the west–northwest to

[3] All times are local (ship's time).

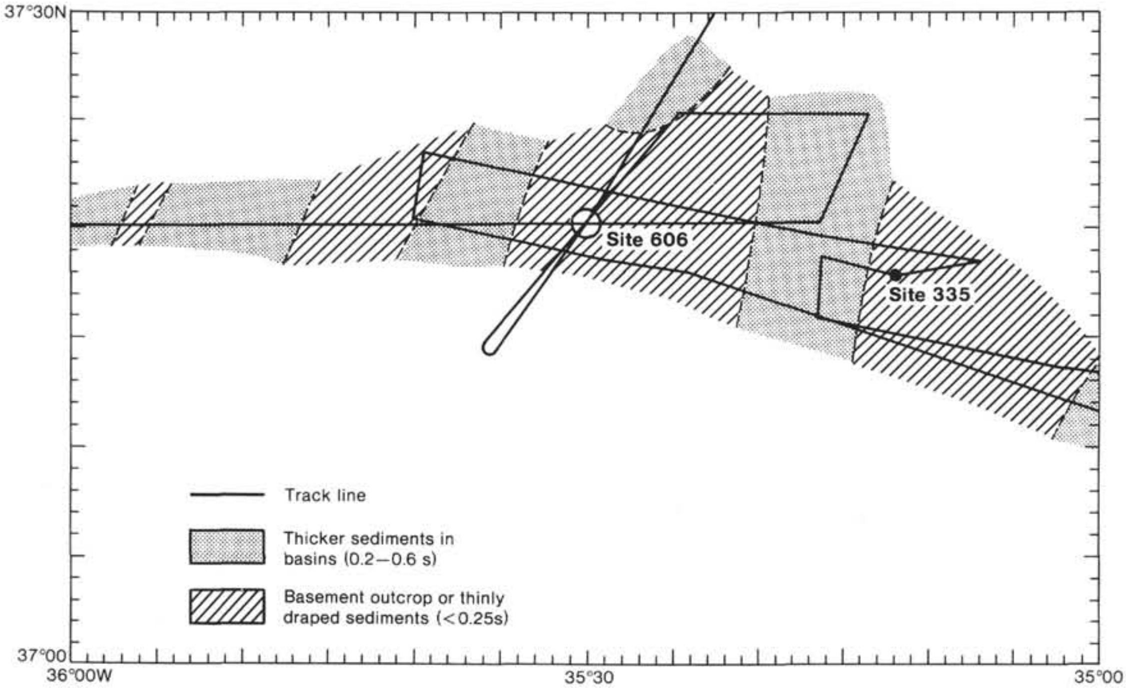

Figure 2. Nature of sediment cover in the vicinity of Site 606. Two basic types are distinguished: (1) generally higher-standing topography, in which basement outcrops or is draped with a thin cover of somewhat hummocky sediments (hachured areas), and (2) lower topographic basins in which there is a thicker sediment fill, smoother surface topography, and slightly more reflective sediments (stippled areas).

an adjacent basin with less reflective, more draped (and slightly thicker—500 m) sediment cover. In the last half day of transit, the course was adjusted to about 088° toward this objective.

After a good satellite fix on 1 July at 1944 hr., we slowed to 7 knots at 2000 hr. to try to improve the quality of the seismic record in order to select an optimal location for Site 606 (see Fig. 1 for final approach to site). Because there was no appreciable change in record quality, we resumed 10 knots at 2030 hr., keeping to a course of about 089°. At 2045 hr. we passed over a gentle high in the thick sediment fill, and this was designated as an ideal target for Site 606 after a survey to check the dimensions of the sedimentary basin to the east and north. We ran east until 2135 hr., then 025° until 2210 hr. on 2 July, then 270° until 2305 hr., and finally 215° until the beacon drop at 2347 hr. The water gun began firing intermittently after 2200 hr. and was replaced by an air gun at 2215 hr. From 2338 to 2347 hr. the magnetometer was pulled in, and the seismic gear retrieved from 2345 to 2400 hr. We then turned and went back to the beacon, which was located by later satellite fixes at 37°20.316′N, 35°29.994′W.

This survey showed (Figs. 2 and 3) that there are no basement outcrops near Site 606 to the north, east, or west, and that the quality of sediment cover looks very good for predominantly pelagic sedimentation, with an apparently minor and rather gentle component of current redistribution along the seafloor.

After maneuvering back over the beacon at 0037 hr., a test was begun of the ship's thrusters, and particularly the hand-controlled part of the system that had not worked correctly in the test off Norfork. The defect was corrected and the test ended at 0055 hr. From 0130 to 0517 hr., a test was run on the APC (advanced piston corer, see Introduction, Background, and Explanatory Notes chapter, this volume). One minor problem involving shear pin stubs falling inside the tool and preventing tight piston coupling for the succeeding run was diagnosed. We then began running in to the hole at 0615 hr. on 2 July. Running-in time was longer than normal because the new pipe had to be strapped and fitted with rubber protectors. From 1530 to 1857 hr., we felt for bottom, taking one full core (overshot), then a water core, and finally a 2.85-m core that gave an unambiguous mudline at 3022.1 m water depth. Following the spud-in at 1857 hr. on 2 July, we undertook continuous piston coring at Site 606.

APC coring at 9.5- to 9.6-m increments gave excellent results (90–100% recovery and no contorted intervals at the top of any core). Minor problems continued with the shear pins falling into the scoping assembly, and this necessitated delays of between 5 and 20 min. in order to retrieve the pins. Turn-around time averaged a little under 1.5 hr. for the entire hole.

We took a total of 18 cores at Hole 606 (Table 1) to a sub-bottom depth of 165.75 m and an age of early Pliocene (Zone NN14). Recovery for the entire section was 154.1 m, giving an average of 92.9%. We stopped coring short of refusal by the advanced piston corer because (1) we had penetrated an important paleoenvironmental objective at 3.2 Ma and (2) we wanted to leave

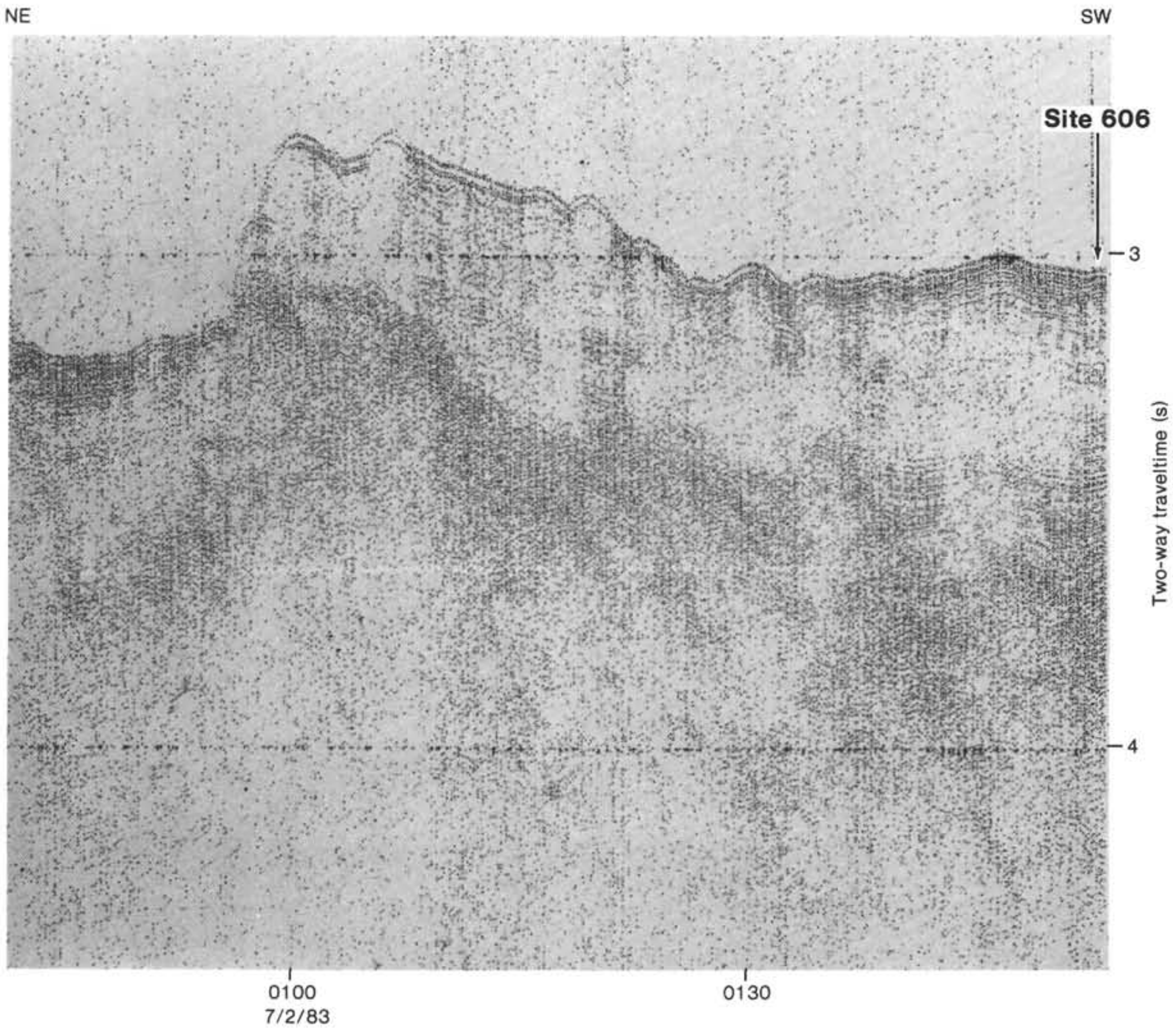

Figure 3. Seismic section taken aboard the *Glomar Challenger* on Leg 94, coming into Site 606.

some time to reach deeper objectives in Hole 606A. The last core from Hole 606 was on board at 2345 hr. on 3 July.

We pulled pipe and cleared the mudline at 0115 hr. on 4 July and offset 100 ft. to the west to Hole 606A at a position calculated from later satellite fixes as 37°20.29′N, 35°30.017′W. At 0205 hr. we spudded into Hole 606A with a mudline core at a pipe-line depth of 3023.8 m and began collecting a second set of piston cores. Coring proceeded smoothly, except that recovery was only moderate (85–90%) for the first half-dozen cores. This was corrected by adding a core catcher with strong fingers, and recovery improved. Contorted sections were again not a problem. Cross-checks of correlative lithologies and paleomagnetic boundaries were used to prove that we were successfully overlapping the core boundaries in such a way as to achieve a complete composite column of sediment between Holes 606 and 606A (Fig. 4; see also Ruddiman et al., this volume).

Coring proceeded smoothly until Core 18, at which point we retrieved a badly shattered liner with a large void. The over-pull of 100,000 lbf. on Core 18 was at or near the limit recommended for the APC. The next core (19) also contained a large void but did not show significant over-pull. Finally, during pullout of Core 20, the piston rod sheared at 40,000 lbf. of over-pull at 0105 hr. on 5 July, leaving the APC in the hole. Attempts to retrieve the bottom part of the APC assembly failed, and we terminated Hole 606A.

We retrieved a total of 19 cores at Hole 606A to a sub-bottom depth of 178.4 m and an age of early Pliocene (NN13/12). Recovery for the entire section was 156.3 m, for an average of 87.6%.

We then attempted to begin a third hole at Site 606 at an immediately adjacent location (no offset of ship's position) with an initial wash down to a sub-bottom depth of 145 m and then coring with the extended core barrel (XCB). This choice of level allowed some overlap with the last several cores in both Holes 606 and 606A. Wash down for the next hole began at 0600 hr., was completed at 1230 hr., and after a change of swivels for the next hole we began initial attempts to core.

We first retrieved a short contorted core, but then got an empty water core on the next attempt. At this point, on the basis of several observations, we realized we had lost the bottom 41 m of the bottom-hole assembly at

Table 1. Coring summary, Site 606.

Core no.	Date (July, 1983)	Time (hr.)	Depth from drill floor (m) Top–Bottom	Depth below seafloor (m) Top–Bottom	Length cored (m)	Length recovered (m)	Recovery (%)
Hole 606							
1	2	1920	3022.1-3025.0	0.0-2.85	2.85	2.85	100
2	2	2207	3025.0-3034.6	2.85-12.45	9.6	8.33	86.8
3	2	2325	3034.6-3044.2	12.45-22.05	9.6	8.28	86.3
3	3	0100	3044.2-3053.8	22.05-31.65	9.6	8.67	90.3
5	3	0228	3053.8-3063.4	31.65-41.25	9.6	9.35	97.4
6	3	0355	3063.4-3073.0	41.25-50.85	9.6	9.50	99.0
7	3	0508	3073.0-3082.6	50.85-60.45	9.6	9.33	96.9
8	3	0622	3082.6-3092.2	60.45-70.05	9.6	9.47	98.6
9	3	0726	3092.2-3101.8	70.05-79.65	9.6	9.32	97.1
10	3	0848	3101.8-3111.4	79.65-89.25	9.6	9.15	95.3
11	3	1020	3111.4-3120.9	89.25-98.75	9.5	8.51	88.6
12	3	1153	3120.9-3130.4	98.75-108.25	9.5	8.51	88.6
13	3	1403	3130.4-3139.9	108.25-117.75	9.5	8.69	90.5
14	3	1606	3139.9-3149.5	117.75-127.35	9.6	9.10	94.8
15	3	1739	3149.5-1359.1	127.35-136.95	9.6	9.03	94.1
16	3	2150	3159.1-3168.7	136.95-146.55	9.6	7.69	80.1
17	3	2228	3168.7-3178.3	146.55-156.15	9.6	9.10	94.8
18	3	2345	3178.3-3187.9	156.15-165.75	9.6	9.19	95.7
					165.75	154.06	92.9
Hole 606A							
1	4	0225	3023.8-3029.4	0.0-5.6	5.6	5.6	100
2	4	0345	3029.4-3039.0	5.6-15.2	9.6	7.46	77.7
3	4	0509	3039.0-3048.6	15.2-24.8	9.6	8.11	84.5
4	4	0622	3048.6-3058.2	24.8-34.4	9.6	8.58	89.3
5	4	0739	3058.2-3067.8	34.4-44.0	9.6	8.59	89.5
6	4	0844	3067.8-3077.4	44.0-53.6	9.6	7.71	80.3
7	4	1005	3077.4-3087.0	53.6-63.2	9.6	9.17	95.5
8	4	1123	3087.0-3096.6	63.2-72.8	9.6	9.54	99.4
9	4	1237	3096.6-3106.2	72.8-82.4	9.6	9.33	97.2
10	4	1404	3106.2-3115.8	82.4-92.0	9.6	9.53	99.3
11	4	1521	3115.8-3125.4	92.0-101.6	9.6	9.18	95.6
12	4	1638	3125.4-3135.0	101.6-111.2	9.6	9.18	95.6
13	4	1747	3135.0-3144.6	111.2-120.8	9.6	7.44	80.6
14	4	1747	3144.6-3154.2	120.8-130.4	9.6	9.07	94.5
15	4	2007	3154.2-3163.8	130.4-140.0	9.6	8.96	93.3
16	4	2127	3163.8-3173.4	140.0-149.6	9.6	8.86	92.3
17	4	2239	3173.4-3183.0	149.6-159.2	9.6	8.90	92.7
18	4	2355	3183.0-3192.6	159.2-168.8	9.6	6.43	67.0
19	5	0132	3192.6-3202.2	168.8-178.4	9.6	4.71	49.1
					178.4	156.30	87.6

0630 hr. during initial wash down: (1) the loss of 10,000 lb. of weight on the drill string at 0630 hr., equivalent to a length of 30 to 40 m of bottom-hole assembly; (2) the apparent lack of sediment between the first core and the second attempt; and (3) the recovery in the first core of a stratigraphic section several tens of meters above the estimated anticipated depth derived from correlation with Hole 606A. The loss occurred before the first core attempt, so that the extended core barrel protruded beyond the broken drill string on the first attempt but did not come all the way out, and retrieved contorted sediments from a level roughly 30 to 40 m shallower than anticipated. Then on the second attempt, the XCB came all the way out of the drill string and was lost. We decided to end further work at Site 606 for three reasons: (1) the 16 hr. of round-trip time needed to begin again would have put us at least 1/2 day over time on this site; (2) a decision that the deeper cores at the next two sites would adequately cover the late Miocene scientific objectives in this region; and (3) the need to build up some reserve time against foul weather anticipated later in the cruise at more northerly sites. We also chose not to designate this as Hole 606B; the core was discarded because of the uncertainties as to sub-bottom depth, the contorted nature of the sections retrieved, and the full overlap of this part of the record at Holes 606 and 606A. We began to pull pipe at 1230 hr. and finished at 1715 hr. We got underway to Site 607 at 1745 hr. on 5 July 1983, roughly two days ahead of schedule.

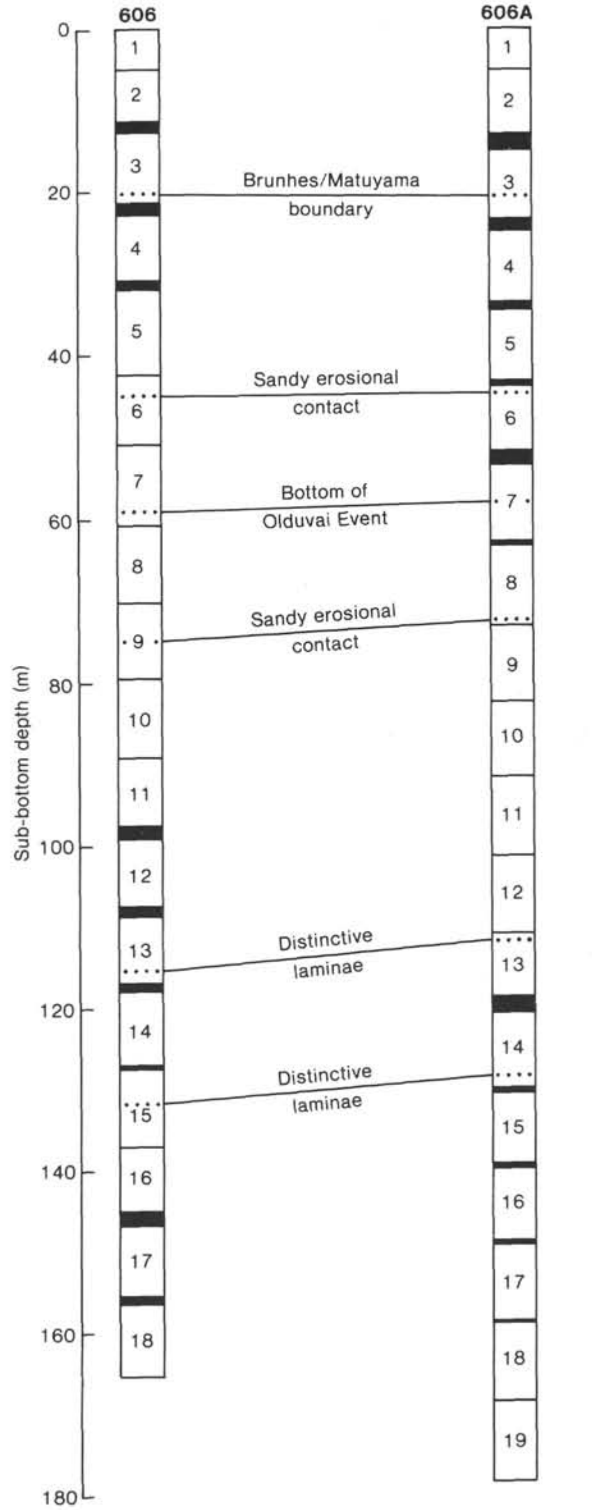

Figure 4. Coring gaps (shown in black) and relative offsets of correlative horizons between Holes 606 and 606A.

SEDIMENT LITHOLOGY

Site 606 consists of two holes, both cored with the advanced piston corer (APC). Hole 606 reached a sub-bottom depth of 165.75 m and Hole 606A a sub-bottom depth of 178.4 m. Disturbances resulting from coring procedures were minimal throughout.

The entire cored section is contained in one major lithologic unit consisting exclusively of foraminiferal–nannofossil ooze. This lithologic unit can be subdivided into two subunits on the basis of color and the presence of color laminae (Fig. 5).

In both Holes 606 and 606A, approximately the top 50 cm of the uppermost subunit is brownish and is Holocene in age. It contains no color laminae and has a highly bioturbated basal contact. The remainder of this subunit (~100 m) is predominantly pale gray and is distinguished throughout by the presence of purple or green laminae 5 to 20 mm thick. The number of laminae per section is highest at around 25 m sub-bottom and falls off markedly toward the base of the subunit (Fig. 6). Although the siliceous component throughout the hole is small, it is slightly higher in Subunit A.

At an approximate sub-bottom depth of 100 m, there is a gradational change to Subunit IB. This subunit is typically white and homogeneous. It has very few laminae. Those that are present are very faint (Fig. 6).

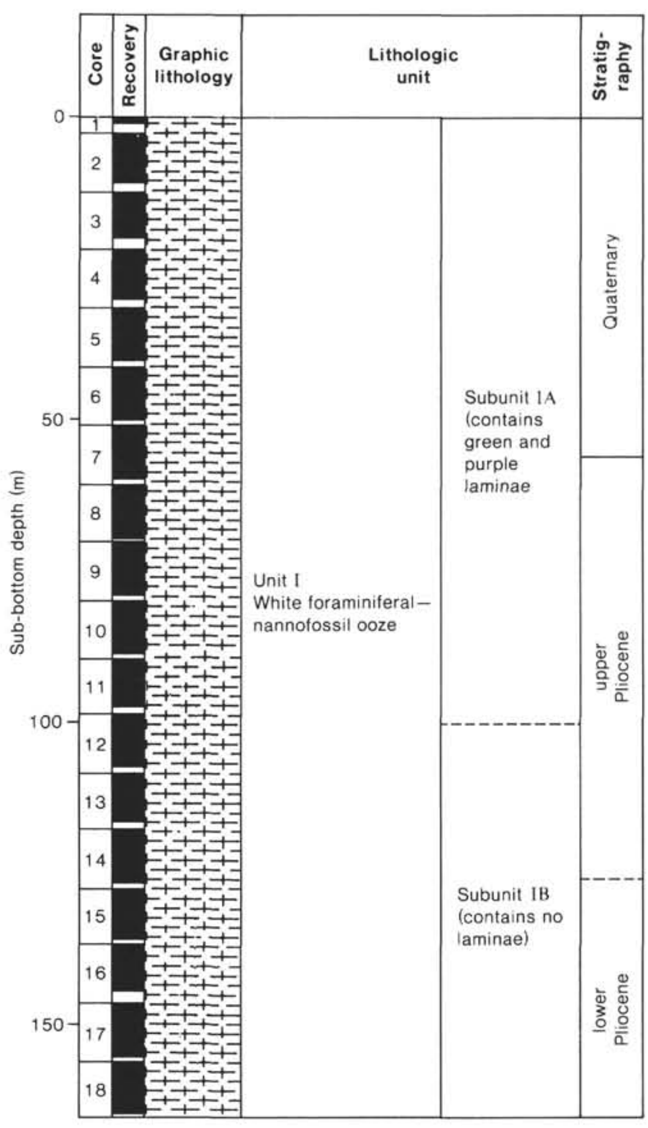

Figure 5. Lithologic subunits at Site 606, Hole 606.

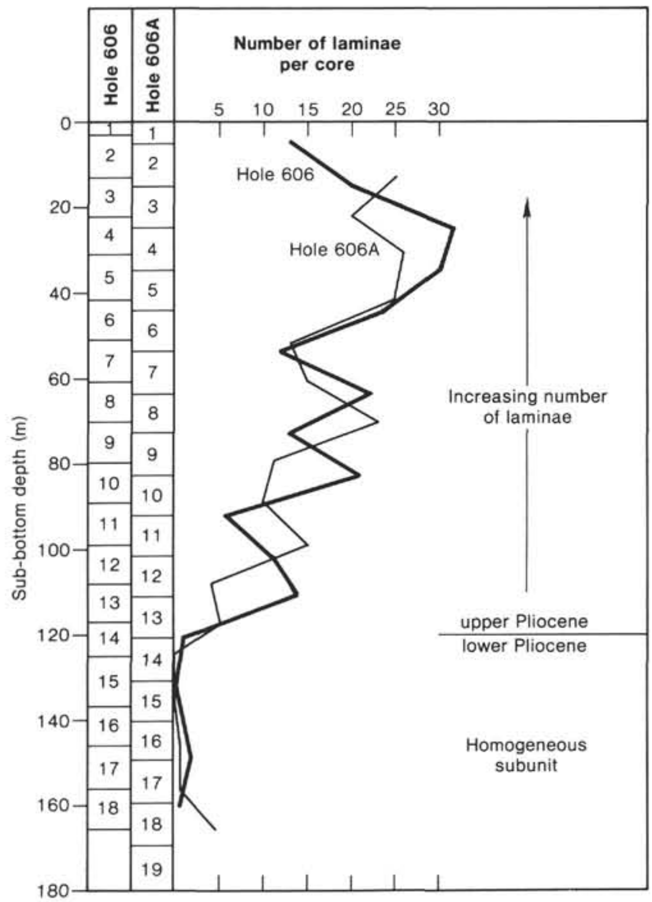

Figure 6. Frequency of color laminae at Site 606.

Both subunits contain abundant pyrite-rich patches and stringers. Pyrite is generally present either as micronodules or as encrusting on or infill in foraminifer tests. Isolated pyrite-lined burrows occur in the uppermost sediments of Site 606, whereas in the deeper parts nodules up to 5 cm in length fill the traces of older burrows. The purple and green colors of the laminae in Subunit IA are due to the presence of very fine iron particles (pyrite?).

Other features noted in scattered cores were: (1) isolated glacial erratic clasts up to 5 mm in diameter in Cores 606-1, -2, -8, -9, and -10 and 606A-1 and -3: (2) isolated pumice clasts in Cores 606-3, -4 and -6 and 606A-1 and -2; (3) an ash layer in Core 606-4; and (4) pelagic turbidites in Cores 606-9 and 606A-6. The ash and turbidite layers occur only in one of the two overlapping holes, suggesting a very local occurrence.

PHYSICAL PROPERTIES

The physical properties measured on samples from Site 606 are shown in Figure 7. The dry water content values are shown in Figure 7A. The water content of the upper 20 m varies between 65 and 120%. The higher values obtained within this interval are normal for surface sediments. At depths greater than 20 m, water content values decrease roughly linearly with depth, from values of 70% at 40 m to 45% at 160 m. Wet water content values show roughly the same trend (Fig. 7B).

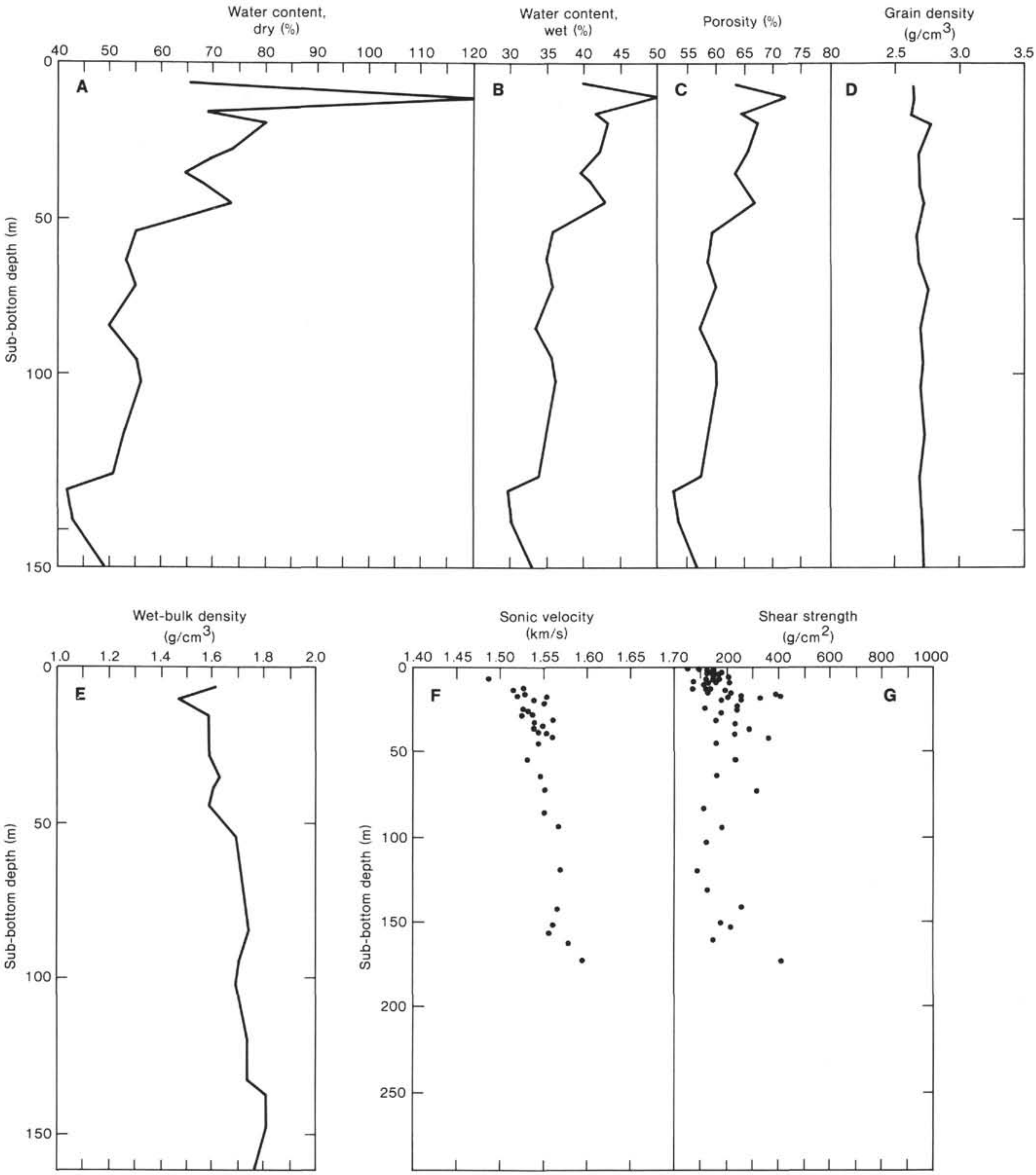

Figure 7. A-G. Physical properties at Site 606.

The porosity curve obtained from Hole 606 (Fig. 7C) shows minor variability around a gradual decrease from 68% at the surface to 57% at a depth of 160 m.

Grain density values from Hole 606 fall between 2.63 and 2.78 g/cm^3 (Fig. 7D). Additional grain density samples need to be examined before a downcore trend can be interpreted.

Wet-bulk density values from GRAPE and gravimetric analysis show a linear increase in bulk density with depth (Fig. 7E).

Sonic velocity (Fig. 7F) increases from 1.48 km/s at the surface to 1.55 km/s at 20 m deep. Below 20 m, sound velocity values show minor variability around a mean of 1.55 to 1.56 km/s.

A definitive description of shear strength is not available because the vane device is basically designed for clays, but the results of the shear strength analyses are shown in Figure 7G.

SEISMIC STRATIGRAPHY

Figure 8 illustrates a portion of the shipboard water gun seismic profile collected during the approach to Site 606. Three acoustic units have been identified (A, B, C), and the relevant parts of this acoustic section are matched to the lithology of the site (lithologic Unit I).

Acoustic Unit A is acoustically well stratified and characterized by wavy reflectors of moderately high amplitude. Its lower boundary at 0.05 s sub-bottom is abrupt.

Acoustic Unit B consists of considerably weaker, less stratified, wavy reflectors extending from 0.05 to 0.125 s sub-bottom. There is a suggestion of subunits with still weaker reflectivity within this unit.

Acoustic Unit C consists of a largely transparent section extending from 0.128 s sub-bottom to basement at 0.39 s sub-bottom. Some increase in reflectivity is apparent just below 0.20 s and at 0.325 s sub-bottom.

Site 606 was drilled to a total depth of 178.4 m sub-bottom, penetrating all of acoustic Units A and B and well into C. Lithologically, the Site 606 sediments are a rather monotonous foraminiferal-nannofossil ooze throughout. $CaCO_3$ percentages are all in excess of 90%, except for the thin 50-cm layer at the core top. There is, however, one lithologic criterion that distinguishes two subunits at a sub-bottom depth of about 100 m: a change from an upper subunit in which greenish and purple laminae are common to a lower, more homogeneous unit in which they are absent (Figs. 5 and 6). This change actually occurs over a broad interval from roughly 80 to 120 m sub-bottom depth, but it is centered at about 100 m. This is also the approximate depth at which the sedimentation rate increases from about 37 to about 62 m/m.y. (Fig. 10).

Correlation of the seismic and lithologic data (Fig. 8) suggests that this subtle change in lithology and significant increase in sedimentation rate both coincide with the boundary between acoustic Units B and C at approximately 100 m sub-bottom depth.

At the boundary between acoustic Units A and B at 0.05 s (Fig. 8), there is an apparently correlative decrease in number of laminae per core (Fig. 6). This suggests that the highly reflective acoustic Unit A is equivalent to the more highly laminated Pleistocene sequence in the upper 54 m (Fig. 8), whereas the moderately reflective acoustic Unit B is generally equivalent to the moderately laminated upper Pliocene sequence from 54 to 120 m

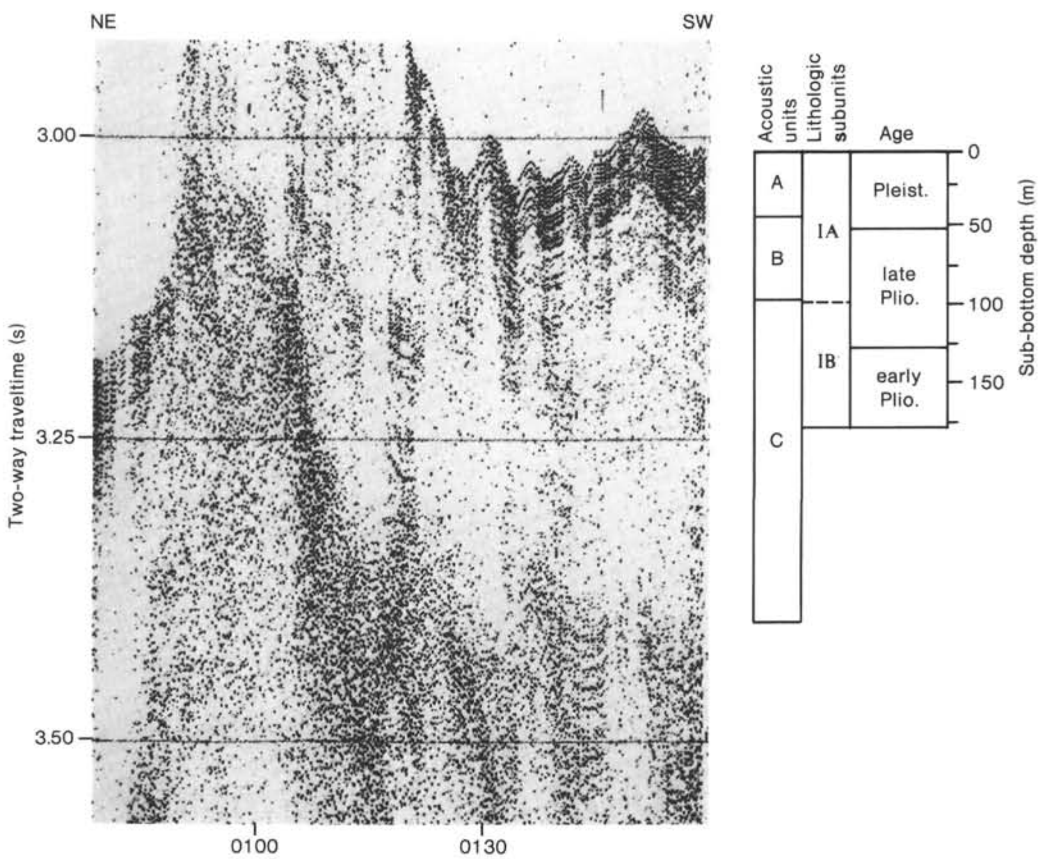

Figure 8. Comparison of acoustic units (A–C) with lithological subunits (A and B), cored at Site 606. For the shipboard water-gun seismic profile collected during approach to the site, depths in meters are estimated using a seismic velocity of 1.55 km/s, as indicated in the section on physical properties.

(Figs. 6, 8). Finally, the lowest sediment cored at Site 606, which gave large over-pulls during core retrieval (see Operations section), coincides with a diffuse reflector faintly visible in acoustic Unit C at 0.20 to 0.23 s (Fig. 8).

BIOSTRATIGRAPHY

A stratigraphically continuous sequence of lower Pliocene through Quaternary nannofossil oozes was recovered from Holes 606 and 606A. The sediments contain abundant, well preserved, and diverse calcareous nannofossils and planktonic and benthic foraminifers. Rare to common siliceous microfossils (diatoms, radiolarians, and silicoflagellates) are moderately well preserved within the uppermost Pliocene and upper Quaternary sediments.

Ages for the base of Holes 606 and 606A (Fig. 9) extrapolated from the sediment accumulation curve are (Fig. 10): 4.1 Ma for the base of Hole 606 and 4.4 Ma for the base of Hole 606A[4].

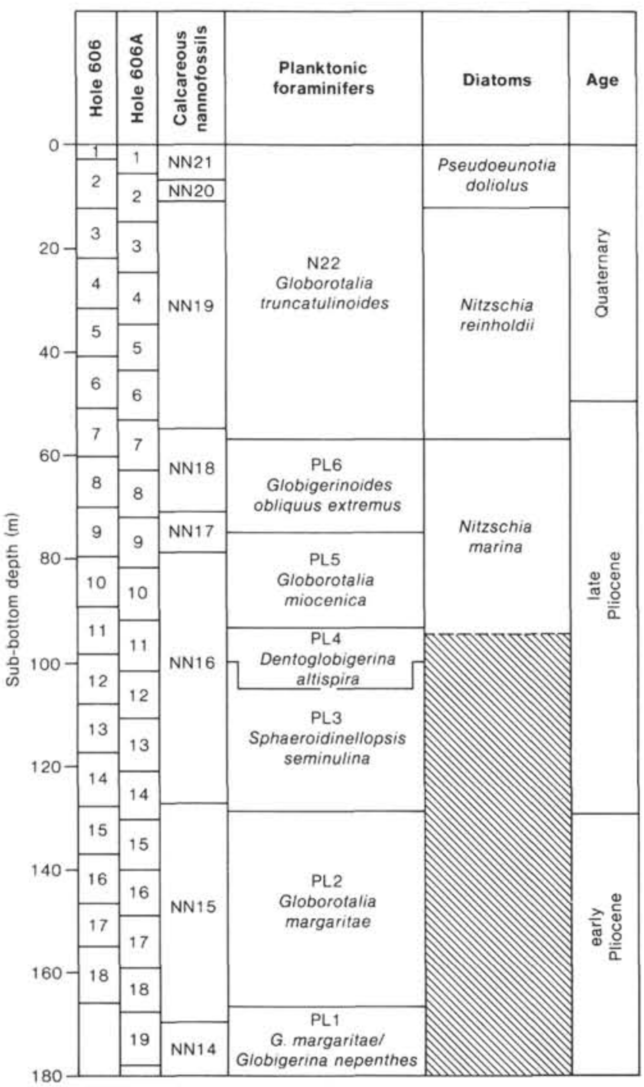

Figure 9. Biostratigraphic summary for Site 606 (for an updated version, see Baldauf et al. this volume). Hachures in Diatoms column indicate samples that are barren or contain rare non-age-diagnostic fragments.

The lower Pliocene/upper Pliocene boundary is placed between Samples 606-14,CC and 606A-14,CC (130.0–127.0 m), based on planktonic foraminifers and paleomagnetic results. Reworking of middle to late Miocene calcareous nannofossils into lower upper Pliocene and lower Pliocene sediments and of middle upper Miocene benthic foraminifers into lower Pliocene sediments (606A-19,CC) is observed. Siliceous microfossils are generally absent from the lowest upper Pliocene Samples 606-11-3, 43–45 cm and 606A-10,CC and older material.

The Pliocene/Pleistocene boundary is placed in the lower portion of Cores 606-6 and the middle portion of Core 606A-6 (~50 m sub-bottom), based on calcareous nannofossils and planktonic foraminifers.

Calcareous Nannofossils

The shipboard study of nannofossils from Site 606 was primarily confined to core-catcher samples.

Quaternary and Pliocene nannofossils occur at this site. Preservation is good in the Pleistocene and upper Pliocene and moderate in the lower Pliocene because of overgrowth of calcite on some specimens. Nannofossil assemblages in Hole 606A are quite similar to those observed in Hole 606.

Samples 606-1,CC and 606A-1,CC are assigned to the upper Pleistocene to Holocene NN21 *Emiliania huxleyi* Zone. *Emiliania huxleyi* and *Gephyrocapsa muellerae* are dominant. *Rhabdosphaera clavigera, Calcidiscus leptoporus, Coccolithus pelagicus*, and *Discolithina japonica* are frequent. Samples from 606-2-1, 30–140 cm are dominated by small gephyrocapsids (probably dominantly *G. aperta*), together with a few specimens of *E. huxleyi*. This suggests an age between the lower part of oxygen isotope Stage 6 to the upper part of oxygen isotope Stage 8 (P. P. E. Weaver, personal communication, 1983). The presence of *Pseudoemiliania lacunosa* in Samples 606-2,CC to 606-6,CC and 606A-2,CC to 606A-6,CC indicates an early Pleistocene age, the NN19 *Pseudoemiliania lacunosa* Zone. *Helicosphaera sellii* and *Calcidiscus macintyrei* occur continuously below Samples 606-5,CC and 606A-6,CC. In this zone, *Gephyrocapsa* spp. is dominant, and abundant specimens of *Crenalithus doronicoides* are also found, together with *Discolithina multipora, D. japonica, Helicosphaera carteri, Calcidiscus leptoporus, Syracosphaera* sp., *Rhabdosphaera clavigera, Umbilicosphaera* sp., and *Scapholithus fossilis*.

The Pliocene/Pleistocene boundary is quite sharply marked; it is placed between Samples 606-6,CC and 606-7,CC (and between 606A-6,CC and 606A-7,CC) at a level below which *Discoaster brouweri* is found continuously.

Samples 606-7,CC 606-8,CC and 606A-7,CC are assigned to NN18 (*Discoaster brouweri* Zone). In this zone, three-rayed *Discoaster brouweri (D. triradiatus)* is common. According to Bukry and Bramlette (1970) and Taka-

[4] For an updated version of the biostratigraphic summary and the sedimentation rate, see Baldauf et al. (this volume.)

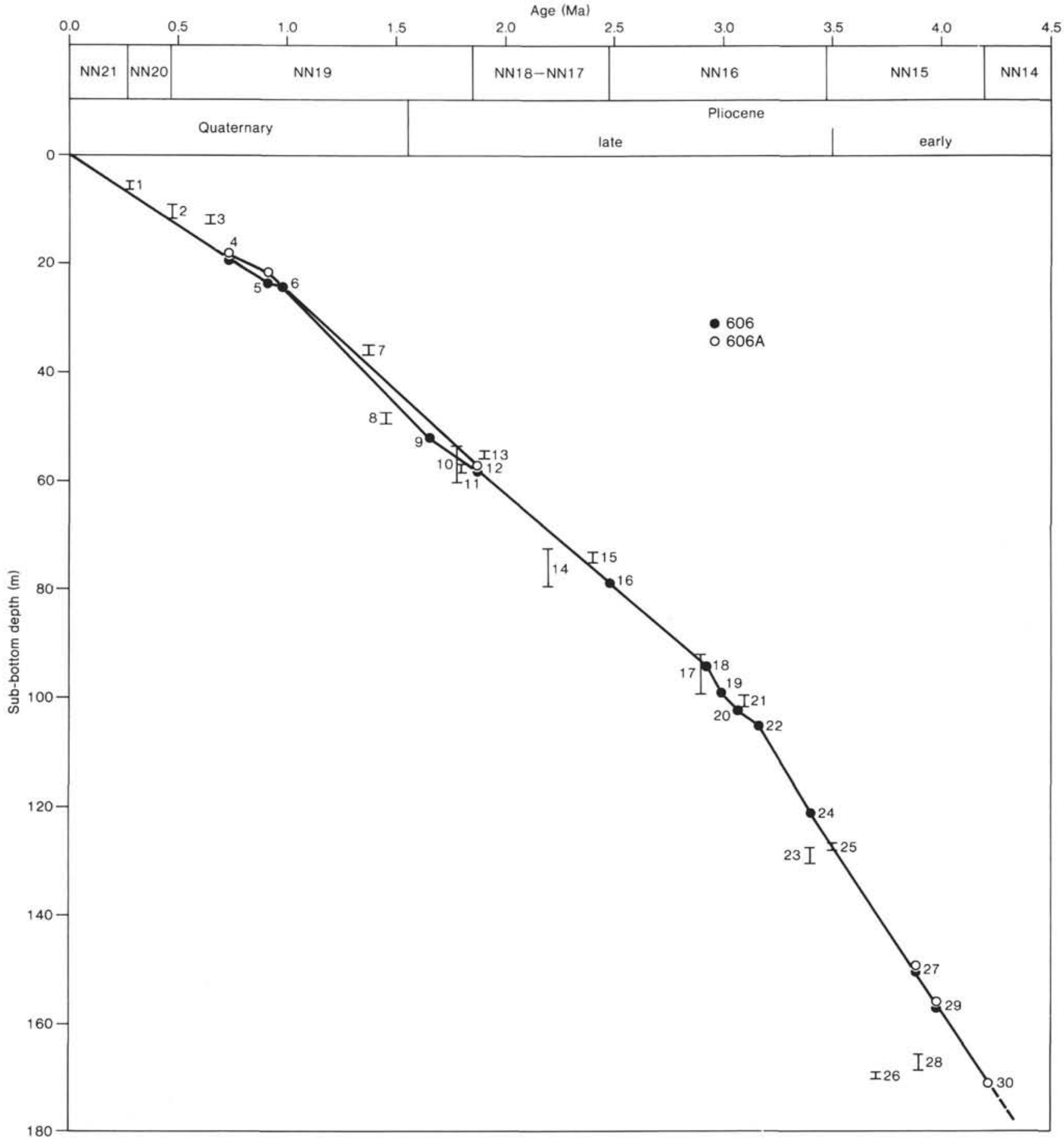

Figure 10. Time-versus-depth plot of cores recovered in Holes 606 and 606A, with nannofossil zonations shown at the top. See Table 4 for datum levels used (1–30). (For an updated version, see Baldauf et al., this volume.)

yama (1970), this species is common in the upper part of the *Discoaster brouweri* Zone, which is placed in the uppermost part of the Pliocene. The occurrence of *Discoaster pentaradiatus* together with *D. surculus* indicates the upper Pliocene NN16 *Discoaster surculus* Zone for Samples 606-9,CC to 606-14,CC and 606A-9,CC to 606A-13,CC. Therefore, NN17 (*Discoaster pentaradiatus* Zone) is not recognized in Hole 606. *Discoaster asymmetricus* and *D. tamalis* first become abundant within this zone. *Pseudoemiliania lacunosa* is still common throughout NN16 but *Helicosphaera sellii* has the base of its range in this zone. *Reticulofenestra* showing strong affinities with *R. pseudoumbilica* were found in Samples 606-12,CC to 606-14,CC and 606A-9,CC to 606A-13,CC. Typical *R. pseudoumbilica*, however, first occur in Samples 606-15,CC and 606A-14,CC, respectively. Thus Samples 606-14,CC and 606A-13,CC are assigned to the upper Pliocene NN16 *Discoaster surculus* Zone. The boundary between the NN15 *Reticulofenestra pseudoumbilica* Zone and NN14 *Discoaster asymmetricus* Zone may be recognized in Core 19 of Hole 606A, although the distinction between these two zones is uncertain because *Amaurolithus* is very rare. *Sphenolithus abies* occurs in Samples 606-16,CC and 606A-14,CC, somewhat below the extinction level of *R. pseudoumbilica*. The absolute age of the bottom sediments of these two holes is estimated at about 4.4 Ma.

Planktonic Foraminifers

All core-catcher samples from this site contain abundant and well preserved planktonic foraminifers. Species diversities are high throughout, with over 20 species recorded in most samples. The site lies in the northern part of the modern-day subtropical gyre and thus the fauna contains subtropical species such as *Globigerinoides conglobatus, Pulleniatina obliquiloculata, Sphaeroidinella dehiscens*, and *Globorotalia miocenica*. Some of the Quaternary samples, however, contain cooler water assemblages, with *Neogloboquadrina pachyderma* (dextrally coiled), *Globigerina quinqueloba, Globigerina bulloides*, and *Globigerinita glutinata* occurring commonly. *N. pachyderma* (sinistrally coiled) occurs in one or two of the colder Quaternary samples but it is never common.

The southerly position of this site enables the subtropical temperate zonation of Berggren (1973, 1977) to be used. No formal subdivision of Zone N22 has been made, but pink *Globigerinoides ruber* occurs in 606-1,CC and 606A-1,CC, suggesting a latest Quaternary age for these samples. *Globorotalia hirsuta* is present in 606-1,CC and 606A-2,CC, which, according to Pujol and Duprat (1983), suggests an age younger than oxygen isotope stage 12. Apart from these species, the Quaternary samples contain a diverse assemblage with *Globorotalia inflata, Globigerina bulloides, N. pachyderma* (d), and *Globigerinoides ruber* generally being the most common species. The base of the *Globorotalia truncatulinoides* Zone is taken at the first appearance of the nominate species in 606-5,CC and 606A-6,CC. Other results, however, show that 606-5,CC lies stratigraphically above 606A-6,CC and the presence of *G. truncatulinoides* in Core 606-6 therefore seems likely. No *Globigerinoides obliquus extremus* were found in 606-5,CC suggesting that this sample belongs to the *Globorotalia truncatulinoides* Zone.

The base of Zone PL6 (*Globigerinoides obliquus extremus* Zone) is marked by the last occurrence of *Globorotalia miocenica* in Core 606-9. In 606A, however, *G. miocenica* occurs in Samples 606A-9,CC and 606A-8,CC. The latter contains a high percentage of reworked material, and so the true extinction of *G. miocenica* cannot be ascertained. By comparison to Hole 606, this extinction should occur near the base of 606A-8,CC or in Core 606A-9. The fauna of Zone PL6 is similar to that of the *G. truncatulinoides* Zone, but with the addition of *Globigerinoides obliquus, Globigerina decoraperta*, and *Globigerina apertura*; and an increase in *Globorotalia crassaformis*. Within this zone the transition from *Globorotalia puncticulata* to *G. inflata* is seen.

The base of Zone PL5 is marked by the last occurrence of *Dentoglobigerina altispira*, which occurs in Cores 606-11 and 606A-11. The fauna of Zone PL5 is very similar to Zone PL4 but with the addition of *Globorotalia miocenica*.

The base of Zone PL4 is marked by the last appearance of *Sphaeroidinellopsis seminulina*, which occurs in Cores 606-12 and 606A-11. Thus Zone PL4 is contained entirely within Core 606A-11, because 606A-10,CC belongs to Zone PL5. Zone PL4 is of short duration with a fauna identical to Zone PL5 except for the addition of *D. altispira*.

Zone PL3 is defined by the presence of *S. seminulina* and *D. altispira* and the absence of *G. margaritae*. The base is marked by the last appearance of *G. margaritae*, which occurs in Cores 606-15 and 606A-14. Faunas are similar in this zone, with the addition of *S. seminulina*.

Zone PL2 is defined as the interval of *G. margaritae* above the extinction of *Globigerina nepenthes*. *G. nepenthes* has its last occurrence in Core 606A-18, but Hole 606 does not reach this datum. *Globorotalia margaritae* is a common species in this zone, which also sees the evolution of *G. puncticulata* and *G. crassaformis*. The ages of the first appearances of these two species are later at Site 606 than in the Rio Grande Rise sections study by Berggren (1977). In the Rio Grande Rise they first appear in Zone PL1 and make a subdivision of this zone possible. Zone PL1 is present in Cores 606A-17 and 606A-18, but there is no overlap of *Globigerina nepenthes* with *Globorotalia puncticulata* or *G. crassaformis*. The lowest subdivision of zone PL1 (the *Globorotalia cibaoensis* Subzone) was not penetrated at Site 606.

Benthic Foraminifers

Benthic foraminifers constitute much less than 1% of the total foraminiferal fauna in the >63 μm fraction of the samples studied (mud-line sample, Samples 606-1,CC; -3,CC; -5,CC; -7,CC; -9,CC; 16,CC; -18,CC; and 606A-19,CC). However, all samples contained sufficient specimens for counts of 200 individuals. This is not enough to study the rare species, but much larger counts would be needed to obtain any additional species (see Thomas, this volume).

The diversity is generally high, in most samples around 50 species, except around 40 in the upper two samples and over 50 in the lowest sample (64). The preservation is good; only miliolids, which are the most sensitive to dissolution, show some damage. In the mud-line sample, aragonitic species (*Hoeglundina elegans, Robertina cylindrica*) are preserved. Miliolids are common (about 10%) in all samples except 606A-19,CC.

The relative abundances of the most common species fluctuate strongly. *Epistominella exigua* is common in the mud-line sample only. This association in the mud-line sample is typical of Recent or interglacial faunas in this area (Schnitker, 1974). *Nuttallides umbonifera*, if common, is thought to be indicative of Antarctic Bottom Water; at Site 606, the species occurs below Sample 606-8,CC and is moderately common (9%) in Sample 606-16,CC only. Relative abundances of the *Uvigerina* species (*U. peregrina, U. graciliformis*) fluctuate strongly, as do the abundances of the "biserial group": *Bolivi-*

na spp., *Fursenkoina* spp., *Stainforthia complanata, Francesita advena*.

In Sample 606A-19,CC benthic foraminifers are more common than in any other sample and the number of species is extraordinarily high, although the solution-prone miliolids are rare. A few specimens of *Vulvulina spinulosa* and *Bulimina jarvisi* are present; these species have been described from Miocene sediments only (e.g., Thomas, 1985). These observations suggest that the core catcher from Core 606A-19 penetrated sediments that either contain reworked benthic foraminifers or represent a period of slow sedimentation or a hiatus.

Diatoms

Abundant to rare diatoms occur in the upper Pliocene through Quaternary sediments recovered at Site 606. The lower Pliocene sediments recovered are barren or contain rare fragments of diatoms. Preservation is generally moderate to poor, with occasional samples containing a well preserved assemblage. The diatom assemblage consisting of *Coscinodiscus crenulatus, C. nodulifer, Ethmodiscus rex, Hemidiscus cuneiformis, Nitzschia marina, N. reinholdii, Rhizosolenia bergonii, Thalassiosira eccentrica, T. leptopus*, and *T. oestrupii* is characteristic of a warm-temperate environment. *Rhizosolenia barboi* and *R. curvirostris* (cold-water species) and *Melosira granulata* (a fresh-water species) occur occasionally within the sediment.

Samples examined from 606-1,CC through 606-2,CC (43–45 cm) and 606A-1,CC are assigned to the *Pseudoeunotia doliolus* Zone of Burckle (1977) based on the occurrence of *P. doliolus* stratigraphically above the last occurrence of *Nitzschia reinholdii*.

Samples 606-3-1, 43–45 cm and 606A-7-5, 43–45 cm and 606A-2,CC through 606A-5,CC are assigned to the *Nitzschia reinholdii* Zone of Burckle (1977). At Hole 606A, the base of the *N. reinholdii* Zone is currently placed between Samples 606A-5,CC and 606A-8,CC. Exact placement is difficult because Sample 606A-6,CC contains rare, poorly preserved specimens and Sample 606A-7,CC is barren of diatoms.

Samples 606-7-6, 43–45 cm through 606-11-3, 43–45 cm and 606A-8,CC through 606A-9,CC are assigned to the *Nitzschia marina* Zone of Baldauf (1984). Rare specimens of *Nitzschia jouseae* are present in Sample 606A-10,CC, allowing this sample to be assigned to the *Nitzschia jouseae* Zone of Baldauf (1985).

With the exception of rare fragments observed in Samples 606-15,CC and 606A-7,CC samples stratigraphically below Samples 606-11-3, 43–45 cm and 606A-10,CC are barren of diatoms.

Radiolarians

Radiolarians are present in the Quaternary and Pliocene sediments of the first ten cores of Hole 606. To date, only core catchers from Hole 606 have been examined (Table 2). Most of the species in these samples are long-ranged forms that provide little stratigraphic information. However, there are several species whose ranges are confined to the upper Pliocene and Pleistocene: *Amphirhophalum ypsilon, Didymocyrtis tetrathalamus, Theocorythium trachelium*, and the last occurrence of *Stylatractus universus* occurs between Samples 606-1,CC and 606-2,CC.

Table 2. Abundance and preservation of radiolarians in Hole 606.

Sample	Abundance[a]	Preservation[b]
1,CC	F	G
2,CC	C	G
3,CC	F	M
4,CC	B	
5,CC	R	M
6,CC	R	M
7,CC	C	G
8,CC	F	G
9,CC	F	G
10,CC	F	M
11,CC	B	
12,CC	B	
13,CC	B	
14,CC	B	
15,CC	B	
16,CC	B	
17,CC	B	
18,CC	B	

[a] C = 5000–10,000 specimens/slide, F = 1000–5000 specimens/slide, R = < 1000 specimens/slide, and B = barren.
[b] G = good; M = moderate; and P = poor.

Preservation is very good in the first two core catchers and the assemblage is diverse, containing forms that inhabit warm-temperate surface waters. In the samples from Core 606-3, the radiolarians are less well preserved and less diverse, and in the next sample from Core 606-4, siliceous fossils are dissolved. In the other core catchers from Cores 606-5 and -6, radiolarians are moderately well preserved, but they are rare and not very diverse, mostly species characteristic of cold or deep water. In the next four cores, radiolarians are more abundant, diverse, well preserved, and include the warm-temperate, surface forms found in the top of this hole. All samples from below Core 606-10 were barren of radiolarians.

PALEOMAGNETISM

Hole 606

The hydraulic piston cores obtained at Site 606 provided more than 165 m of relatively undeformed sediment suitable for paleomagnetic study. The sediment was sampled at an interval of 150 cm (one sample per core section) using 7-cm^3 plastic boxes. This interval was changed to two samples per core section in Cores 3 through 10 in order to allow adequate definition of the Jaramillo, Olduvai, and Reunion Subchronozones, given the observed sedimentation rate of 3 $cm/10^3$ yr. In Cores 11 through 18 the sampling interval was decreased to one sample per section as the sedimentation rate increased. The samples were measured using a Molspin portable magnetometer and were subjected to alternating field demagnetization using a Shonstedt A.C. demagnetizer.

The orientation device (Kuster tool) was not used for all cores at this site and did not work every time it was used. For this reason the declinations are not consistent from core to core and, therefore, the inclinations alone were used to determine a polarity log of the sediment (see Clement and Robinson, this volume). The depths of the reversal boundaries are given in Table 3.

Hole 606A

The same procedures were followed at this hole as at Hole 606, with the exception that paleomagnetic samples were taken only within the intervals encompassing the Brunhes/Matuyama reversal, the lower Olduvai reversal, and Cores 16, 17, and 19. By determining the level of the Brunhes/Matuyama and lower Olduvai reversals, the amount of offset between holes was monitored during the coring process (Fig. 4). The standard sampling scheme of one sample per section was resumed on Core 16. Unfortunately, Core 18 was deformed and was heated with a torch on deck in order to remove it from the drill pipe. Therefore, it was not sampled. The depths of the reversal boundaries are given in Table 3.

SEDIMENTATION RATES

Sedimentation rates at Site 606 (Fig. 10, Table 4) were calculated on the basis of paleomagnetic stratigraphy and from calcareous nannofossil, foraminiferal, and diatom zones. All subunits are nannofossil oozes.

In the Quaternary (Cores 606-1 through -6, and 606A-1 through -6), rates of deposition averaged 30 m/m.y. in foraminiferal–nannofossil ooze. Rates appear to have increased from about 25 m/m.y. in the upper 25 m to about 37 m/m.y. in the interval from 25 to 54 m sub-bottom. This higher rate (~37 m/m.y.) continued through most of the upper Pliocene down to 105 m sub-bottom depth at an age of 3.15 Ma. Still higher deposition rates occurred in the lowermost upper Pliocene and upper part of the lower Pliocene, with a rate of 62 m/m.y. characterizing the interval between 105 m (3.15 Ma) to the bottom of the hole.

Table 3. Depths of reversal boundaries.

Reversal		Age (Ma)	Sample (core-section, cm level)	Sub-bottom depth (m)[a]
Hole 606				
Brunhes/Matuyama		0.73	3-5, 128/3-6, 6	19.69/19.97
Jaramillo	(top)	0.91	4-1, 120/4-2, 35	23.21/23.86
	(bottom)	0.98	4-2, 35/4-2, 07	23.86/24.48
Cobb Mt.	(top)	?	4-4, 35/4-4, 97	26.86/27.48
	(bottom)	?	4-4, 97/4-5, 35	27.48/28.98
Olduvai	(top)	1.66	7-2, 35/7-2, 97	52.66/53.28
	(bottom)	1.88	7-6, 35/7-6, 97	58.66/59.28
Reunion	(top)		8-5, 35/8-6, 97	68.26/70.28
	(bottom)		8-6, 97/9-2, 97	70.28/72.48
Matuyama/Gauss	(top)	2.47	9-6, 97/10-1, 97	78.48/80.58
Kaena	(top)	2.92	11-3, 97/11-4, 97	93.18/94.68
	(bottom)	2.99	12-1, 97/12-2, 97	99.68/101.18
Mammoth	(top)	3.08	12-3, 97/12-4, 97	102.68/104.18
	(bottom)	3.18	12-5, 97/12-6, 85	105.68/107.06
Gauss/Gilbert		3.40	14-3, 97/14-4, 97	121.68/123.18
Cochiti	(top)	3.88	17-4, 96/17-5, 96	151.97/153.47
	(bottom)	3.97	18-1, 97/18-3, 110	157.08/160.21
Hole 606A				
Brunhes/Matuyama		0.73	3-4, 20/3-4, 55	19.90/20.25
Jaramillo	(top)	0.91	3-5, 97/3-5, 127.5	22.18/22.48
	(bottom)	0.98	3-6, 4/4-1, 20	23.36/25.01
Olduvai	(bottom)	1.88	7-3, 97/7-3, 140	57.58/58.01
Cochiti	(top)	3.88	17-1, 97/17-2, 97	150.58/152.08
	(bottom)	3.97	17-5, 97/17-6, 97	156.58/158.08
Nunivak	(bottom)	4.24	19-2, 97/19-3, 97	171.28/172.78

[a] Midpoint depths of samples in third column.

Table 4. Datum levels used to construct the time-versus-depth plot for Site 606 (Fig. 10).

Number	Datum level	Age (Ma)
1	Bottom of *Emiliania huxleyi*	0.28
2	Top of *Pseudoemiliania lacunosa*	0.47
3	Top of *Nitzschia reinholdii*	0.65
4	Matuyama/Brunhes	0.73
5	Top of Jaramillo	0.91
6	Bottom of Jaramillo	0.98
7	Top of *Helicosphaera sellii*	1.37
8	Top of *Calcidiscus macintyrei*	1.45
9	Top of Olduvai	1.66
10	Bottom of *Globorotalia truncatulinoides*	1.78
11	Bottom of *Pseudoeunotia doliolus*	1.80
12	Bottom of Olduvai	1.88
13	Top of discoasters	1.90
14	Top of *Globorotalia miocenica*	2.20
15	Top of *Discoaster pentaradiatus*	2.40
16	Top of Gauss	2.47
17	Top of *Dentoglobigerina altispira*	2.90
18	Top of Kaena	2.92
19	Bottom of Kaena	2.99
20	Top of Mammoth	3.08
21	Top of *Sphaeroidinellopsis seminulina*	3.10
22	Bottom of Mammoth	3.15
23	Top of *Globorotalia margaritae*	3.40
24	Gilbert/Gauss	3.40
25	Top of *Reticulofenestra pseudoumbilica*	3.50
26	Top of *Amaurolithus tricorniculatus*	3.70
27	Top of Cochiti	3.88
28	Top of *Globigerina nepenthes*	3.90
29	Bottom of Cochiti	3.97
30	Top of Nunivak	4.12

GEOCHEMISTRY

Samples for carbonate bomb analysis were taken throughout Site 606 and from below 150 m in Hole 606A. Interstitial water samples were taken at four levels in Hole 606A. For comparison, a surface seawater sample was also taken at Hole 606.

Carbonate Bomb

The calcium carbonate concentrations in sediments at Site 606 remain consistently above 80% (Fig. 11), with some samples giving values of 100%. The top 25 m of Hole 606 give the lowest values (between 80 and 90% $CaCO_3$), and the remainder of the hole and the sample from Hole 606A generally contain more than 90% $CaCO_3$).

Interstitial Water

Salinity is constant through the sediment column, whereas pH decreases from a relatively high value of 7.15 at 7 m sub-bottom depth to a neutral value at 41 m and below (Fig. 12). The alkalinity shows a corresponding increase from 3.32 meq dm^{-3} at 7 m to around 4.0 meq dm^{-3} in the lower sample. The chlorinity and Ca^{2+} concentration follow similar trends to each other with a minimum at the 7-m sample. In contrast, Mg^{2+} reaches an

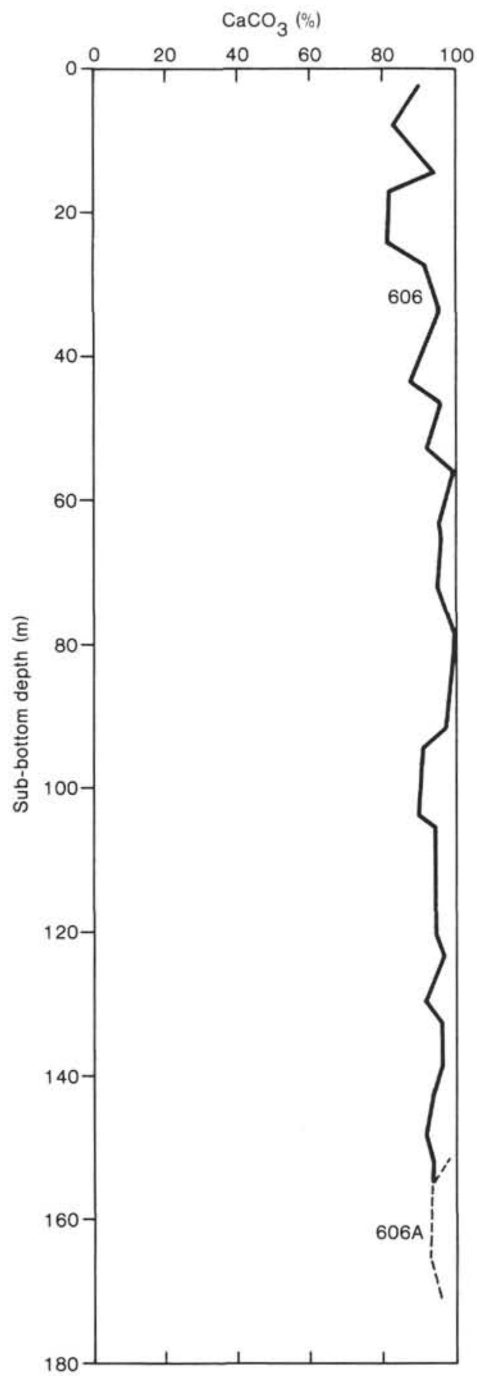

Figure 11. Carbonate bomb analyses, Site 606.

anomalous maximum at 93 m. With only five samples analyzed, it is difficult to assess the value of these data.

SUMMARY AND CONCLUSIONS

Site 606 is located on the upper western flank of the Mid-Atlantic Ridge at 37°20.3′N, 35°30.0′W. It was chosen to anchor the southern limit of a north-south transect designed to study the detailed paleoceanography of the North Atlantic during the late Neogene. As such, the most important results will gradually emerge from detailed laboratory analysis over the next several years. Conclusions here are accordingly limited, in large part, to an assessment of our success in obtaining a complete pelagic sequence useful for further study.

As shown in Figure 4, we were successful in obtaining a complete Pleistocene to lower Pliocene section using the newly developed APC (advanced piston corer). Hole 606 penetrated to 165.75 m (4.1 Ma); Hole 606A to 178.4 m (4.4 Ma). Paleomagnetic, biostratigraphic, and lithologic tie lines between the two holes (Fig. 4) indicate conclusively that we obtained a 100% complete composite section (unrecovered intervals in one section were recovered in the other by offsetting the sub-bottom depths of the cores by half a core length). The sub-bottom depth offset of correlative horizons between holes is nil for the first 50 m and then slowly increases to almost 4 m by 130 m sub-bottom. Because all nannofossil and foraminiferal zones are present, we have a complete uppermost Pleistocene to lower Pliocene stratigraphic section within the limits detectable by our sampling.

We were not successful in obtaining pre-Pliocene sediment because of coring problems and resulting time constraints. We decided that the basic Miocene objectives would be met at Sites 607 and 608 and that it would be unwise to fall behind schedule at a fair-weather site with much rougher weather presumably looming ahead.

The lithologies of Holes 606 and 606A are nannofossil oozes throughout, with a minor change from frequent pyrite-rich laminae in the upper 100 m to rare or no laminae below. This level coincides approximately with a change at about 3 Ma from depositional rates of 30 to 37 m/m.y. in the Pleistocene and late Pliocene to as much as 62 m/m.y. in the early Pliocene. The calcareous fractions are well preserved throughout, indicating minimal dissolution. There is relatively little reworking, except for some Miocene nannofossils in the lower Pliocene sections.

The lithologies argue for basically pelagic deposition, but the rates of deposition and reworking require some enhancement of the pure pelagic rain by redistribution along the seafloor. Pelagic deposition rates in undissolved calcareous oozes are generally in the range of 10 to 20 m/m.y. during the Pleistocene (Crowley, 1981), and probably during the Pliocene as well. The rates at Site 606 are thus a factor of 2 or 3 higher than the pure pelagic "rain."

The seismic records support this argument. Rather than a uniformly draped cover, the profiles show high-standing basement outcrops with little or no cover situated adjacent to deeper basins containing thick sediment fill. This pattern argues for some kind of sediment redistribution from high to low topography. Site 606 lies in a basin with a thick sediment fill (0.39 s), suggesting that this location has received an excess of sediment relative to the regional norm for most of its 13-m.y. history.

There is, however, no evidence of turbidites or debris flows at Site 606, and the amount of reworked nannofossils is never a high percentage of the total. Yet the hummocky topography observed on some of the high relief in seismic records and some reworked foraminifers suggest sediment reworking. We conclude that the reworking is largely a slow, gentle redistribution of contemporaneous sediments from high-energy sites (topo-

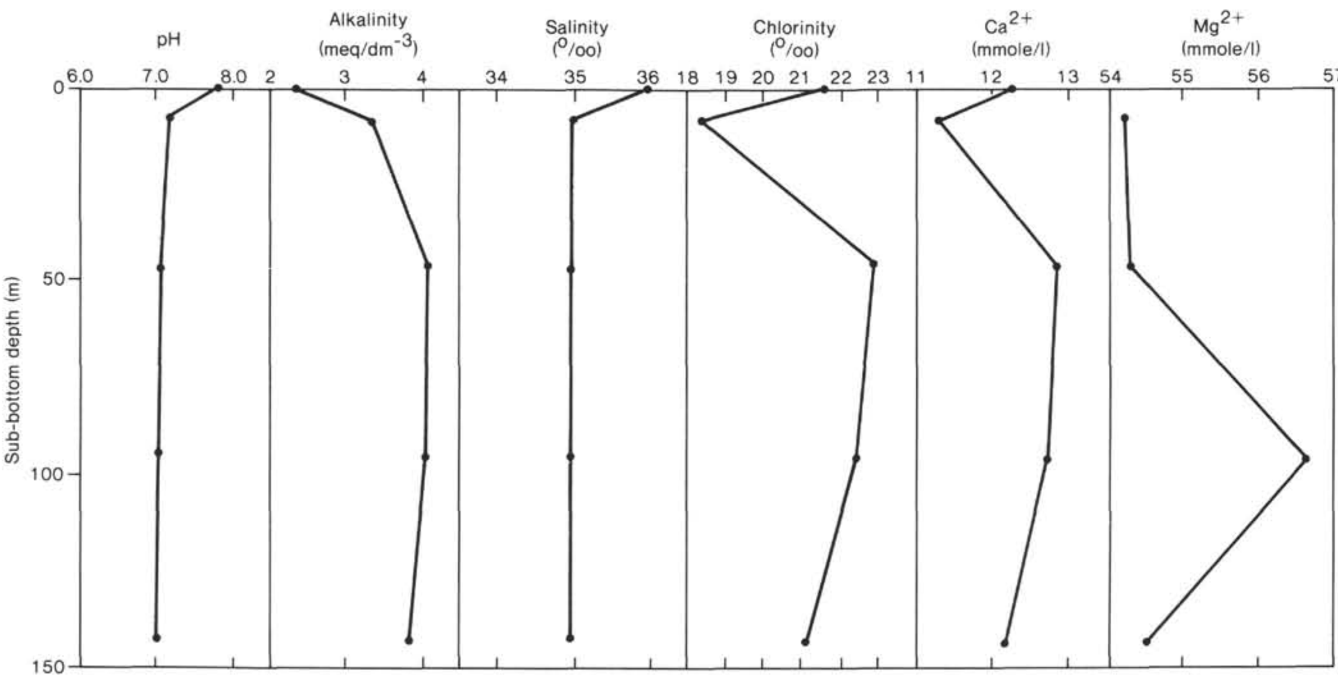

Figure 12. Interstitial water analyses, Hole 606A.

graphic highs and slopes) to low-energy sites (topographic lows); that it proceeds in a relatively continuous manner without a noticeable incidence of catastrophic events; and that it leaves intact an excellent stratigraphy typical of the hypothetical pure "pelagic" core but deposited at enhanced rates. In summary, this appears to be an excellent site for detailed Pliocene-Pleistocene paleoceanographic studies.

There is evidence of some change in the sediments at the bottom of Hole 606A. The large over-pulls on Cores 18 (100,000 lbf.) and 20 (40,000 lbf. when the piston rod sheared) indicate more cohesive sediments, although the physical properties do not show major changes at these depths. The sedimentation rate appears to decrease below Core 16, although this is not very well constrained by the available datum levels (see Table 4 and Fig. 10). The increased content of reworked nannofossils and benthic foraminifers could argue for slower deposition rates or a hiatus just below the cored intervals. The increased reflectivity in the seismic section at the total depth of Holes 606 and 606A (Fig. 8) also is consistent with a fundamental change in the nature of the sediments.

Finally, the total sediment thickness of 0.39 s at Site 606 (Fig. 8) would equate to 292 m sub-bottom depth at a seismic velocity of 1.55 km/s. The latter velocity is a minimum estimate based on that measured in the upper 178 m cored. Higher velocities would give thinner total accumulations. Using the above values, we calculate that the lower 114 m of sediment was deposited in about 8.6 m.y., which is the difference between the ages at total depth (4.4 Ma) and at basement (13 Ma). This middle/upper Miocene sequence was thus deposited at an average rate of only 13 m/m.y., about one third that in the upper sediment column. This is consistent with, but not proof of, a hiatus at or just below depth at 178 m. Deeper hiatuses and/or intervals of slow deposition during the Miocene are also likely.

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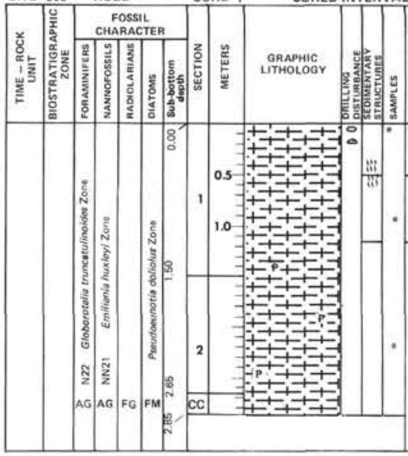
SITE 606 HOLE CORE 1 CORED INTERVAL 0.00–2.85 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale yellowish brown (10YR 6/3) abruptly changing at 50 cm to light gray (5Y 7/1), abruptly changing at 113 cm to white (N9); 4 mm pebble at 137 cm; patches rich in pyrite scattered between Section 1, 130 cm to Section 2, 100 cm.

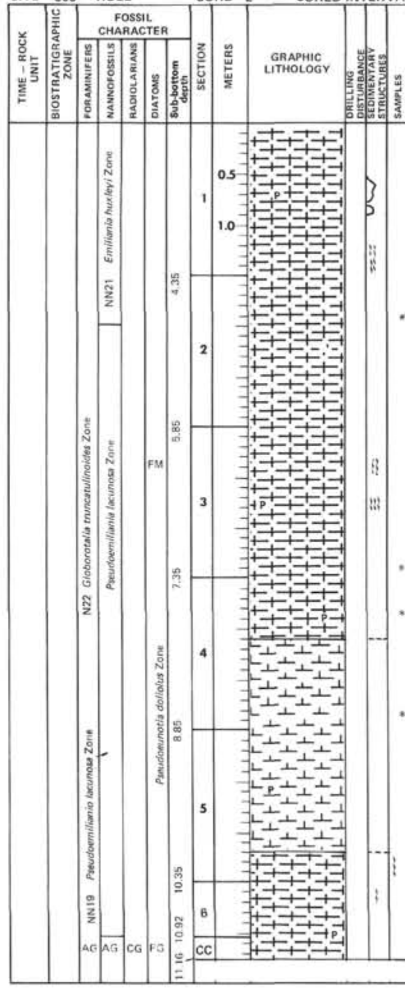
SMEAR SLIDE SUMMARY (%):

	1, 1	1, 92	2, 70
	D	D	D
Composition:			
Feldspar	–	–	TR
Pyrite	–	–	3
Foraminifers	11	25	10
Calc. nannofossils	89	75	87

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61
Organic carbon	–
Carbonate	90

SITE 606 HOLE CORE 2 CORED INTERVAL 2.85–12.45 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, light gray (5Y 7/1) to white (N9), 5–10 mm laminae of pale green (5GY 7/1) and medium gray (N5) scattered through Sections 2–4; patches rich in pyrite scattered throughout core; sedimentary clasts between Section 1, 63 to 76 cm and Section 1, 83 to 88 cm composed of pyrite-rich foraminiferal nannofossil ooze, pale purple (5P 8/2).

MINOR LITHOLOGY: NANNOFOSSIL OOZE, pale gray (5Y 8/1) Section 4, 60 cm to Section 5, 120 cm.

SMEAR SLIDE SUMMARY (%):

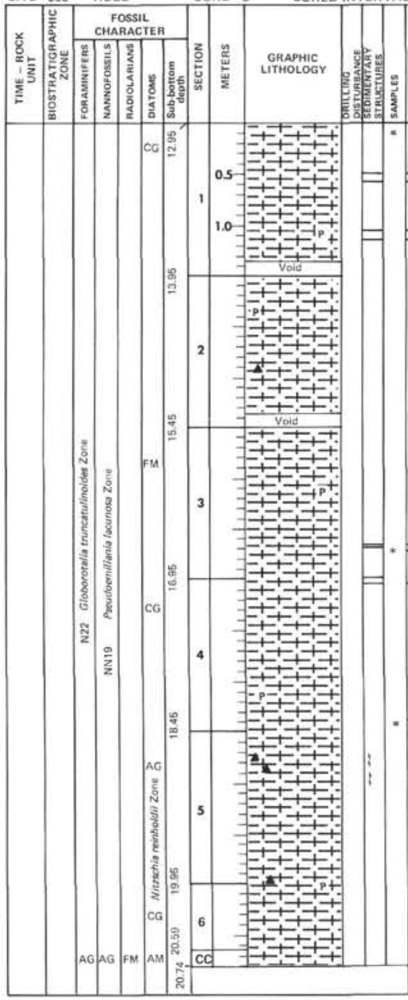
	2, 43	3, 143	4, 38	4, 132
	D	D	D	M
Composition:				
Carbonate unspec.	–	–	5	–
Foraminifers	20	20	15	5
Calc. nannofossils	80	80	80	95
Diatoms	–	TR	–	–
Sponge spicules	–	TR	TR	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	87	83

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

SITE 606 HOLE CORE 3 CORED INTERVAL 12.45–22.05 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1) and pale yellowish brown (10YR 7/1), abruptly changing to pale purple (5P 8/2) between Section 1, 56 to 59 cm, Section 1, 107 to 111 cm, Section 3, 59 to 61 cm and Section 4, 1 to 3 cm; 5 mm laminae of pale purple (5P 8/2) and pale green (5GY 7/1) scattered through Section 3,CC; patches rich in pyrite scattered through Sections 2, 3, and 6; pumice fragments at Section 2, 91 cm, Section 3, 21, 37, and 146 cm.

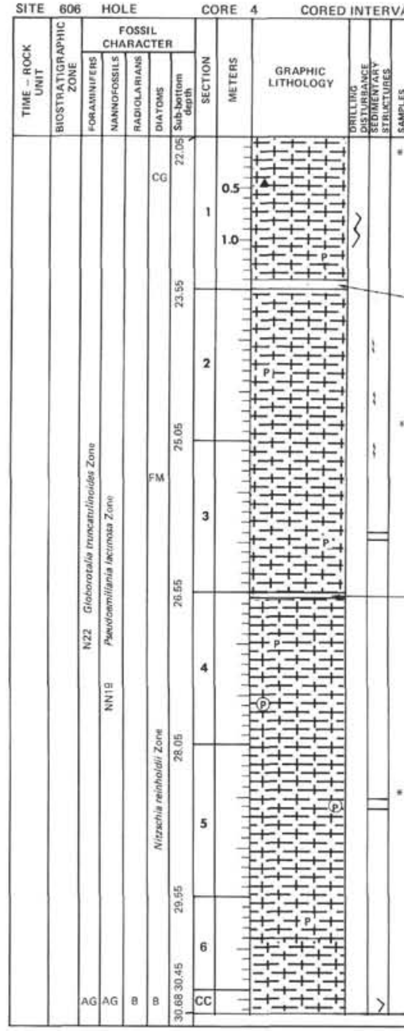
SMEAR SLIDE SUMMARY (%):

	1, 10	3, 122	4, 145
	D	D	D
Composition:			
Volcanic glass	TR	–	TR
Foraminifers	10	20	10
Calc. nannofossils	90	80	90
Diatoms	–	TR	TR

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	94	81

SITE 606 HOLE CORE 4 CORED INTERVAL 22.05–31.65 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 7/1 to 5Y 8/1) and pale purple (5P 8/1); 5 mm laminae of pale purple (5P 8/1) and pale green (5GY 7/1) scattered throughout core; patches rich in pyrite scattered throughout core; 5 mm lamina rich in ash at Section 3, 3 cm; pyrite nodules at Section 4, 103 cm and Section 5, 58 cm; 5 mm pumice fragment at Section 1, 46 cm.

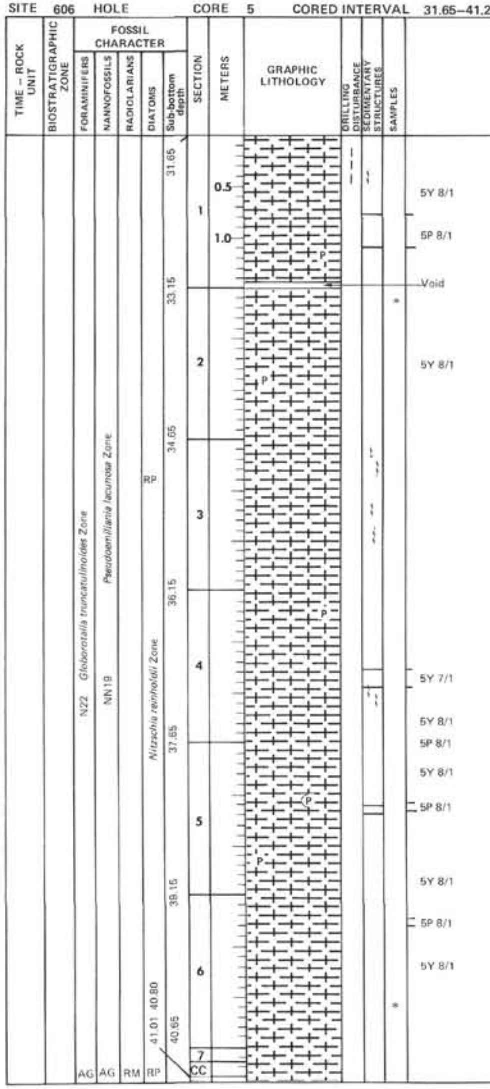
SMEAR SLIDE SUMMARY (%):

	1, 19	2, 132	5, 45
	D	D	D
Composition:			
Volcanic glass	TR	TR	TR
Foraminifers	14	12	10
Calc. nannofossils	86	88	90
Diatoms	–	TR	–
Radiolarians	–	TR	TR
Sponge spicules	TR	–	–
Silicoflagellates	TR	–	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	81	92

SITE 606 HOLE CORE 5 CORED INTERVAL 31.65–41.25 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1 to 5Y 7/1) becoming pale purple (5P 8/1) between Section 1, 77 to 104 cm; Section 5, 2 to 5 cm and 56–64 cm; and Section 6, 24–27 cm; 5 mm laminae of pale purple (5P 8/1) and pale green (5GY 7/1) scattered throughout core; patches rich in pyrite scattered throughout core, pyritized worm burrow at Section 5, 56 cm.

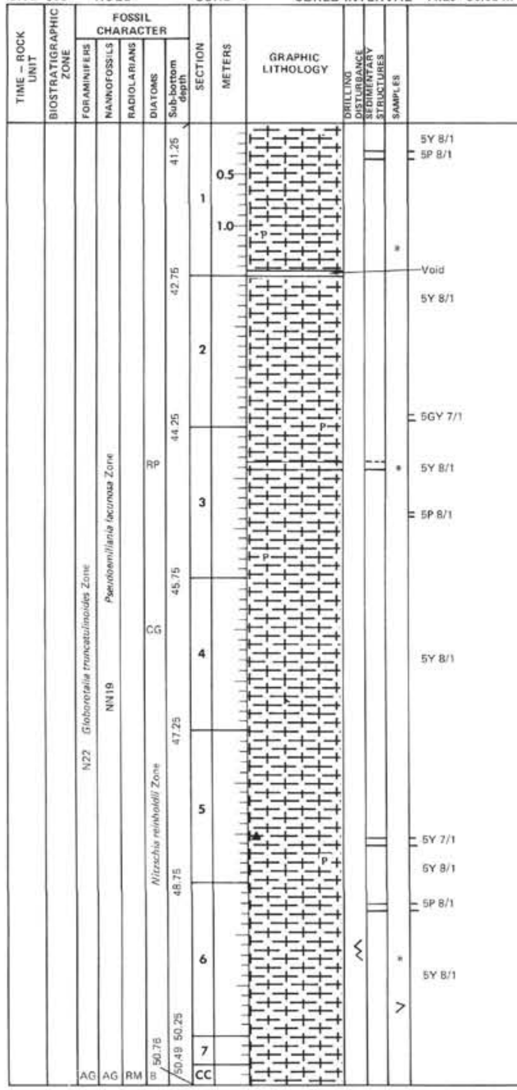
SMEAR SLIDE SUMMARY (%):

	2, 18	6, 110
	D	D
Composition:		
Volcanic glass	TR	TR
Foraminifers	12	11
Calc. nannofossils	88	89
Sponge spicules	TR	–
Silicoflagellates	TR	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	45	94

SITE 606 HOLE CORE 6 CORED INTERVAL 41.25–50.85 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1 to 5Y 7/1), pale purple (5P 8/1) between Section 1, 24 to 26 cm, Section 3, 85 to 87 cm, and Section 6, 14 to 18 cm and pale green (5GY 7/1) between Section 2, 137 to 139 cm; 5 mm laminae of pale purple (5P 8/1) and pale green (5GY 7/1) scattered throughout core; patches rich in pyrite scattered throughout core; small pumice piece at Section 5, 102 cm; core highly disturbed due to an "O" ring within the core between Section 6, 114 to 120 cm.

Minor lithology NANNOFOSSIL FORAMINIFERAL OOZE, gray (10YR 6/1) between Section 3, 35 to 41 cm; having sharp basal (erosional) contact.

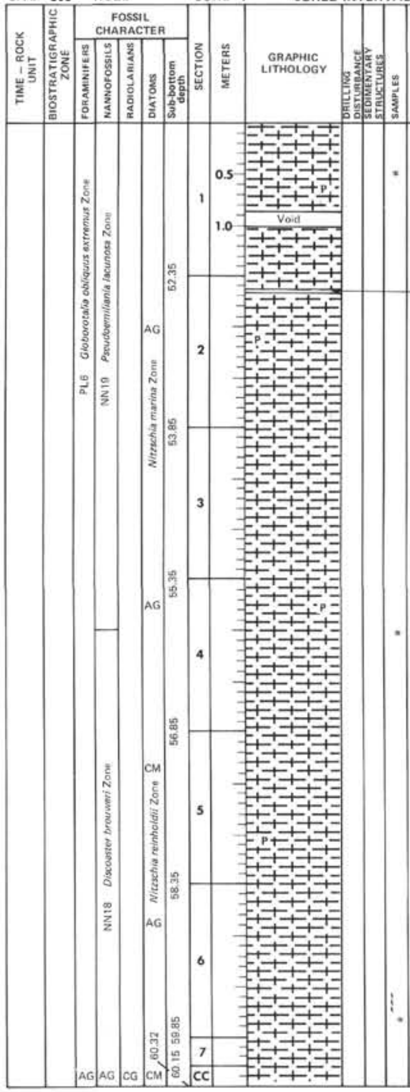
SMEAR SLIDE SUMMARY (%):

	1, 126	3, 40	6, 74
	D	M	D
Composition:			
Quartz	–	–	TR
Volcanic glass	TR	–	–
Foraminifers	10	75	10
Calc. nannofossils	90	25	90
Radiolarians	TR	–	TR

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	87	96

SITE 606 HOLE CORE 7 CORED INTERVAL 50.85–60.45 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1); 5–10 cm laminae of pale purple (5P 8/1) or pale green (5GY 7/1) scattered throughout core; patches rich in pyrite scattered throughout core.

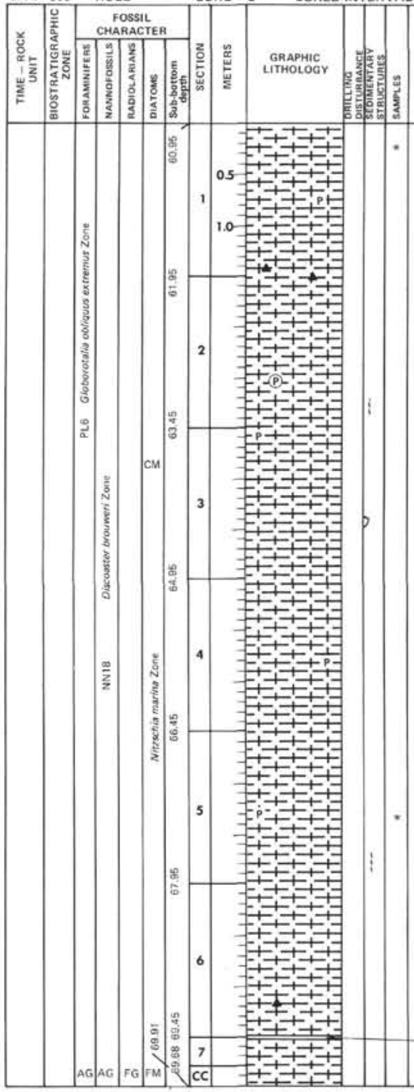
SMEAR SLIDE SUMMARY (%):

	1, 50	4,52	6, 139
	D	D	D
Composition:			
Quartz	TR	–	–
Foraminifers	20	10	10
Calc. nannofossils	80	90	90
Radiolarians	TR	TR	TR

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	92	100

SITE 606 HOLE CORE 8 CORED INTERVAL 60.45–70.05 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1); 5–10 mm laminae of pale purple (5P 8/1) and pale green (5GY 7/1) scattered throughout Sections 1, 4, and 5; patches rich in pyrite scattered throughout core; 10 cm sedimentary clast composed of foraminiferal nannofossil ooze, dark olive gray (5Y 4/2) at Section 3, 94 cm; 5 mm pumice at Section 1, 142 and 144 cm and Section 6, 112 cm; pyritized worm borrow at Section 2, 105 cm.

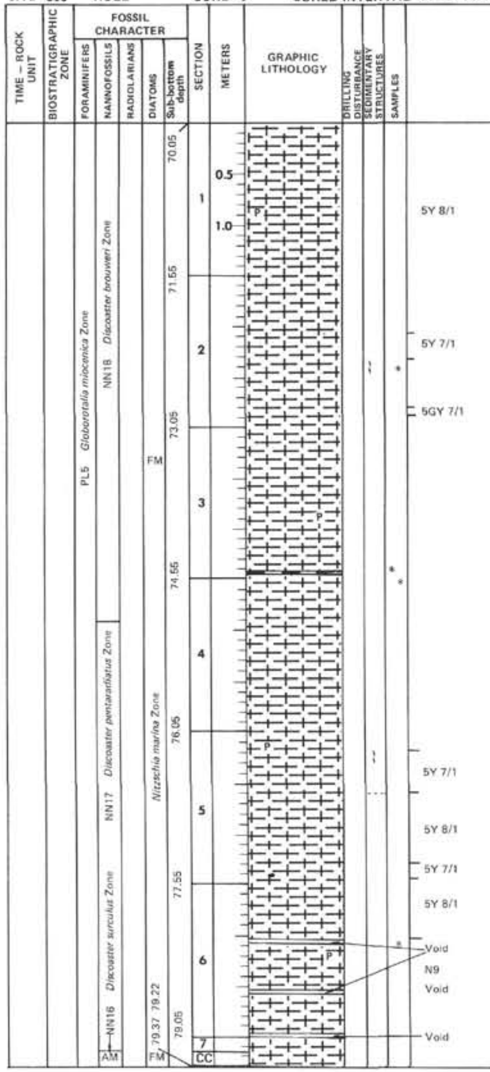
SMEAR SLIDE SUMMARY (%):

	1, 25	5, 88
	D	D
Composition:		
Foraminifers	10	10
Calc. nannofossils	90	90

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	95	96

SITE 606 HOLE CORE 9 CORED INTERVAL 70.05–79.65 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSI OOZE, pale gray (5Y 8/1 to 5Y 7/1) to white (N9); laminae of pale green (5GY 7/1) between Secton 2, 135 to 138 cm and Section 3, 106 to 108 cm; 5–10 mm laminae of pale purple (5P 8/1) and pale green (5GY 7/1) scattered throughout; patches rich in pyrite scattered throughout core; small pebble at Section 5, 141 cm. Layer between Section 3, 140 to 142 cm rich in foraminifers and pyrite, sharp basal (erosional) contact.

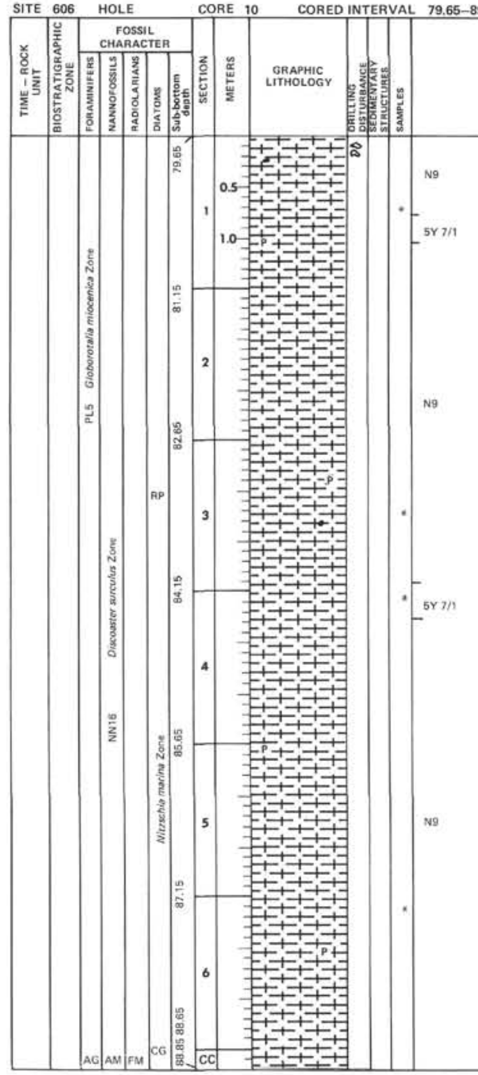
SMEAR SLIDE SUMMARY (%):

	2, 97	4, 1	6, 61	3, 141
	D	D	D	M
Composition:				
Pyrite	–	–	–	15
Foraminifers	20	25	10	25
Calc. nannofossils	80	75	90	60
Radiolarians	TR	–	–	–
Sponge spicules	TR	–	—	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	95	85

SITE 606 HOLE CORE 10 CORED INTERVAL 79.65–89.25 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 7/1) to white (N9); 5–10 mm laminae, pale green (5GY 7/1) scattered throughout; patches rich in pyrite scattered throughout 4 mm pebbles at Section 1, 25 cm and Section 3, 71 cm.

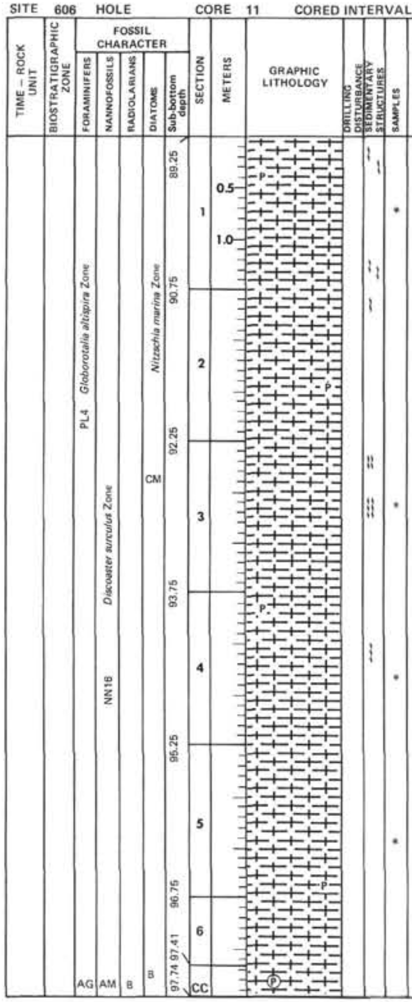
SMEAR SLIDE SUMMARY (%):

	1, 78	3, 77	4, 6	6, 13
	D	D	D	D
Composition:				
Volcanic glass	–	–	–	TR
Foraminifers	20	10	15	20
Calc. nannofossils	79	90	85	80
Radiolarians	–	–	–	TR
Sponge spicules	1	TR	–	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	100	99

SITE 606 HOLE CORE 11 CORED INTERVAL 89.25–98.75 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); 10 mm laminae rich in pyrite at Section 2, 160 cm; 5–10 mm lamina, pale green (5GY 7/1) common throughout core; stringers and patches rich in pyrite scattered throughout; 5 mm lamina pale purple (5P 8/1) scattered throughout; 20 mm pyritized worm burrow at 20 cm of Core Catcher.

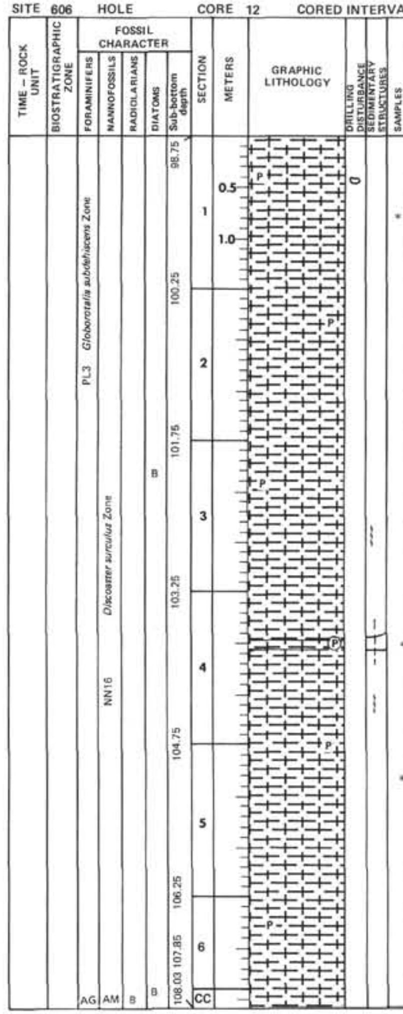
SMEAR SLIDE SUMMARY (%):

	1, 75	3, 64	4, 89	5, 99
	D	D	D	D
Composition:				
Foraminifers	10	10	15	20
Calc. nannofossils	90	90	85	80
Radiolarians	TR	TR	–	–
Sponge spicules	TR	TR	–	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	97	91

SITE 606 HOLE CORE 12 CORED INTERVAL 98.75–108.25 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); 2–5 mm laminae, pale green (5GY 7/1) scattered throughout core; patches and stringers rich in pyrite common throughout core.

Minor lithology NANNOFOSSIL FORAMINIFERAL OOZE, white (N9), between Section 4, 47 to 53 cm; contains pyrite nodule; sharp basal (erosional) contact.

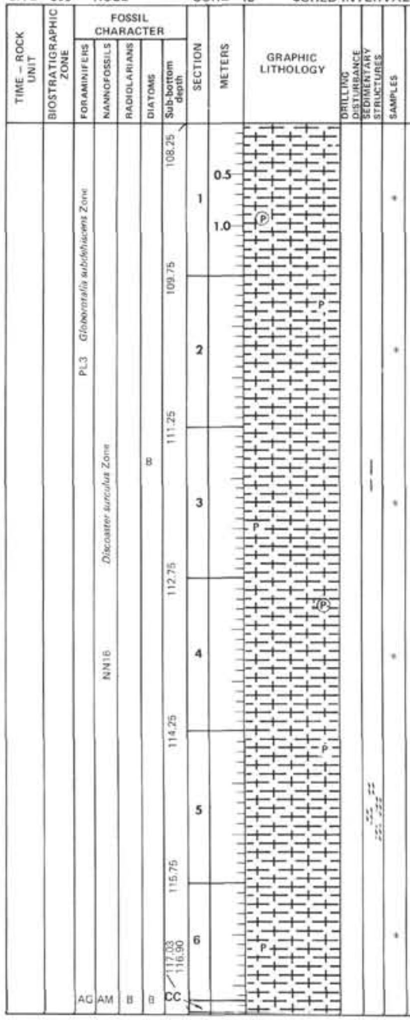
SMEAR SLIDE SUMMARY (%):

	1, 80	4, 53	5, 37
	D	M	D
Composition:			
Foraminifers	10	60	20
Calc. nannofossils	90	40	80
Sponge spicules	TR	–	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	90	89

SITE 606 HOLE CORE 13 CORED INTERVAL 108.25–117.75 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); patches rich in pyrite scattered throughout. Small pyrite nodules at Section 1, 98 cm and Section 4, 28 cm.

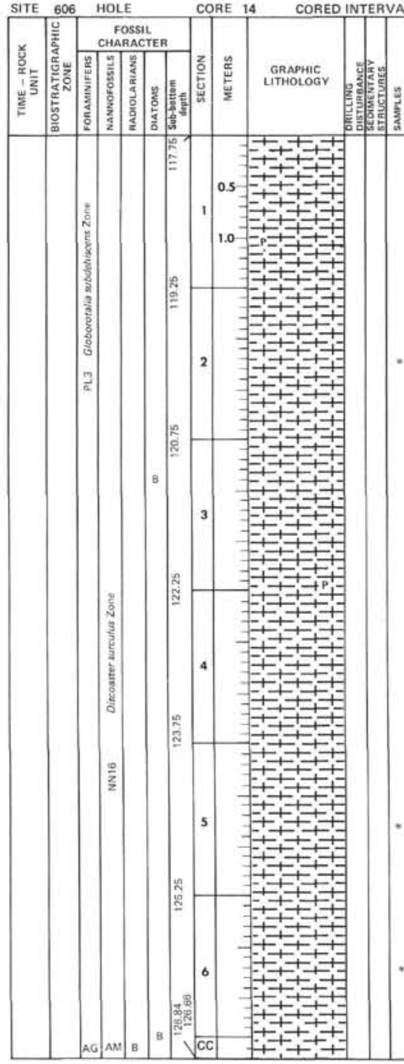
SMEAR SLIDE SUMMARY (%):

	1, 75	2, 75	3, 75	4, 75	6, 50
	D	D	D	D	D
Composition:					
Clay	5	–	–	5	5
Glauconite	TR	–	–	–	–
Carbonate unspec.	15	–	–	–	–
Foraminifers	18	20	25	25	25
Calc. nannofossils	62	80	75	70	70
Plant debris	–	TR	–	–	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	94	93

SITE 606 HOLE CORE 14 CORED INTERVAL 117.75–127.25 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); occasional patches rich in pyrite scattered throughout.

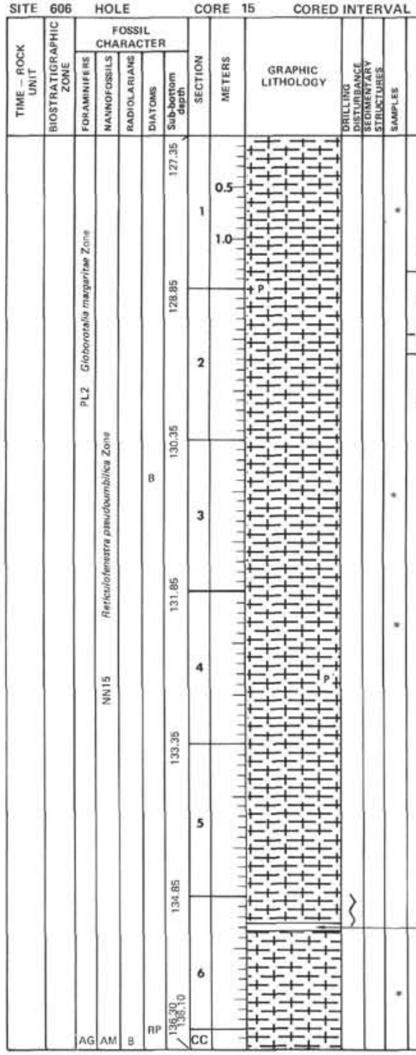
SMEAR SLIDE SUMMARY (%):

	2, 75	5, 80	6, 75
	D	D	D
Composition:			
Clay	5	5	5
Carbonate unspec.	–	–	5
Foraminifers	20	30	20
Calc. nannofossils	75	65	70
Plant debris	TR	TR	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	94	96

SITE 606 HOLE CORE 15 CORED INTERVAL 127.35–136.95 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9) to pale gray (N8); several pale green (5GY 7/1) laminations between Section 3, 136 to 138 cm; occasional patches rich in pyrite scattered throughout; core highly disturbed between Section 6, 0 to 28 cm due to presence of "O" ring inside liner.

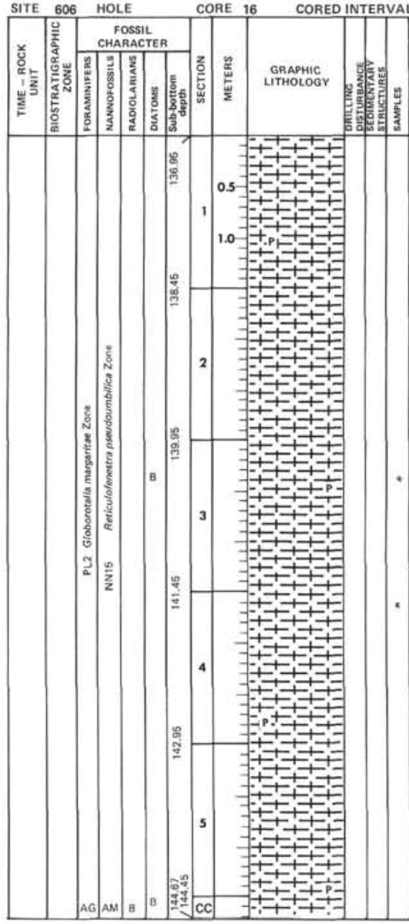
SMEAR SLIDE SUMMARY (%):

	1, 77	3, 56	4, 33	6, 98
	D	D	D	D
Composition:				
Clay	5	–	–	–
Pyrite	–	–	TR	–
Carbonate unspec.	–	20	20	20
Foraminifers	10	10	20	10
Calc. nannofossils	85	70	60	70
Radiolarians	–	TR	–	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	91	96

SITE 606 HOLE CORE 16 CORED INTERVAL 136.95–146.55 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); single 4 mm pale green (5GY 7/1) lamination at Section 3, 63 cm; patches rich in pyrite scattered throughout.

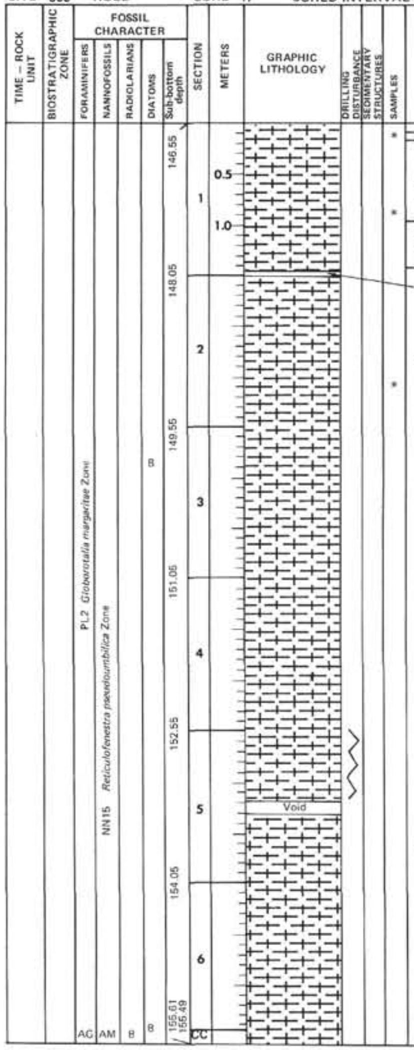
SMEAR SLIDE SUMMARY (%):

	3, 40	4, 15
	D	D
Composition:		
Pyrite	–	1
Carbonate unspec.	20	29
Foraminifers	10	10
Calc. nannofossils	40	60
Silicoflagellates	TR	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	96	93

SITE 606 HOLE CORE 17 CORED INTERVAL 146.55–156.15 m



LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9) to pale gray (N8); pale green (5GY 7/2) 5 mm laminae at Section 6, 15 and 21 cm; 5 mm medium gray (N8) laminae at Section 6, 36 cm; patches rich in pyrite scattered throughout core; core highly disturbed between Section 5, 0 to 80 cm due to presence of "O" ring inside liner.

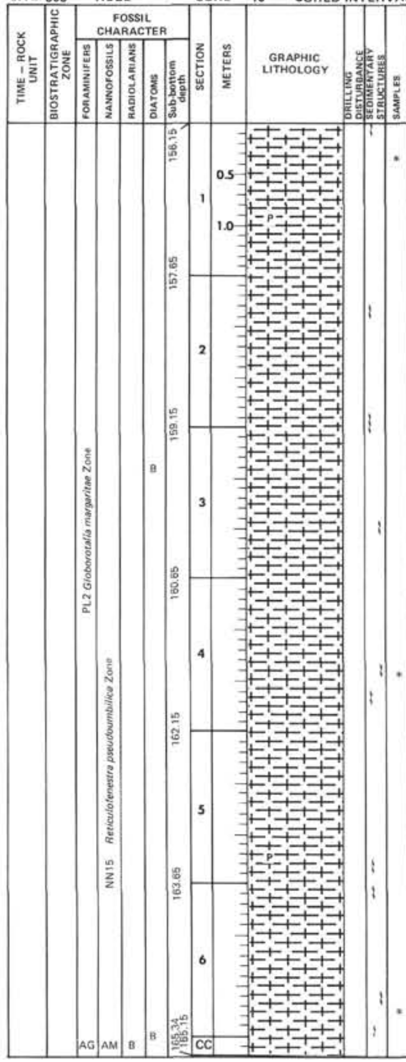
SMEAR SLIDE SUMMARY (%):

	1, 12	1, 90	2, 110
	D	D	D
Composition:			
Feldspar	–	TR	–
Pyrite	–	–	TR
Carbonate unspec.	20	30	20
Foraminifers	20	10	10
Calc. nannofossils	60	60	70
Silicoflagellates	TR	TR	–

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	91	93

SITE 606 HOLE CORE 18 CORED INTERVAL 156.15–165.75 m



LITHOLOGIC DESCRIPTION

5Y 8/1

5Y 8/1

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1); 5 mm pale green (5GY 7/1) laminae abundant between Section 2, 129 to 137 cm, Section 5, 89 to 95 cm, and at Section 4, 11 and 93 cm; patches rich in pyrite scattered throughout.

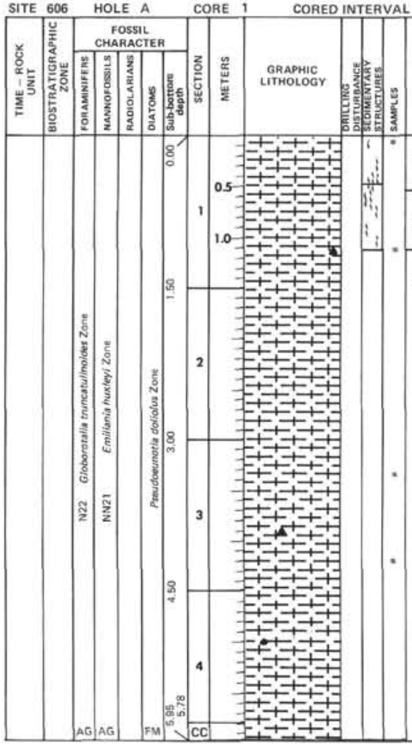
SMEAR SLIDE SUMMARY (%):

	1, 37	4, 94	6, 128
	D	D	D
Composition:			
Volcanic glass	TR	–	–
Foraminifers	10	16	12
Calc. nannofossils	90	84	88

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	93	93

SITE 606 HOLE A CORE 1 CORED INTERVAL 0.0–5.6 m



LITHOLOGIC DESCRIPTION

10YR 6/3

5Y 7/2

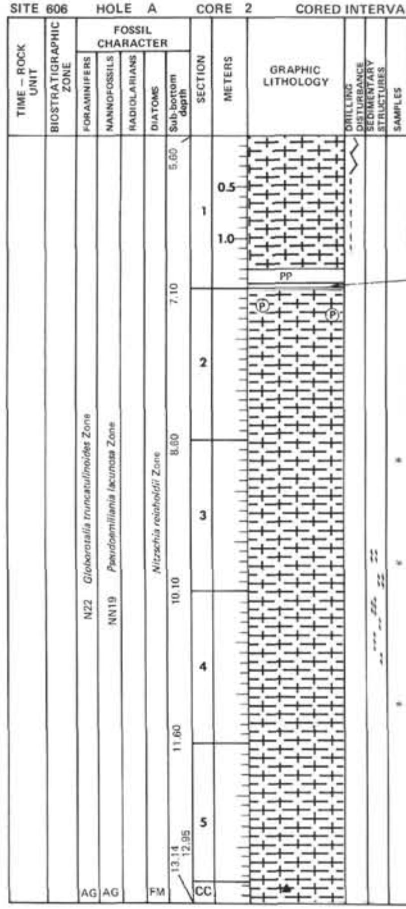
5Y 8/1

FORAMINIFERAL NANNOFOSSIL OOZE, pale yellowish brown (10YR 6/3) abruptly changing to yellowish gray (5Y 7/2) at Section 1, 48 cm, abruptly changing to pale gray (5Y 8/1) at Section 1, 108 cm, 5 mm pale green (5GY 7/1) laminae common between Section 3, 121–133 cm and Section 4, 13–33 cm, 5 mm pebble at Section 4, 50 cm; 5 mm pumice at Section 1, 113 cm and Section 3, 93 cm; occasional patches rich in pyrite scattered throughout.

SMEAR SLIDE SUMMARY (%):

	1, 10	1, 116	3, 38	3, 122
	D	D	D	D
Composition:				
Quartz	–	–	–	TR
Feldspar	–	–	TR	–
Volcanic glass	TR	–	TR	–
Foraminifers	10	10	10	10
Calc. nannofossils	90	90	90	90
Diatoms	–	–	TR	–
Radiolarians	TR	–	TR	TR
Sponge spicules	TR	–	–	–
Fish remains	–	–	–	TR

SITE 606 HOLE A CORE 2 CORED INTERVAL 5.6–15.2 m



LITHOLOGIC DESCRIPTION

5Y 8/1

5Y 7/1

IW

5Y 8/1

N9

5Y 8/1

5GY 4/1

5Y 8/1

N9

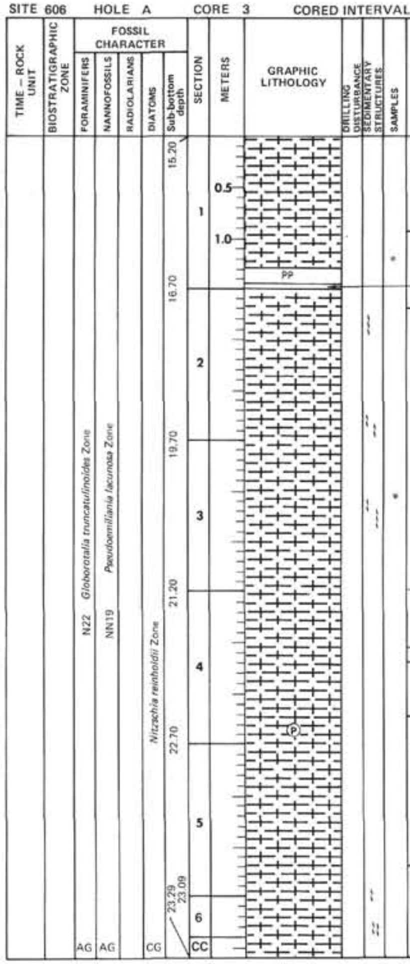
5Y 8/1

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1–5Y 7/1) to white (N9); 5 mm pale purple (5P 8/2) and pale green (5GY 7/1) laminae common throughout Sections 3–5; occasional patches rich in pyrite scattered throughout; pyritized worm burrows at Section 2, 20 and 27 cm; 1 cm pumice at Core Catcher, 1 cm.

SMEAR SLIDE SUMMARY (%):

	3, 21	3, 119	4, 110
	D	D	D
Composition:			
Feldspar	–	–	TR
Foraminifers	10	10	10
Calc. nannofossils	90	90	90
Radiolarians	TR	TR	TR

SITE 606 HOLE A CORE 3 CORED INTERVAL 15.2–24.8 m



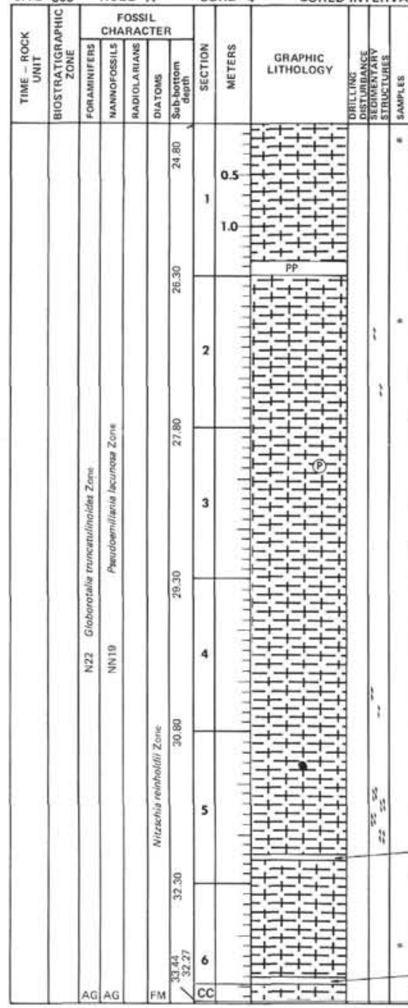
LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1–5Y 7/1) to white (N9); 5–10 mm pale purple (5P 8/2) and pale green (5GY 7/1) laminae common throughout; 3 cm pale purple (5P 8/2) laminae at Section 4, 57 cm; 5 mm gray (N4) lamina rich in pyritized foraminifera tests at Section 5, 123 cm; pyritized worm burrow at Section 4, 138 cm; occasional patches rich in pyrite scattered throughout.

SMEAR SLIDE SUMMARY (%):

	1, 112	3, 54	5, 54
	D	D	D
Composition:			
Feldspar	–	–	TR
Foraminifers	15	10	10
Calc. nannofossils	85	90	90
Radiolarians	–	TR	TR
Sponge spicules	TR	–	–

SITE 606 HOLE A CORE 4 CORED INTERVAL 24.8–34.4 m



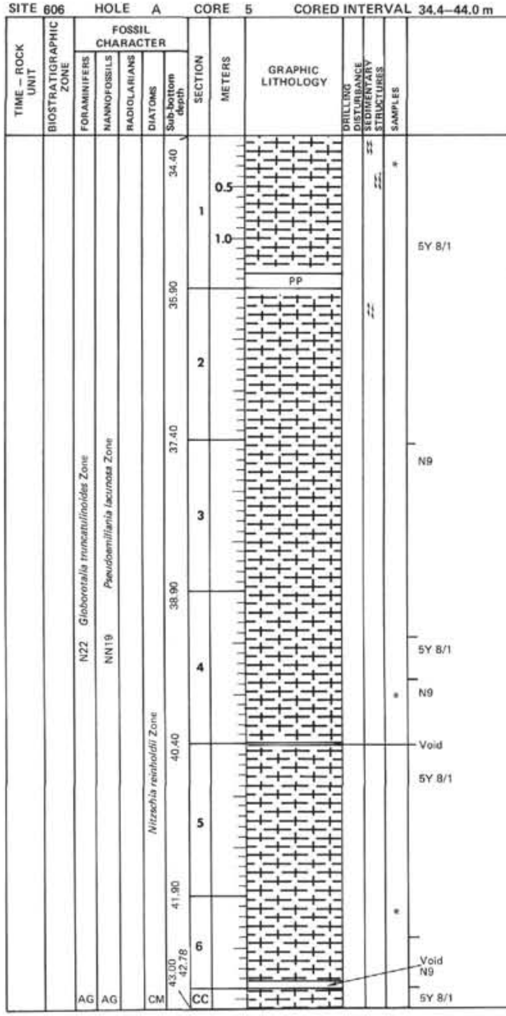
LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1–5Y 7/1) to white (N9); 5–10 mm pale purple (5P 8/2) and pale green (5GY 7/1) common throughout; 2 cm pale purple (5P 8/2) laminae at Section 2, 132 cm; 5 mm pebble at Section 5, 33 cm; large pyritized worm burrowed Section 3, 35 cm; occasional patches rich in pyrite scattered throughout.

SMEAR SLIDE SUMMARY (%):

	1, 16	2, 46	6, 60
	D	D	D
Composition:			
Feldspar	TR	TR	TR
Foraminifers	12	15	14
Calc. nannofossils	88	85	86
Radiolarians	TR	TR	TR
Sponge spicules	TR	TR	TR
Silicoflagellates	–	–	TR

SITE 606 HOLE A CORE 5 CORED INTERVAL 34.4–44.0 m



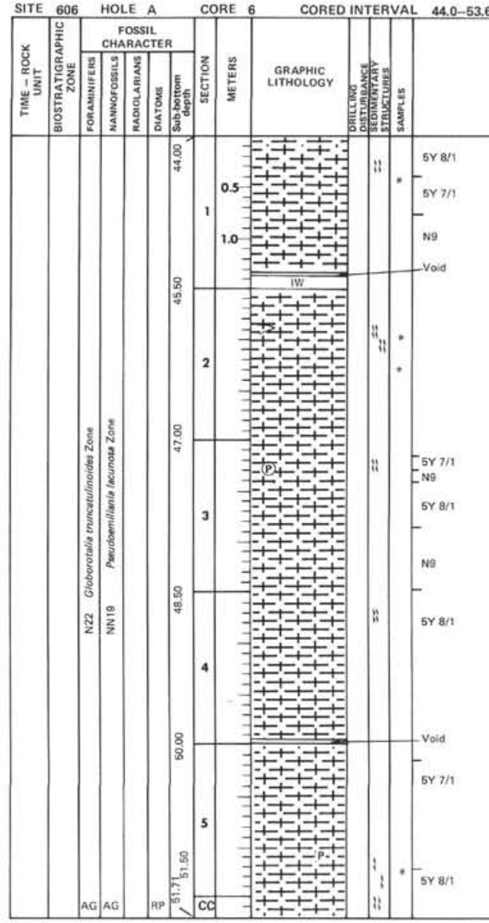
LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1) to white (N9); 5–10 mm pale purple (5P 8/2) and pale green (5GY 7/1) laminae common throughout; occasional patches rich in pyrite common throughout.

SMEAR SLIDE SUMMARY (%):

	1, 30	4, 106	6, 17
	D	D	D
Composition:			
Feldspar	–	TR	TR
Volcanic glass	TR	TR	–
Foraminifers	11	10	11
Calc. nannofossils	89	90	89
Diatoms	–	–	TR
Radiolarians	–	–	TR
Sponge spicules	TR	TR	–

SITE 606 HOLE A CORE 6 CORED INTERVAL 44.0–53.6 m



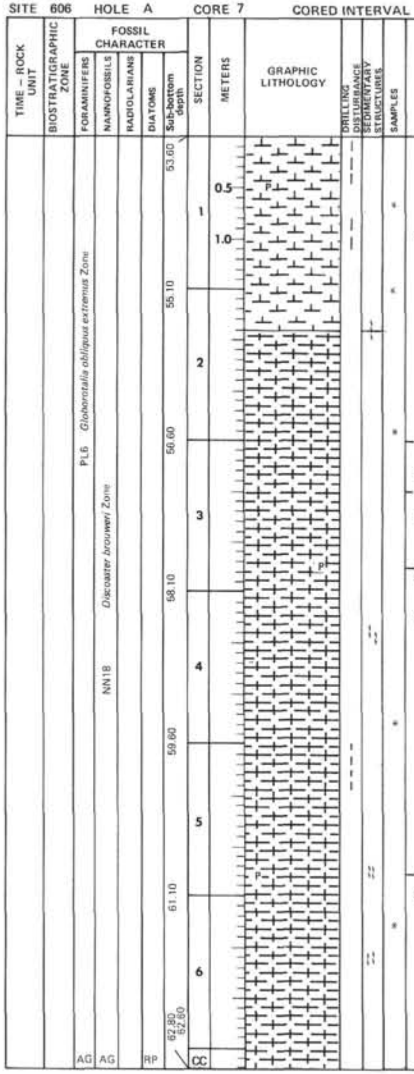
LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 8/1–5Y 7/1) to white (N9); 5 mm lamina at Section 1, 41 cm composed of NANNOFOSSIL FORAMINIFERAL OOZE, sharp basal contact; 5–10 mm pale purple (5P 8/2) and pale green (5GY 7/1) laminae common throughout; pyritized worm burrow at Section 3, 23 cm; occasional patches rich in pyrite scattered throughout.

SMEAR SLIDE SUMMARY (%):

	1, 42	2, 48	2, 79	5, 127
	M	D	D	D
Composition:				
Feldspar	–	TR	–	TR
Heavy minerals	–	TR	–	–
Volcanic glass	TR	–	–	–
Pyrite	TR	TR	–	–
Foraminifers	50	11	10	12
Calc. nannofossils	50	89	90	88
Sponge spicules	–	–	–	TR

SITE 606 HOLE A CORE 7 CORED INTERVAL 53.6–63.2 m



LITHOLOGIC DESCRIPTION

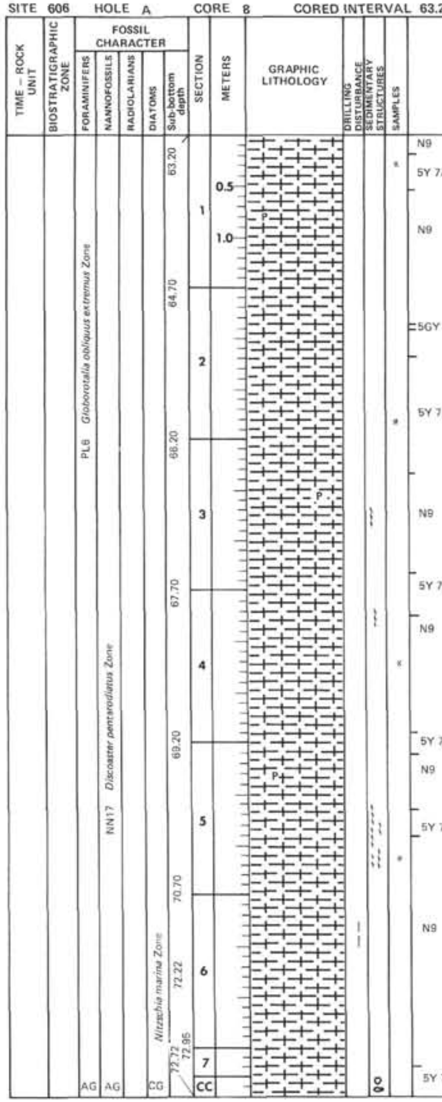
FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 7/1) to white (N9); 5–10 mm pale purple (5P 8/2) and pale green (5GY 7/1) laminae common throughout. Patches rich in pyrite common throughout.

MINOR LITHOLOGY: Section 1, 0 cm to Section 2, 41 cm NANNOFOSSIL OOZE, white (N9); 5 mm pale green (5GY 7/1) laminae common throughout; patches rich in pyrite scattered throughout.

SMEAR SLIDE SUMMARY (%):

	1, 70	2, 2	2, 144	4, 124	6, 33
	M	M	D	D	D
Composition:					
Heavy minerals	TR	–	–	–	–
Clay	TR	–	–	–	TR
Carbonate unspec.	–	–	5	–	–
Foraminifers	8	8	10	15	15
Calc. nannofossils	92	92	85	85	85
Radiolarians	TR	–	–	TR	–
Sponge spicules	TR	TR	–	TR	–

SITE 606 HOLE A CORE 8 CORED INTERVAL 63.2–72.8 m



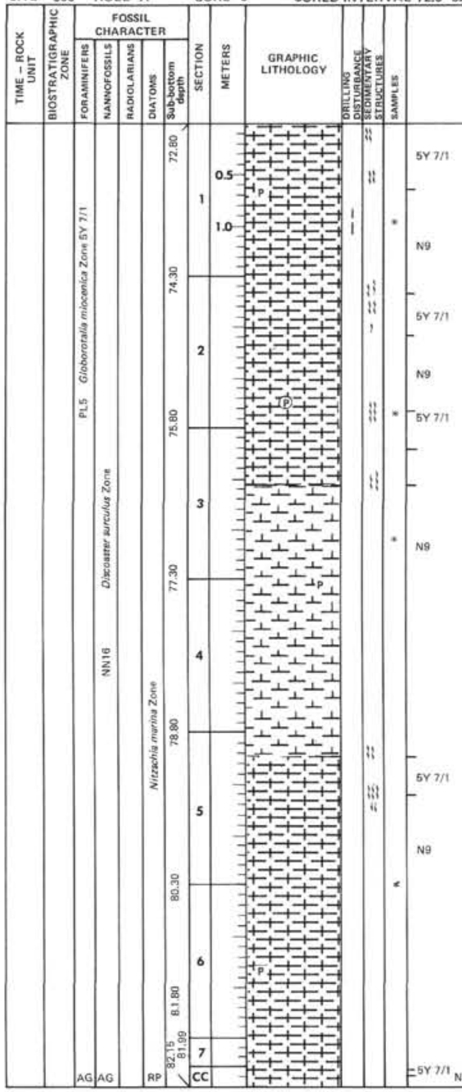
LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 7/1) to white (N9); 5–10 mm pale green (5GY 7/1) and pale purple (5P 8/2) laminae common throughout; 2 cm pale green (5GY 7/1) lamina at Section 2, 34 cm; patches rich in pyrite common throughout.

SMEAR SLIDE SUMMARY (%):

	1, 23	2, 129	4, 65	5, 112
	D	D	D	D
Composition:				
Quartz	TR	–	–	TR
Feldspar	TR	–	–	–
Volcanic glass	–	–	TR	–
Pyrite	TR	–	TR	–
Foraminifers	10	10	12	15
Calc. nannofossils	90	90	88	85
Sponge spicules	–	TR	–	–

SITE 606 HOLE A CORE 9 CORED INTERVAL 72.8–82.4 m



LITHOLOGIC DESCRIPTION

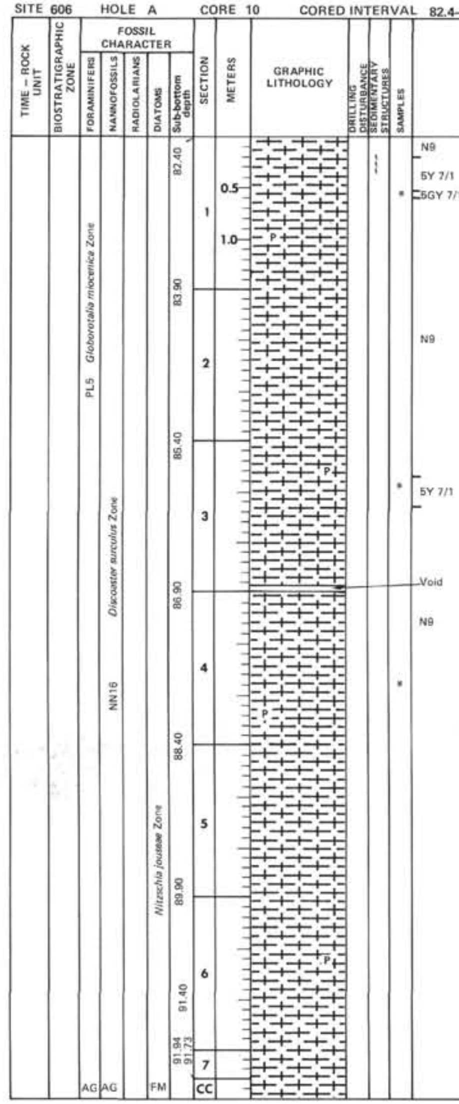
FORAMINIFERAL NANNOFOSSIL OOZE, pale gray (5Y 7/1) to white (N9); pale green (5GY 7/1) and pale purple (5P 8/2), 5–10 mm laminae scattered throughout; 4 mm pyrite nodule at Section 2, 124 cm, patches rich in pyrite common throughout.

MINOR LITHOLOGY: NANNOFOSSIL OOZE, white (N9) between Section 3, 53 cm to Section 5, 20 cm; 5–10 mm pale purple (5P 8/2) and pale green (5GY 7/2) laminae common throughout; patches rich in pyrite common throughout.

SMEAR SLIDE SUMMARY (%):

	1, 87	2, 130	3, 106	5, 146
	D	D	M	D
Composition:				
Quartz	–	TR	–	–
Heavy minerals	TR	–	–	–
Pyrite	TR	–	TR	–
Foraminifers	10	10	5	10
Calc. nannofossils	90	90	95	90
Radiolarians	–	TR	–	–
Sponge spicules	–	TR	–	–
Silicoflagellates	–	–	TR	–

SITE 606 HOLE A CORE 10 CORED INTERVAL 82.4–92.0 m



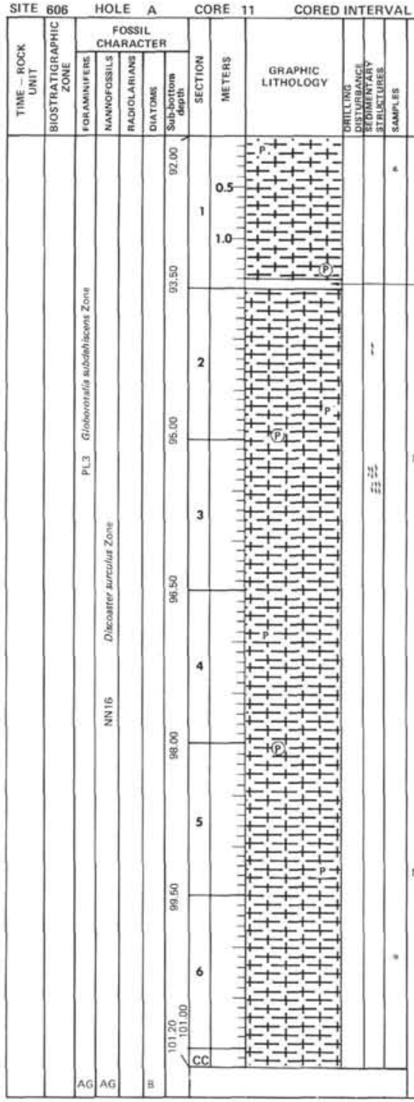
LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9) to pale gray (5Y 7/1); 5–10 mm pale green (5GY 7/1) and pale purple (5P 8/2) laminae scattered throughout; 3 cm pale green (5GY 7/1) lamina at Section 1, 55 cm; patches rich in pyrite common throughout.

SMEAR SLIDE SUMMARY (%):

	1, 55	3, 40	4, 85
	D	D	D
Composition:			
Quartz	–	–	TR
Heavy minerals	TR	TR	TR
Clay	–	TR	–
Foraminifers	10	10	10
Calc. nannofossils	90	90	90
Silicoflagellates	TR	–	–

SITE 606 HOLE A CORE 11 CORED INTERVAL 92.0–101.6 m



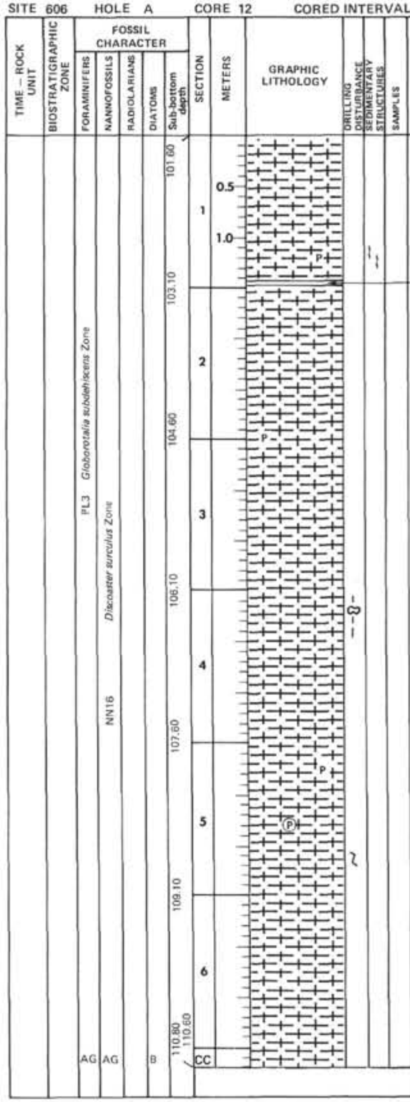
LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); 5–10 mm pale green (5GY 7/1) and pale purple laminae scattered throughout, patches rich in pyrite common throughout. Pyritized burrow at Section 1, 132 cm, Section 2, 147 cm, and Section 5, 2 cm.

SMEAR SLIDE SUMMARY (%):

	1, 28	6, 62
	D	D
Composition:		
Quartz	–	TR
Foraminifers	15	15
Calc. nannofossils	85	85
Sponge spicules	TR	—

SITE 606 HOLE A CORE 12 CORED INTERVAL 101.6–111.2 m



LITHOLOGIC DESCRIPTION

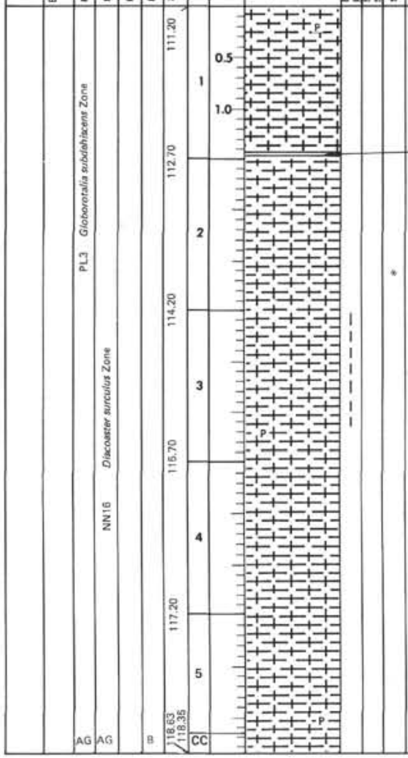
FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); 5–10 mm pale green (5GY 7/1) and pale purple (5P 8/2) laminae common in Sections 1 and 2; patches rich in pyrite scattered throughout; pyritized worm burrow at Section 5, 75 cm.

SMEAR SLIDE SUMMARY (%):

	2, 108	4, 20	5, 134
	D	D	D
Composition:			
Heavy minerals	–	TR	–
Clay	TR	–	–
Foraminifers	10	10	8
Calc. nannofossils	90	90	92

SITE 606 HOLE A CORE 13 CORED INTERVAL 111.2–120.8 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	Sub-bottom depth	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION



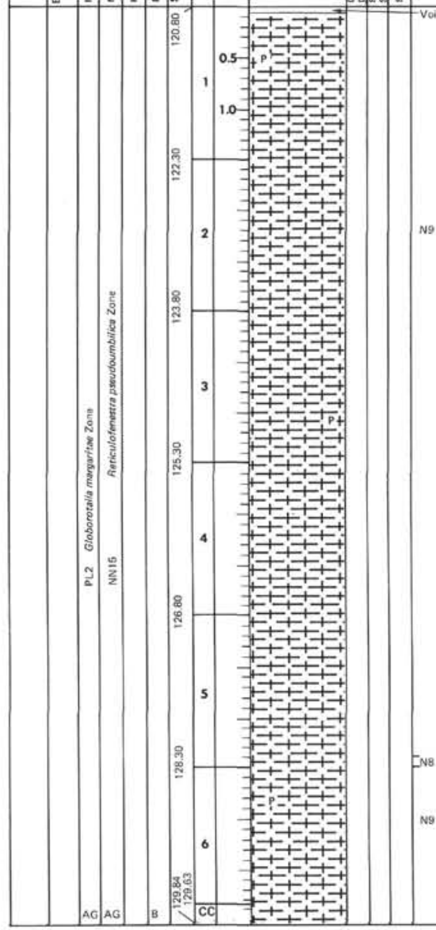
FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); several 5 mm pale green (5GY 7/1) laminations scattered throughout Section 1; patches rich in pyrite scattered throughout.

SMEAR SLIDE SUMMARY (%):

	2, 110
	D
Composition:	
Foraminifers	10
Calc. nannofossils	90

SITE 606 HOLE A CORE 14 CORED INTERVAL 120.8–130.4 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	Sub-bottom depth	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION

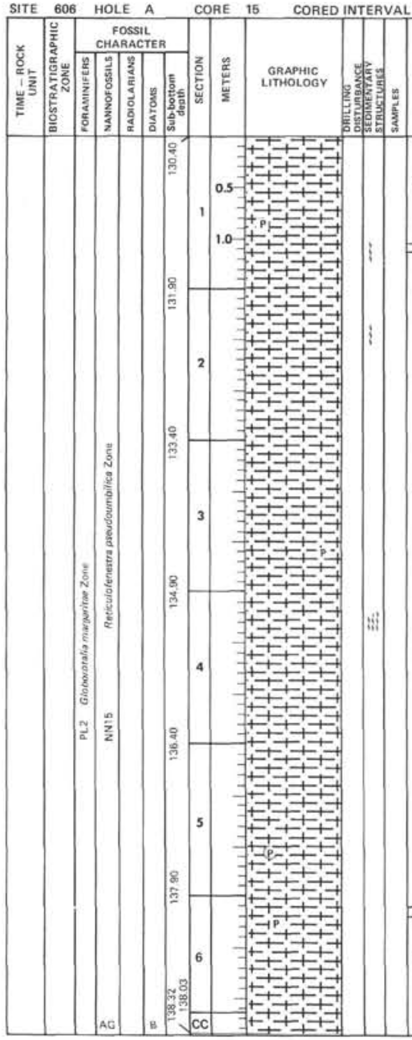


FORAMINIFERAL NANNOFOSSIL OOZE, white (N9) to pale gray (N8); several 3–5 mm pale green (5GY 7/1) laminations scattered throughout Sections 5 and 6; patches rich in pyrite scattered throughout.

SMEAR SLIDE SUMMARY (%):

	4, 40
	D
Composition:	
Quartz	TR
Foraminifers	15
Calc. nannofossils	85

SITE 606 HOLE A CORE 15 CORED INTERVAL 130.4–140.0 m



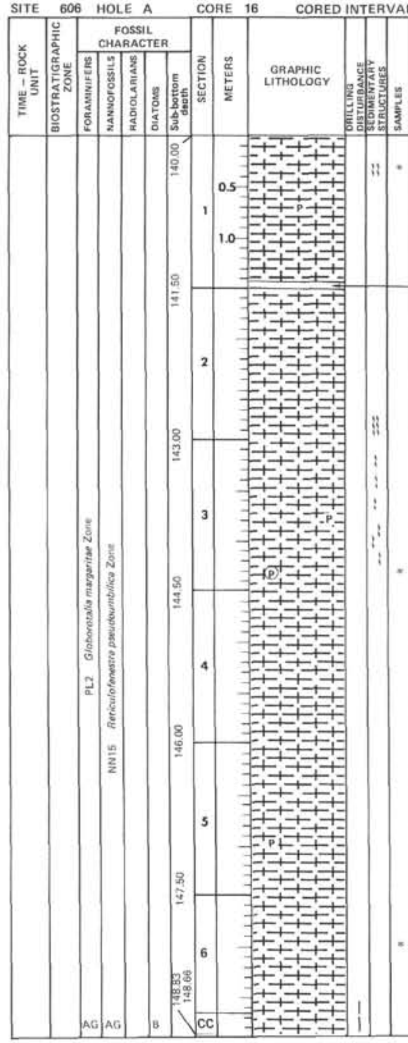
LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9) to pale gray (5Y 8/1); 5 mm pale purple (5P 8/2) and pale green (5GY 7/1) laminae sparsely scattered throughout; patches rich in pyrite scattered throughout; pyritized worm burrow at Section 5, 102 cm.

SMEAR SLIDE SUMMARY (%):

	3, 50
	D
Composition:	
Foraminifers	10
Calc. nannofossils	90

SITE 606 HOLE A CORE 16 CORED INTERVAL 140.0–149.6 m



LITHOLOGIC DESCRIPTION

FORAMINIFORAL NANNOFOSSIL OOZE, white (N9) to pale gray (N8); 15 mm laminae rich in pyrite at Section 3, 127 cm; 5 mm pale green (5GY 7/1) laminae common between Section 3, 12–27 cm; pyritized worm burrow at Section 3, 126 cm; patches rich in pyrite scattered throughout.

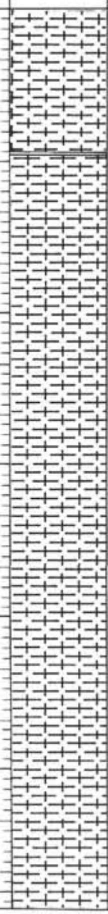
SMEAR SLIDE SUMMARY (%):

	1, 30	3, 127	6, 40
	D	D	D
Composition:			
Quartz	TR	–	–
Pyrite	–	20	–
Foraminifers	10	30	20
Calc. nannofossils	90	50	80

SITE 606 HOLE A CORE 17 CORED INTERVAL 149.6–159.2 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	Sub-bottom depth	SECTION	METERS
	PL2 *Globorotalia margaritae* Zone; NN15 *Reticulofenestra pseudoumbilica* Zone	AG	AG		B	149.60, 151.10, 152.60, 154.10, 155.60, 157.10, 158.36, 158.29	1, 2, 3, 4, 5, 6, CC	0.5, 1.0

GRAPHIC LITHOLOGY



DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES

LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); several 5 mm pale green (5GY 7/1) laminae scattered throughout Sections 5 and 6; stringers and patches rich in pyrite common throughout.

SMEAR SLIDE SUMMARY (%):

	2, 64	6, 66
	D	D
Composition:		
Feldspar	–	TR
Foraminifers	6	10
Calc. nannofossils	94	90

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61	4, 60–61
Organic carbon	–	–
Carbonate	97	94

SITE 606 HOLE A CORE 18 CORED INTERVAL 159.2–168.8 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	Sub-bottom depth	SECTION	METERS
	PL1 *Globorotalia margaritae/Globorotalia nepenthes* Zone; NN15 *Reticulofenestra pseudoumbilica* Zone	AG	AG		B	159.20, 160.7, 161.24, 163.43, 165.20, 166.70, 168.20, 168.49, 168.77	1, 2, 3, 4, 5, 6, 7, CC	0.5, 1.0

GRAPHIC LITHOLOGY

DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | SAMPLES

LITHOLOGIC DESCRIPTION

FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); 5 mm pale green (5GY 7/1) laminae common between Section 5, 59–134 cm; patches and stringers rich in pyrite common throughout; core severely disturbed between Section 1, 53 cm to Section 2, 54 cm due to fragments of core liner. Portions of Sections 2 and 4 and all of Section 3 lost during extrusion of the core. Core heated during extrusion.

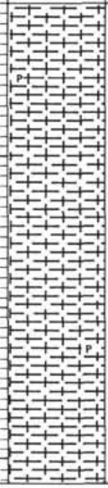
SMEAR SLIDE SUMMARY (%):

	1, 28	5, 31	6, 102
	D	D	D
Composition:			
Feldspar	TR	TR	–
Foraminifers	13	10	10
Calc. nannofossils	87	90	90

ORGANIC CARBON AND CARBONATE (%):

	5, 60–61
Organic carbon	–
Carbonate	93

SITE 606 HOLE A CORE 19 CORED INTERVAL 168.8–178.4 m

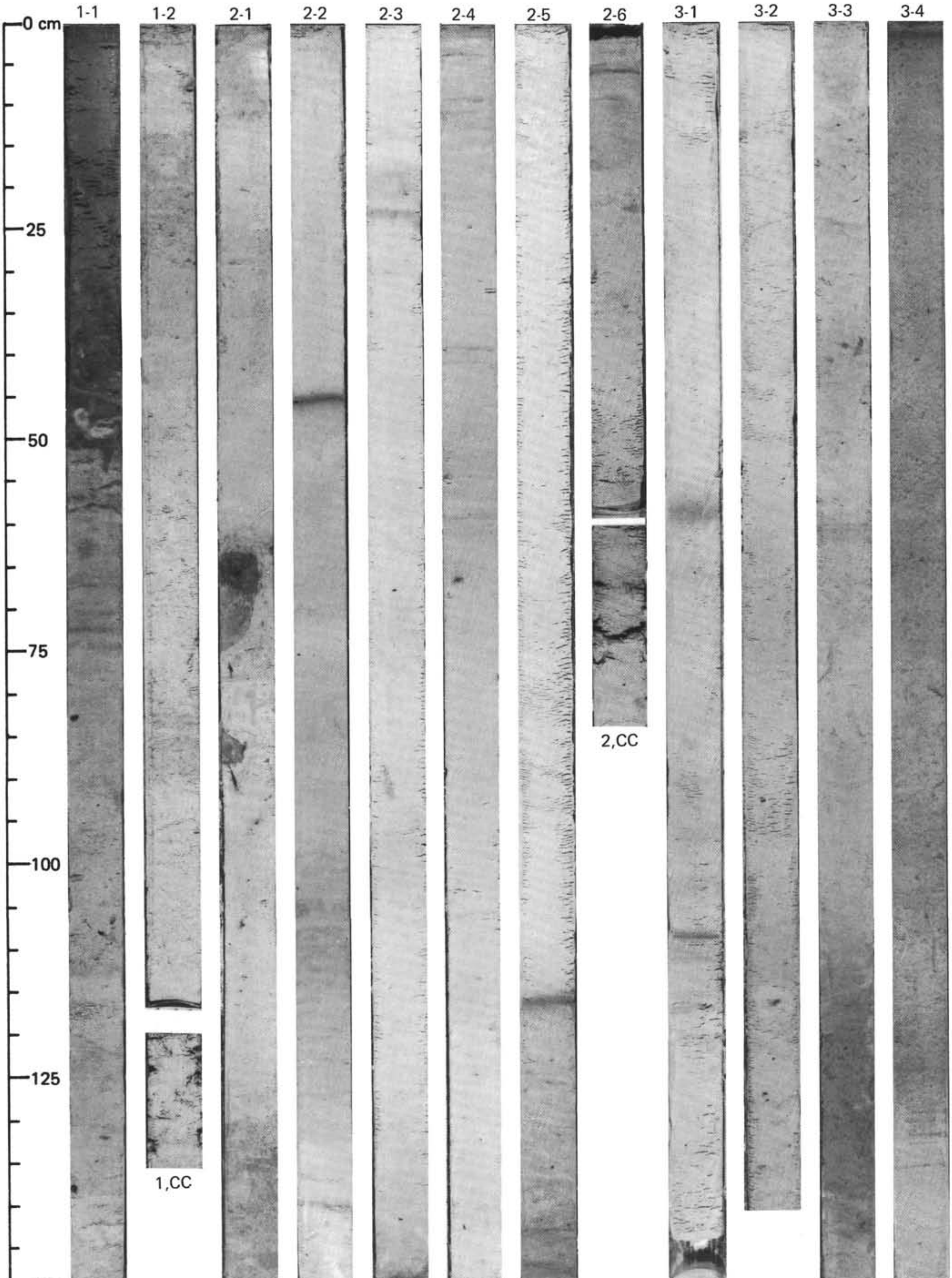
TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	Sub-bottom depth	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES	LITHOLOGIC DESCRIPTION
		PL1 *Globorotalia margaritae/Globorotalia nepenthes* Zone	NN15 *Reticulofenestra pseudoumbilica* Zone; NN14 *Discoaster asymmetricus* Zone			168.80	1	0.5, 1.0				N9	FORAMINIFERAL NANNOFOSSIL OOZE, white (N9); patches rich in pyrite scattered throughout.
						170.30	2						
						171.80	3						
		AG	AM		B	173.30, 173.53	CC						

SMEAR SLIDE SUMMARY (%):

	1, 46	3, 51
Composition:		
Foraminifers	10	12
Calc. nannofossils	90	88

ORGANIC CARBON AND CARBONATE (%):

	2, 60–61
Organic carbon	–
Carbonate	96



1-1
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1,CC
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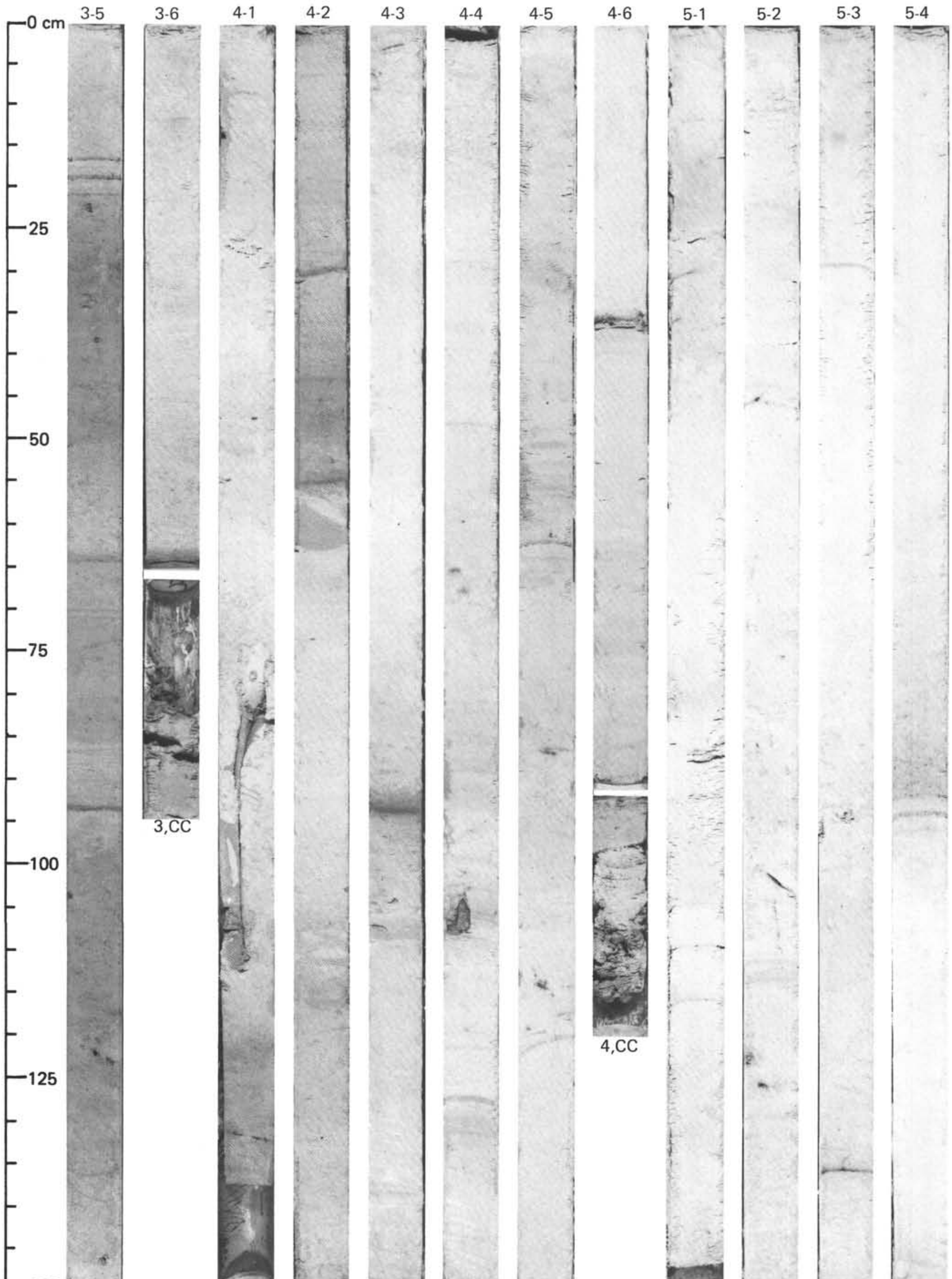
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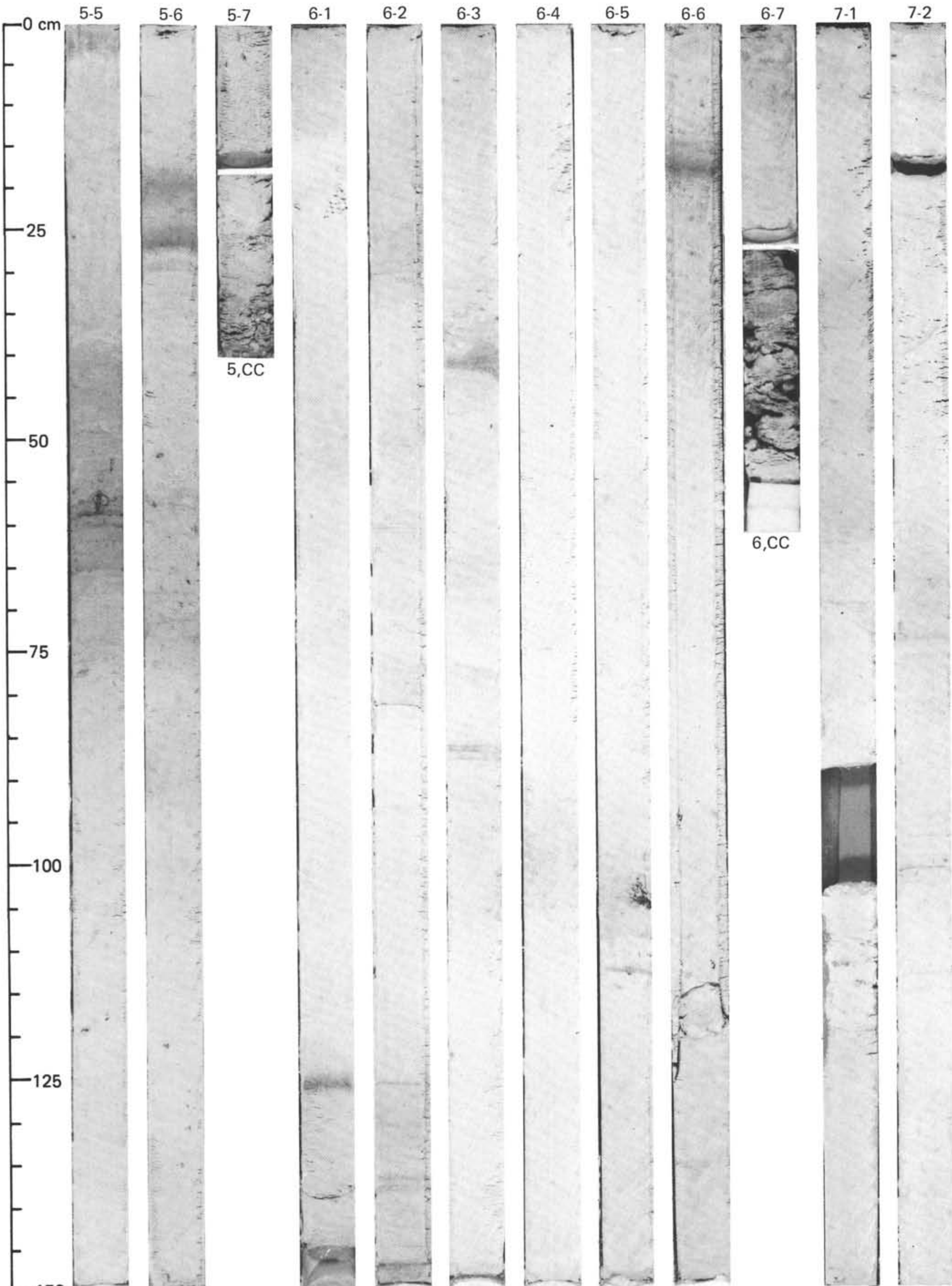
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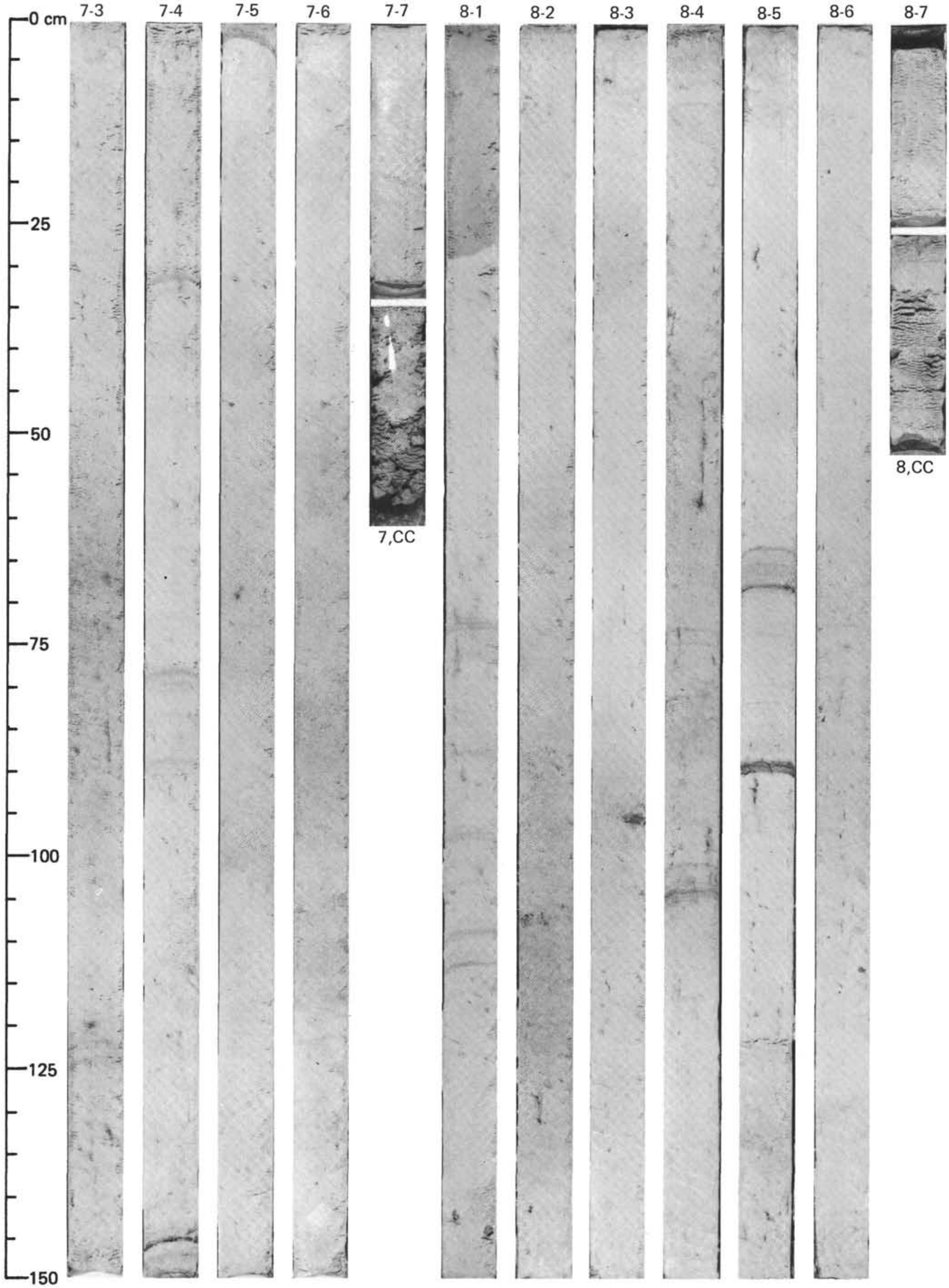
7-1
7-2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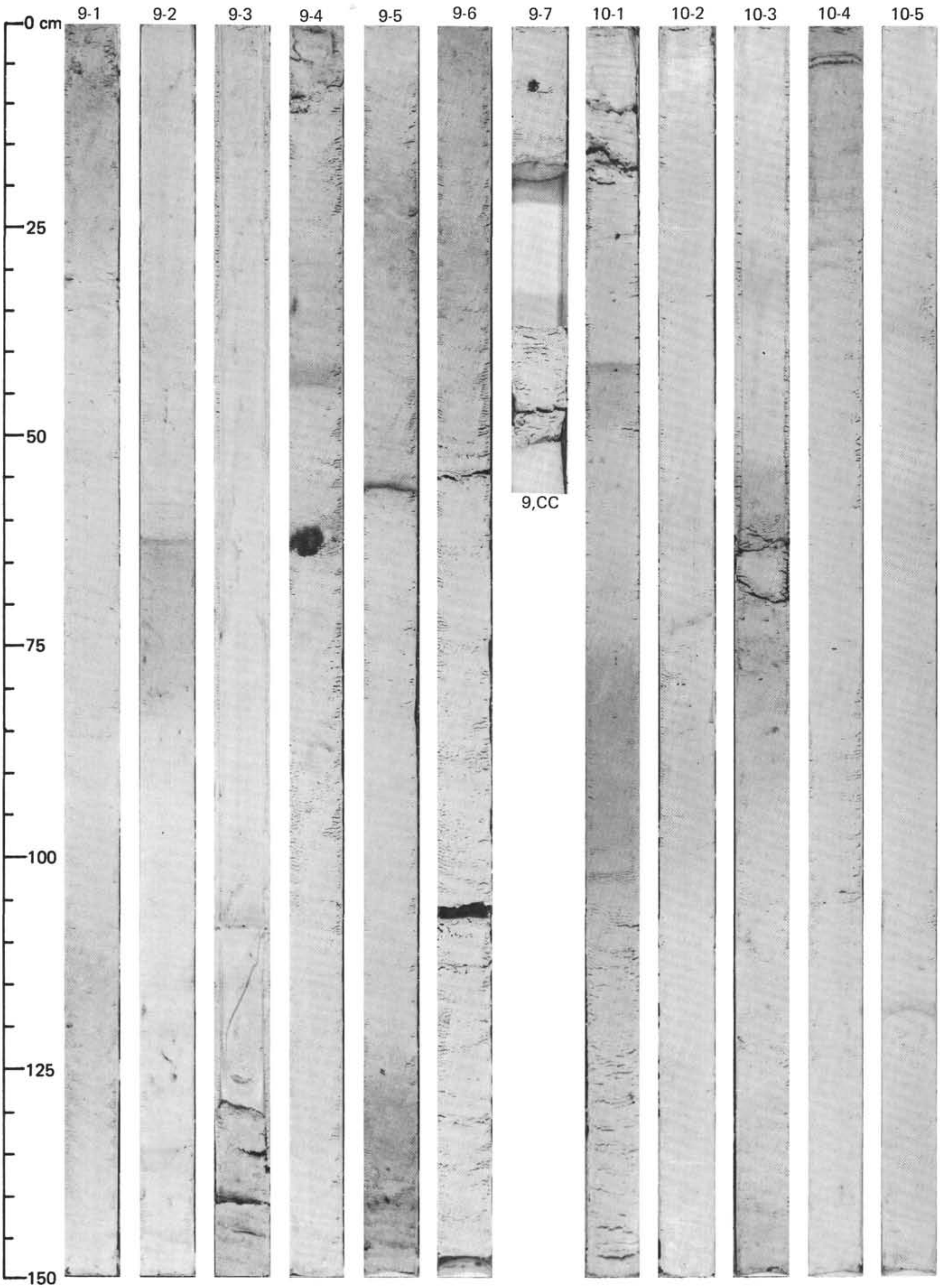
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0 cm
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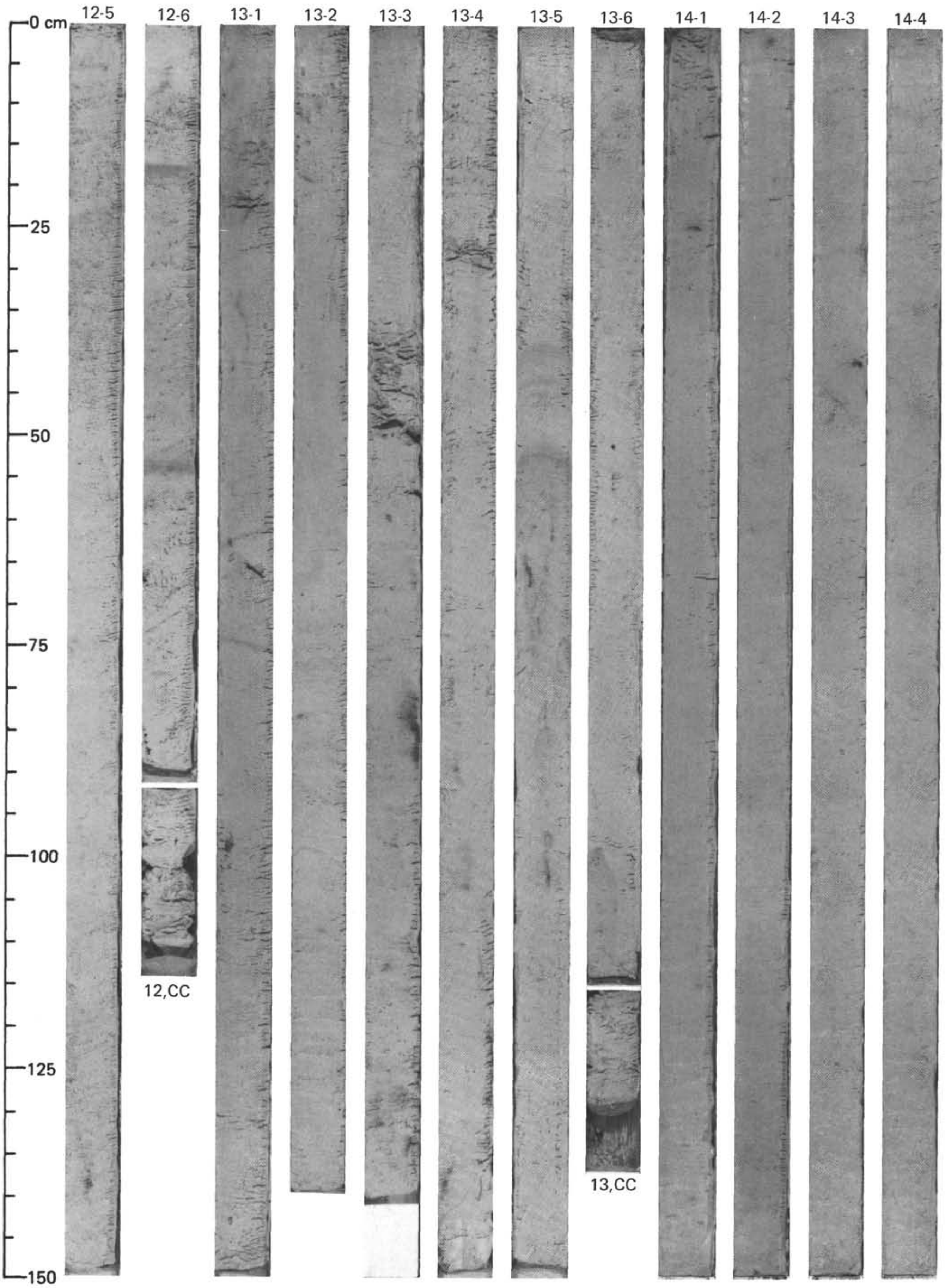
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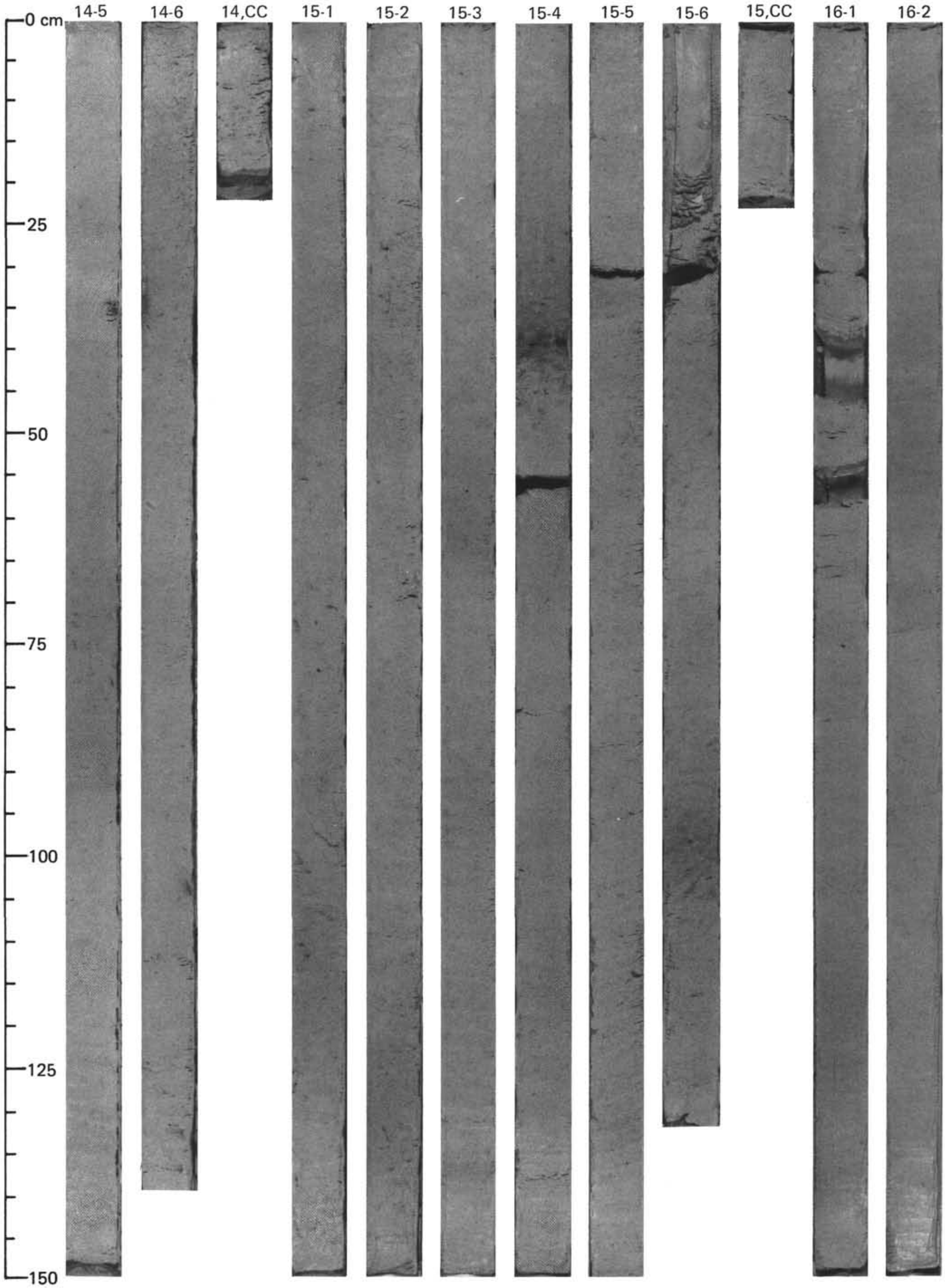
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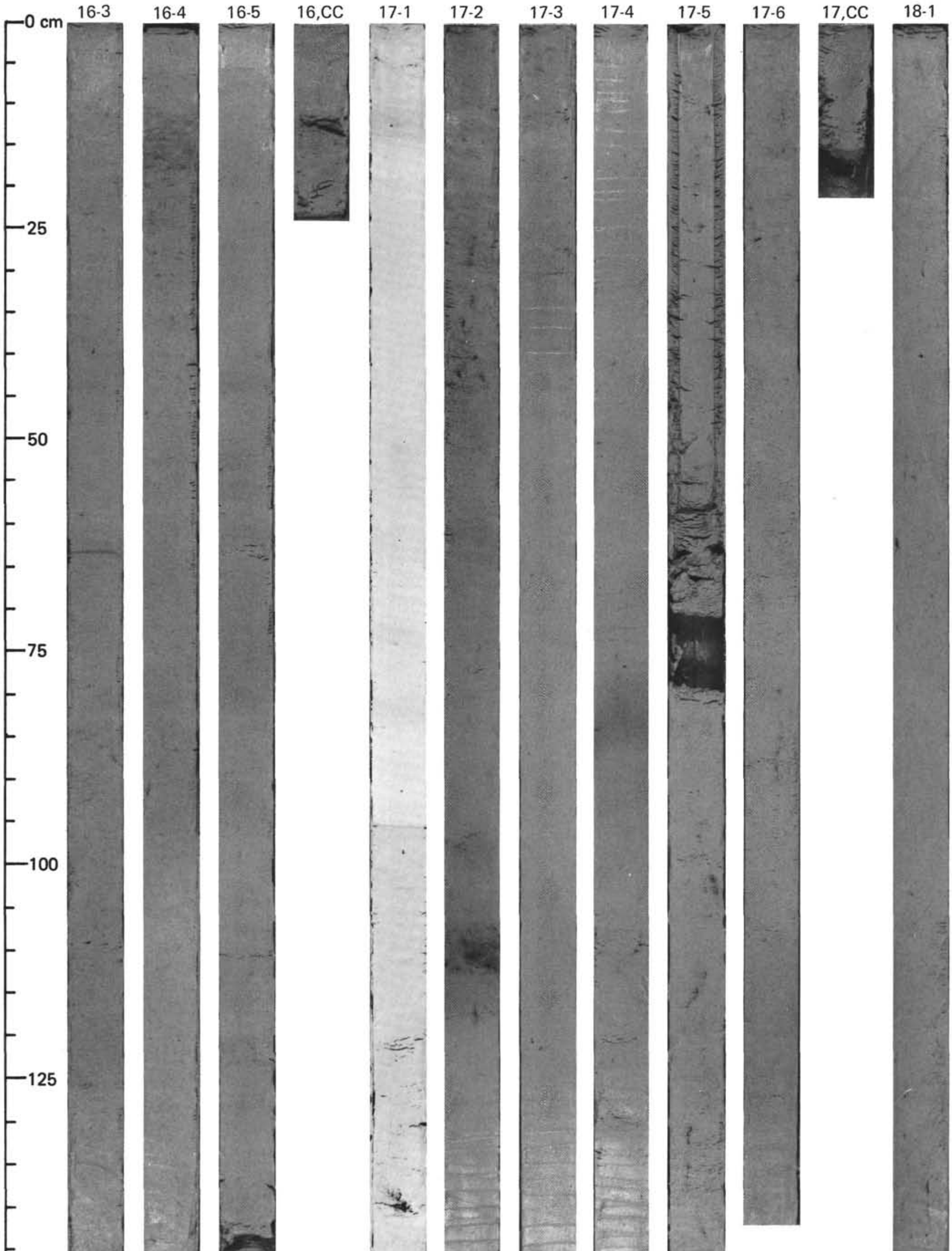
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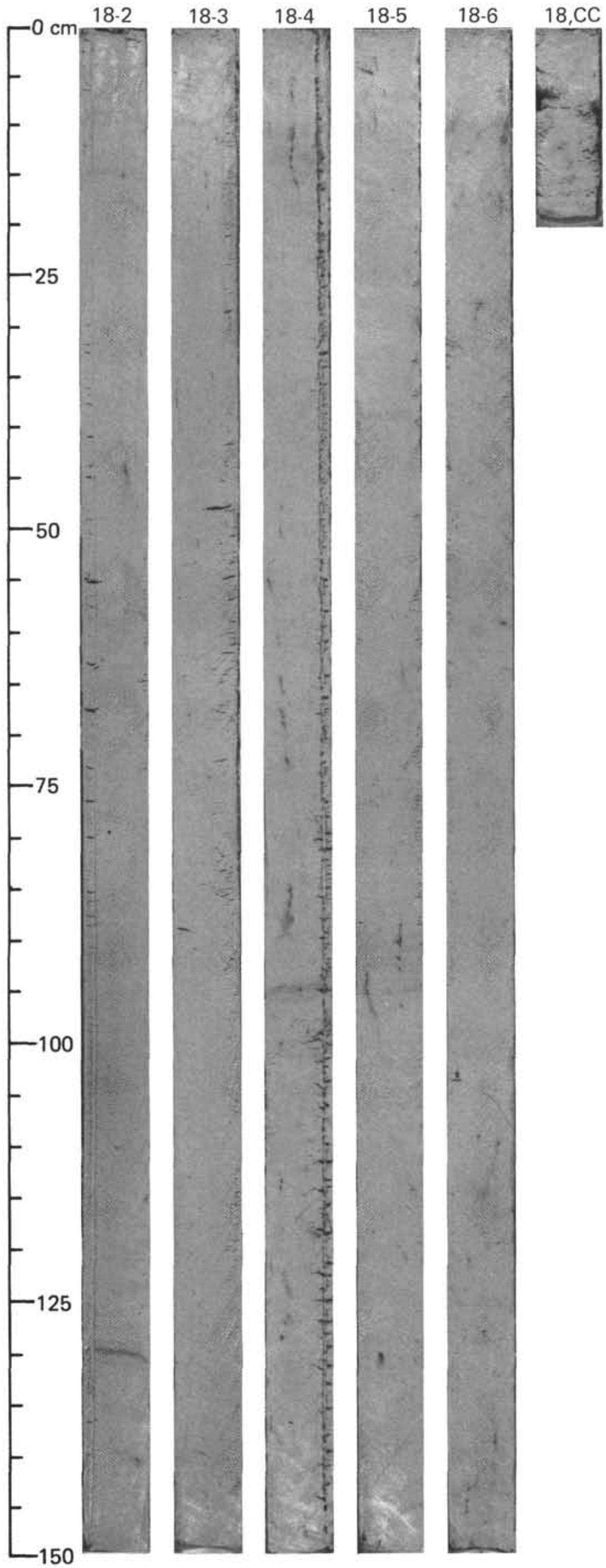
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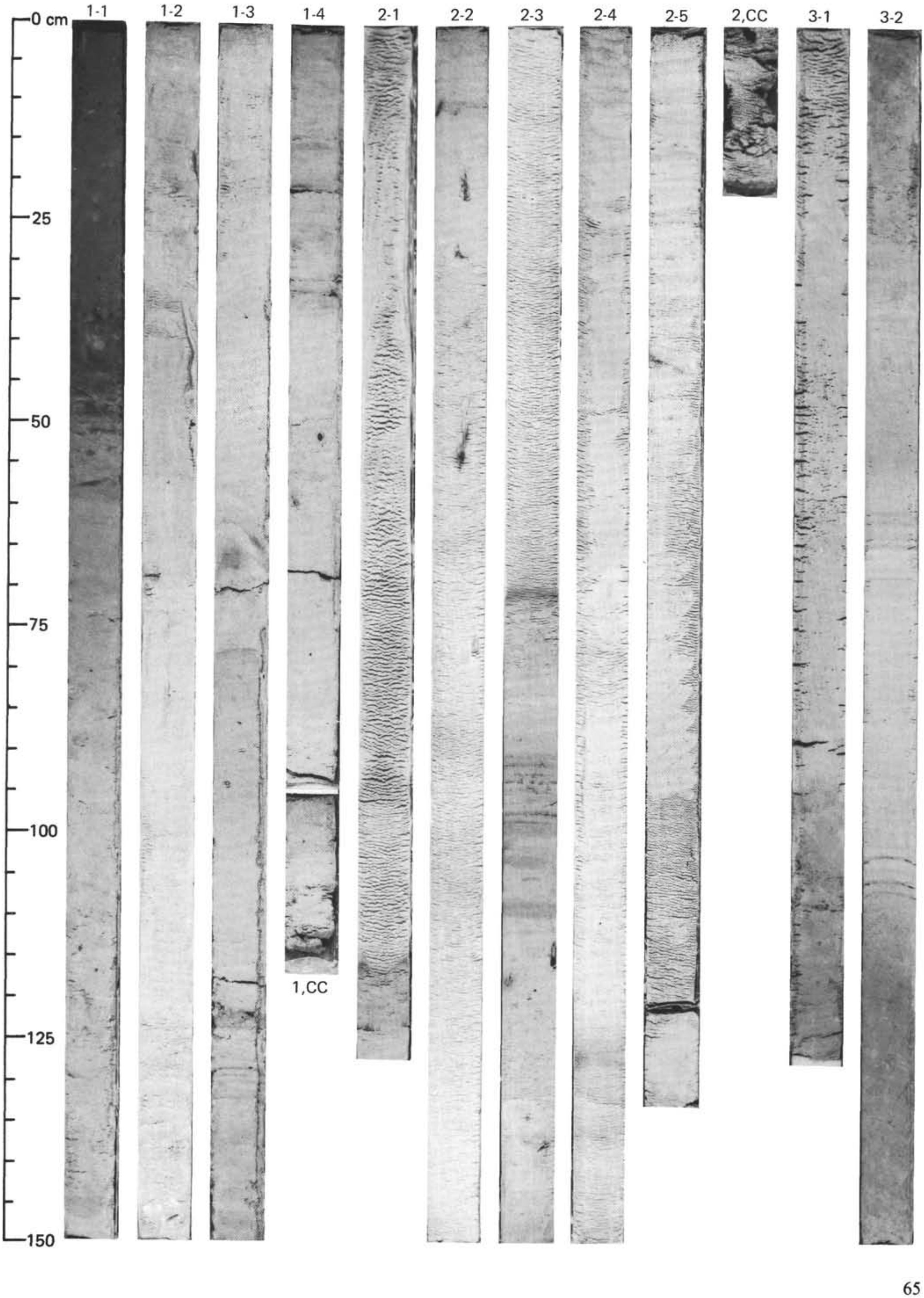

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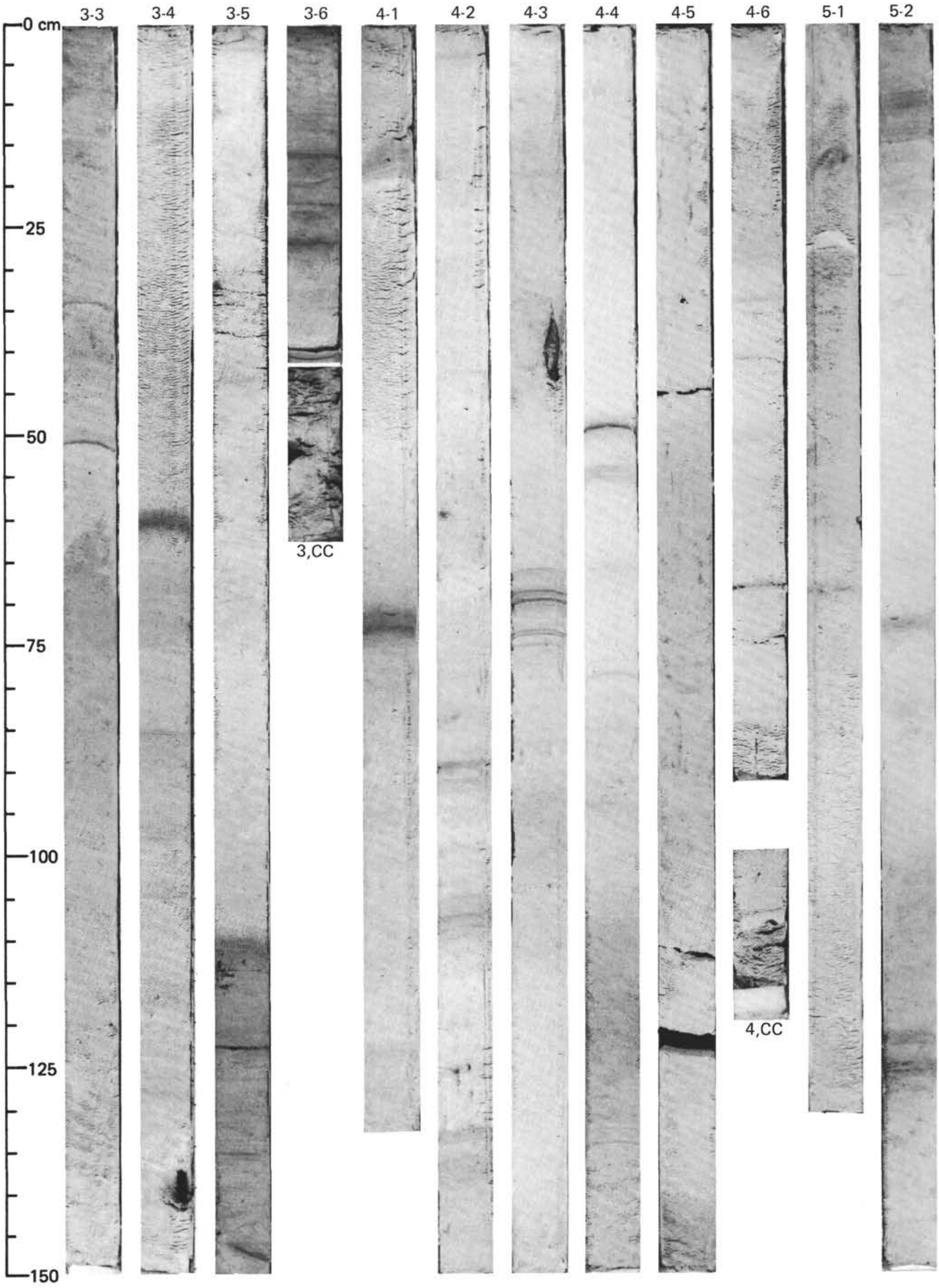
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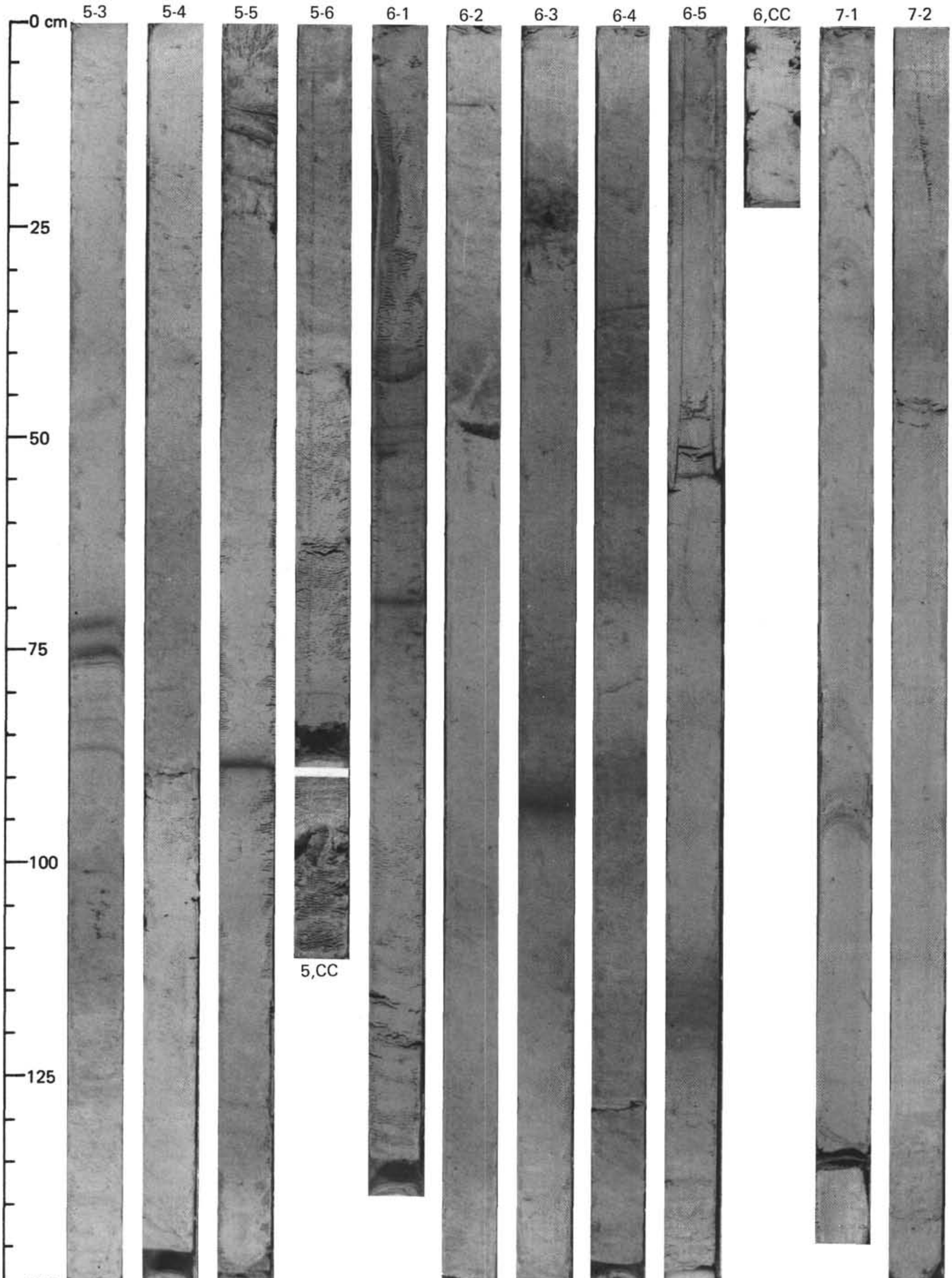
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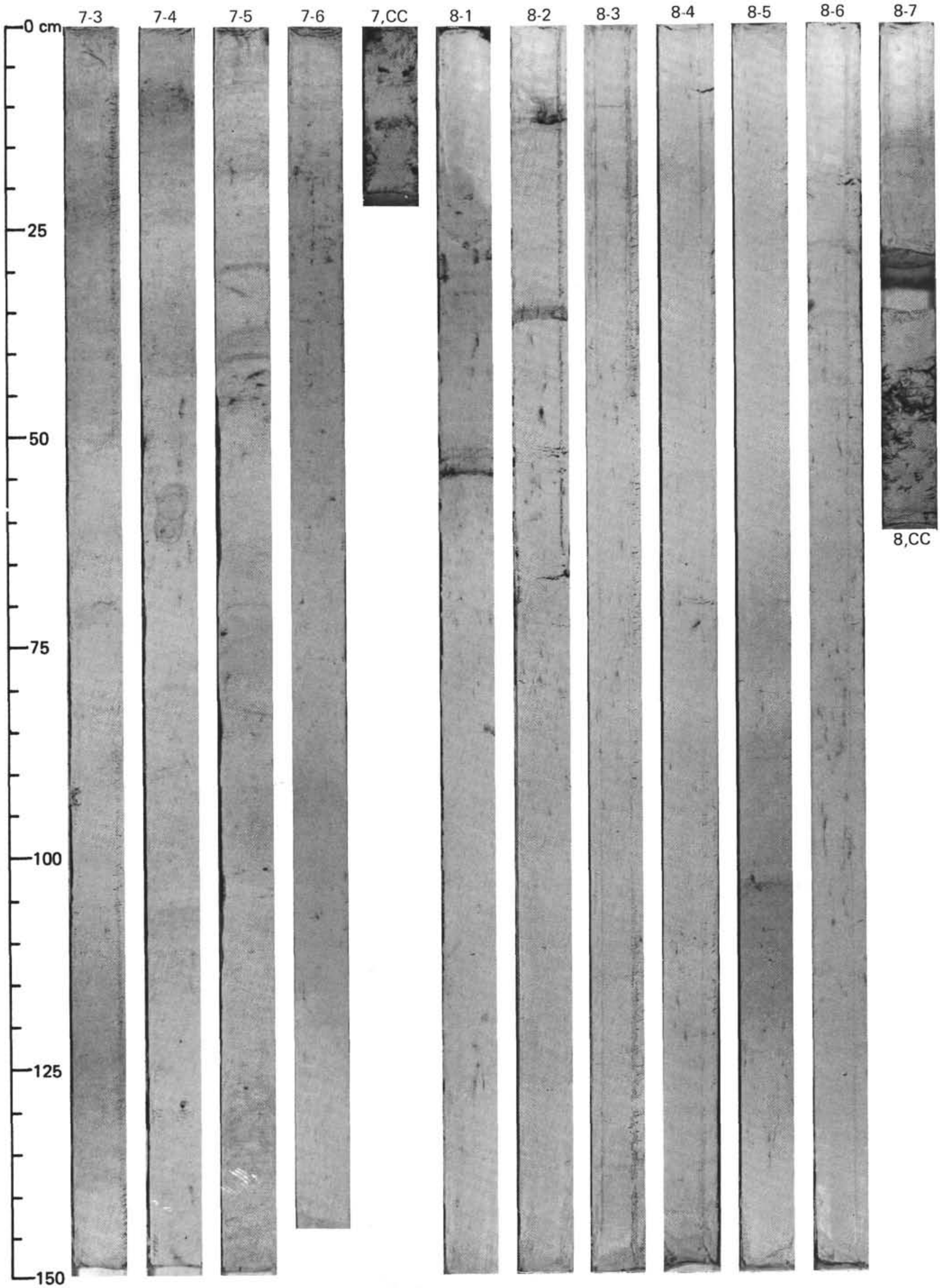
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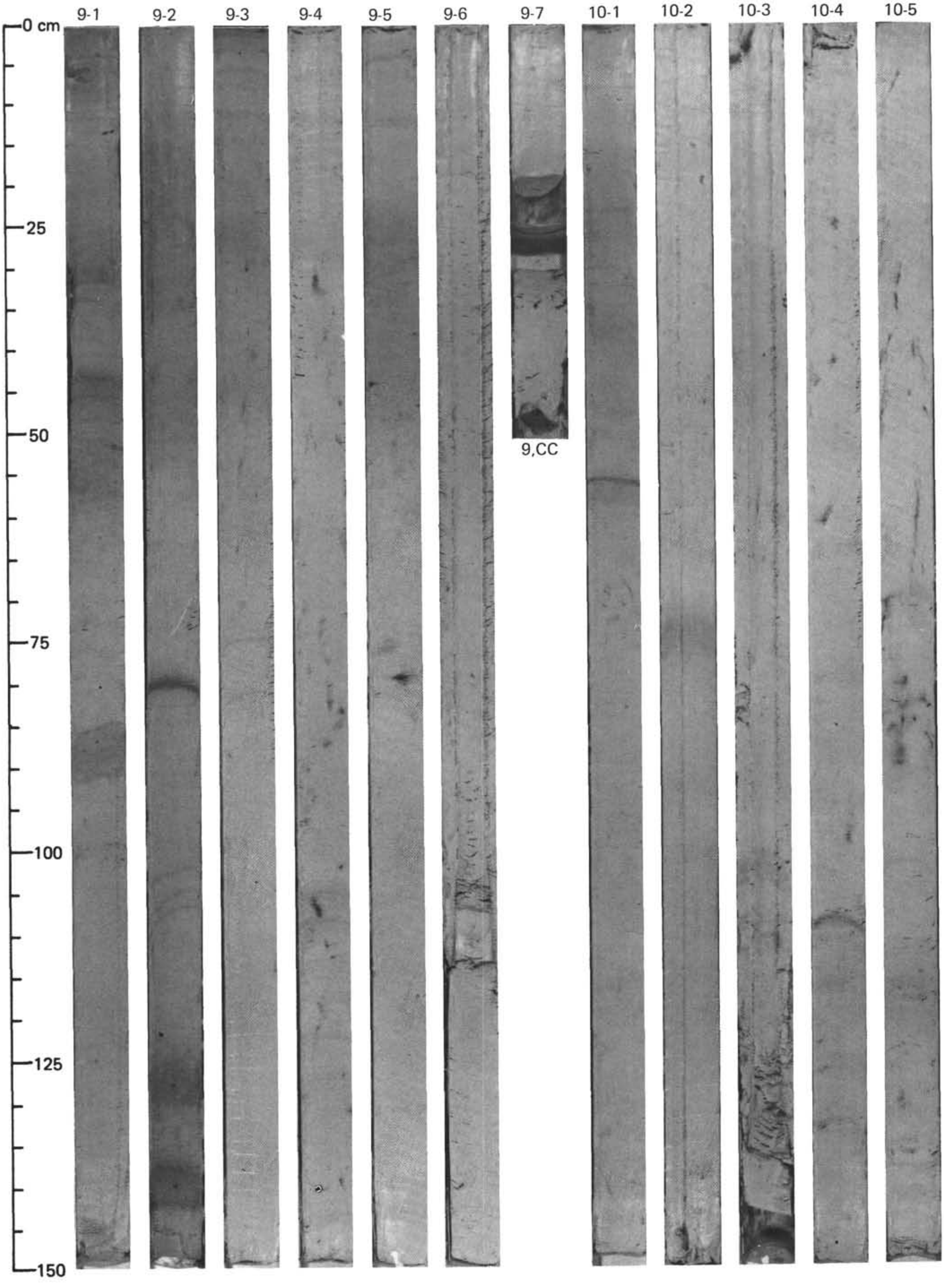

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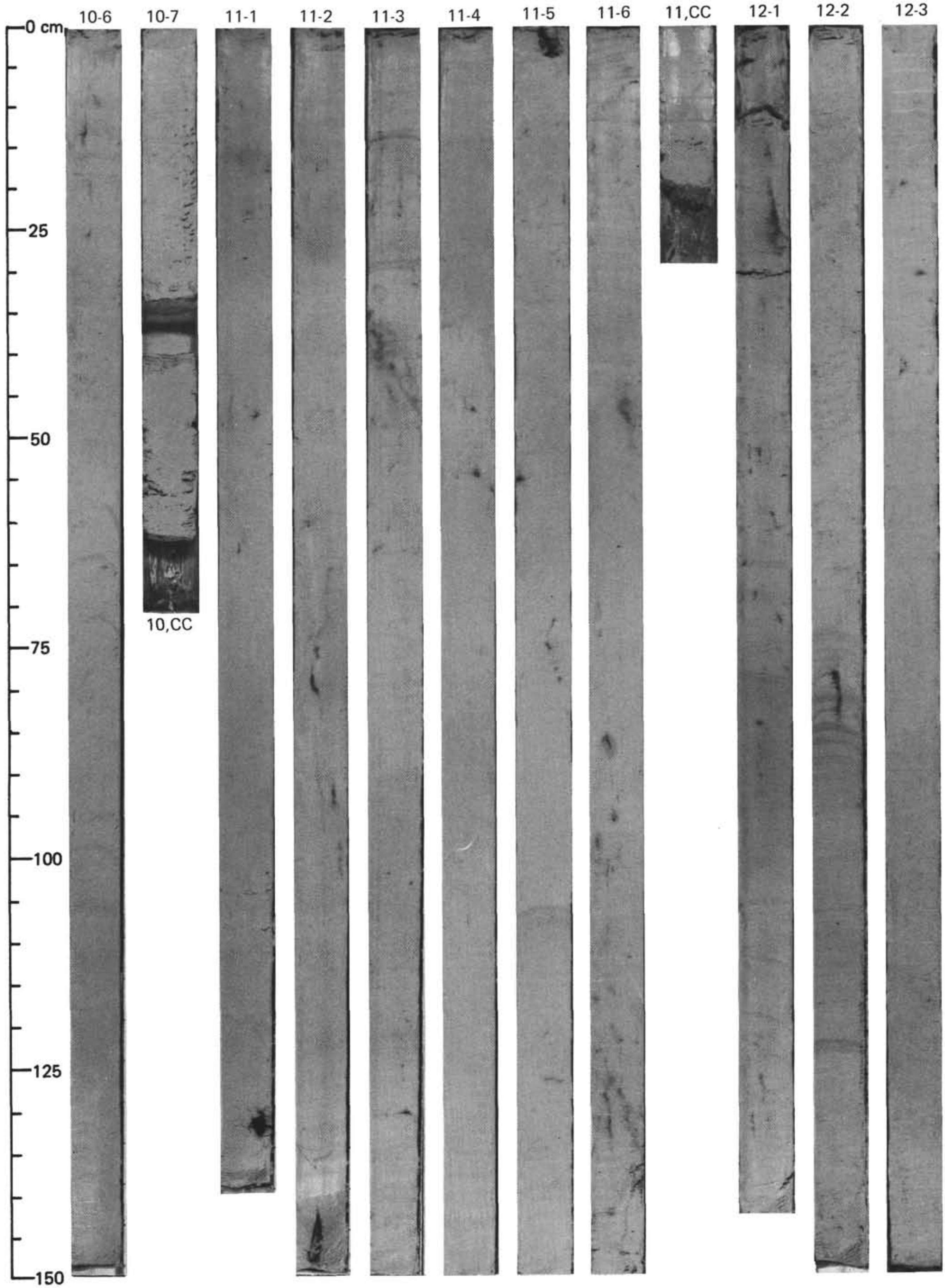
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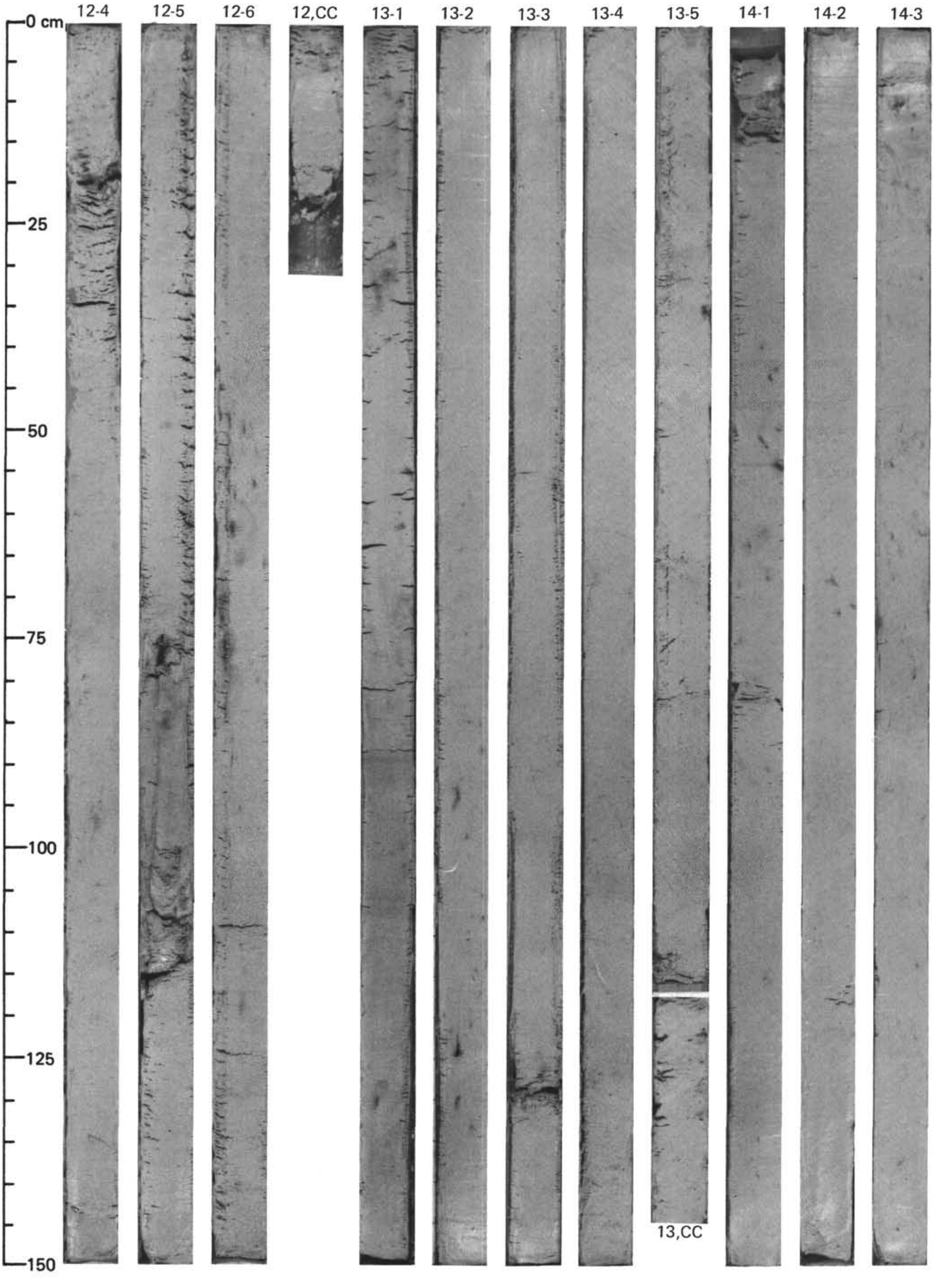
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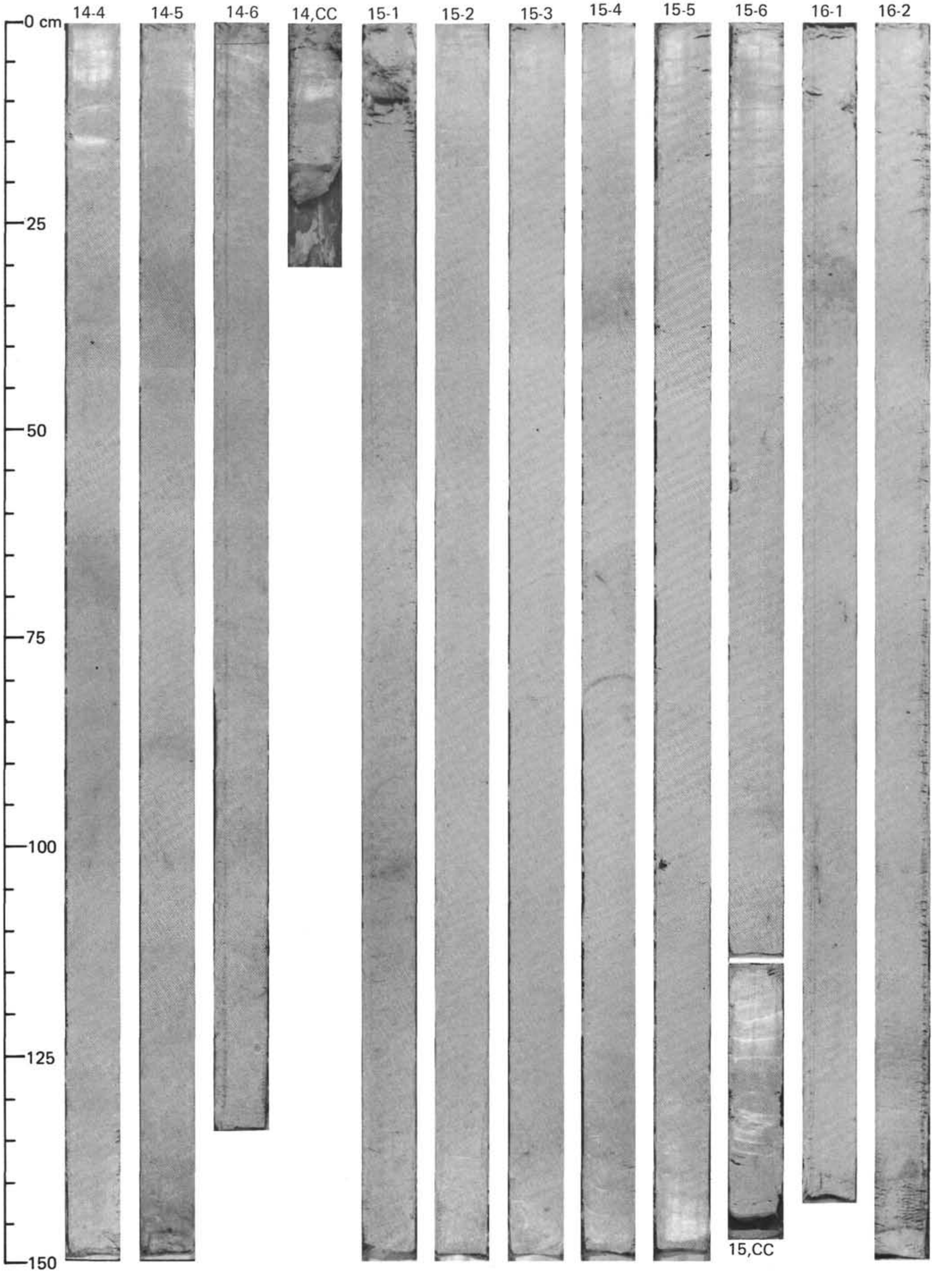
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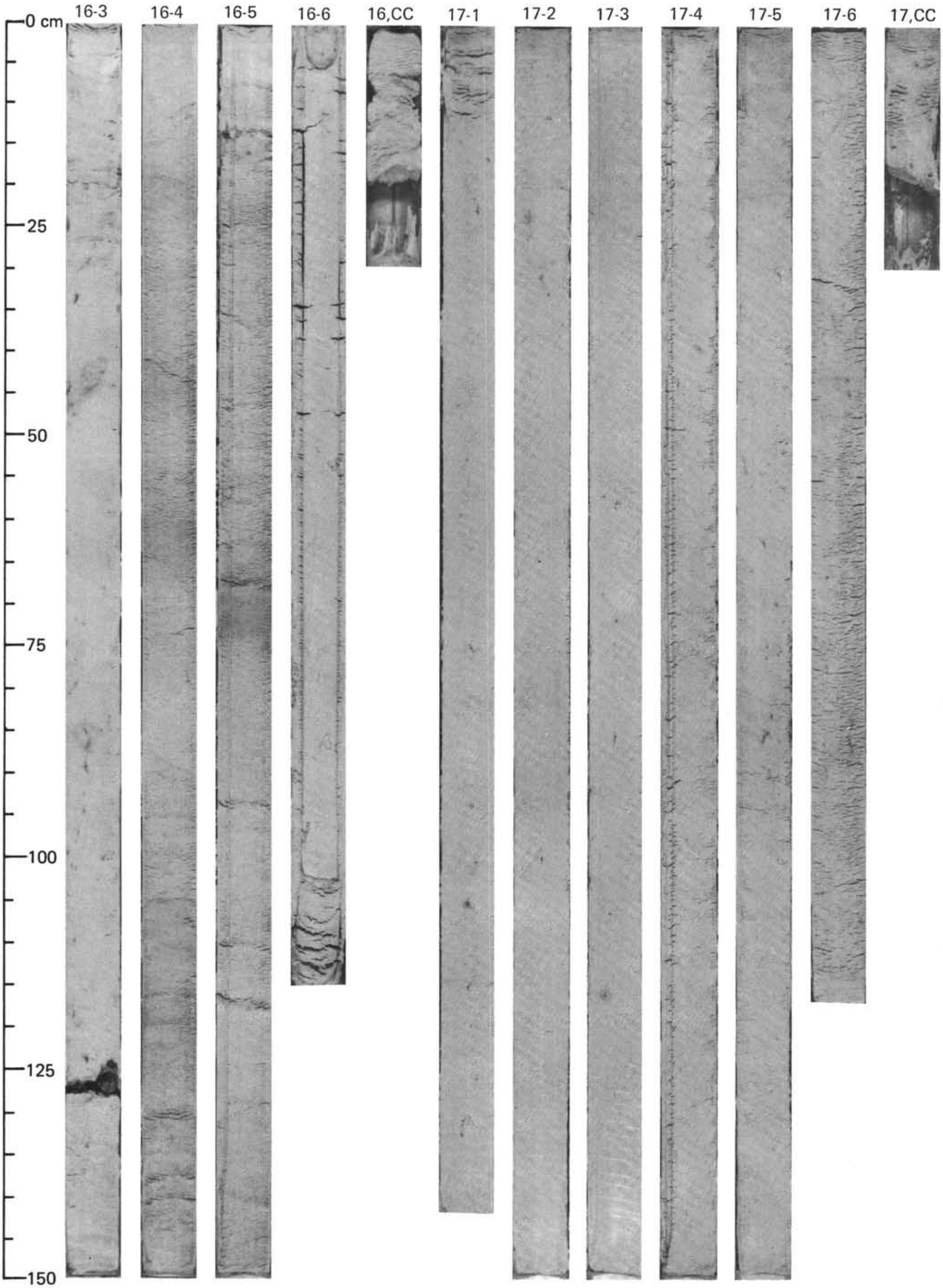

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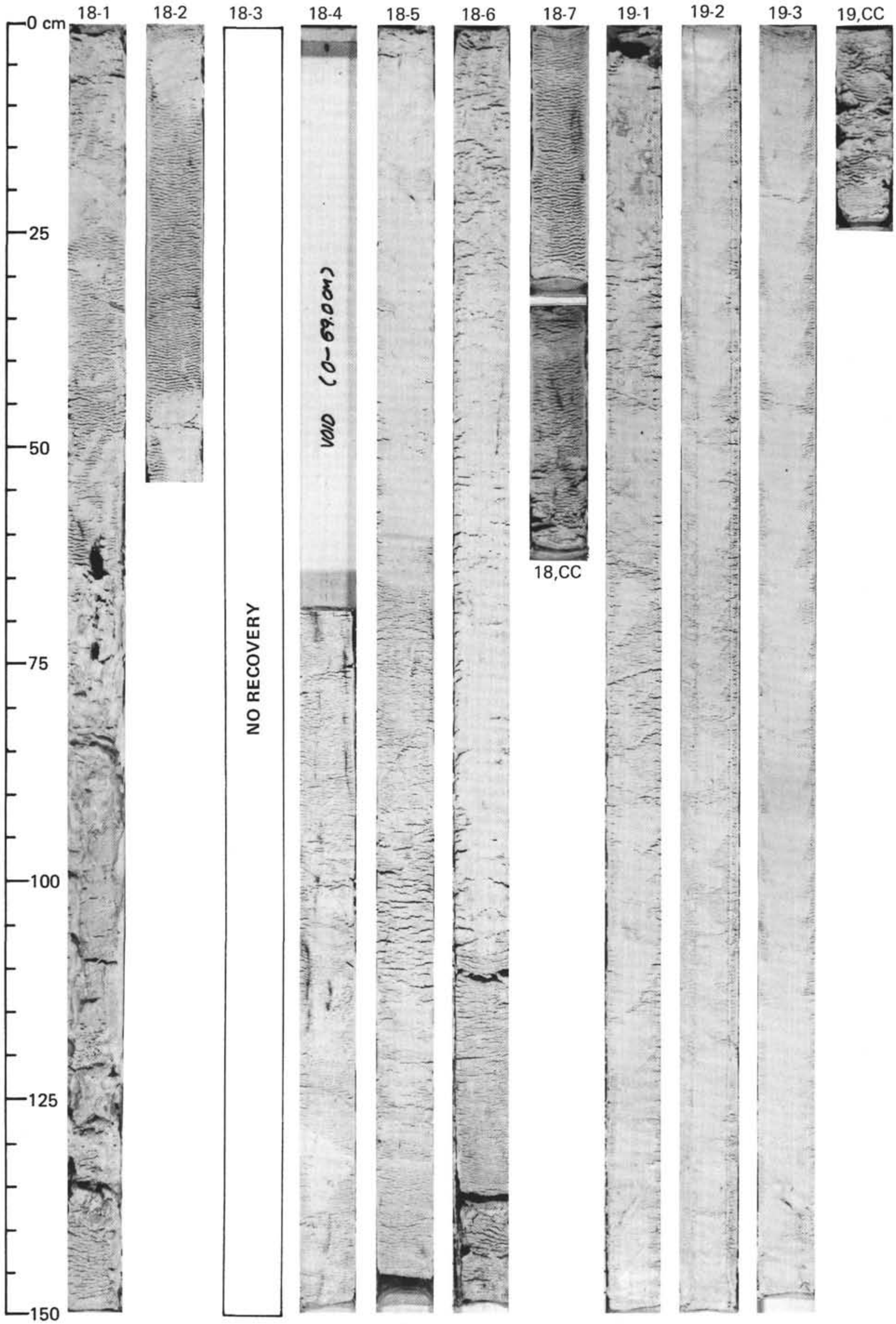
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19,CC
18,CC
NO RECOVERY
VOID (0–69.0CM)