12. SITE 614[1]

Shipboard Scientific Party [2]

HOLE 614

Date occupied: 1 October 1983, 1332 LCT

Date departed: 2 October 1983, 1700 LCT

Time on hole: 22 hr.

Position: 25°04.08′N, 86°08.21′W

Water depth (sea level; corrected m, echo-sounding): 3310 m

Water depth (rig floor; corrected m, echo-sounding): 3320 m

Bottom felt (m, drill pipe): 3314.1

Penetration (m): 37

Number of cores: 5

Total length of cored section (m): 37

Total core recovered (m): 37.07

Core recovery (%): 100

Oldest sediment cored:
Depth sub-bottom (m): 37
Nature: Sand
Age: Pleistocene (Ericson Zone Y)
Measured velocity (km/s): 1.580

Basement: N/A

HOLE 614A

Date occupied: 2 October 1983, 1700 LCT

Date departed: 4 October 1983, 0140 LCT

Time on hole: 1 day, 14 hr.

Position: 25°04.08′N, 86°08.21′W

Water depth (sea level; corrected m, echo-sounding): 3310

Water depth rig floor; corrected m, echo-sounding): 3320

Bottom felt (m, drill pipe): 3314.1

Penetration (m): 150.3

Number of cores: 13

Total length of cored section (m): 113.3

Total core recovered (m): 55.67

Core recovery (%): 49

Oldest sediment cored:
Depth sub-bottom (m): 150.3
Nature: Clay
Age: Pleistocene (Ericson Zone Y)
Measured velocity (km/s): 1.730

Basement: N/A

BACKGROUND AND OBJECTIVES

Holes 614 and 614A were drilled in the lower Mississippi Fan. The site is located in the seaward thinning section of the youngest fan lobe of the Pleistocene Mississippi fan complex. The site location was selected so as to encounter one of these thinning units in the uppermost 30 to 40 m of the section and to penetrate the entire youngest fan lobe. At the site, side-scan sonar images show an extremely complex seafloor morphology consisting of strongly reflecting linear features that often display multiple orientations. Highly reflective small targets are found in the immediate vicinity of the site. Bathymetric relief is variable with maximum relief being on the order of 10 m. The sub-bottom profiler records display well-developed reflection horizons that range in thickness from 2 to 5 m. Individual reflectors can often be correlated for distances of up to 15 km. Near-surface reflectors are generally conformable with the surface topography, indicating the absence of any significant seafloor erosion during emplacement.

Site 614 was drilled to satisfy the following objectives:

1. To determine the sedimentological, paleontological, geochemical, and geotechnical properties of a lower fan lobe.

2. To assess the amount of sand deposited at the distal ends of a fan lobe and to evaluate the mechanisms responsible for its deposition.

3. To evaluate whether Mutti's "compensation cycles" exist in the distal ends of the Mississippi Fan.

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[1] Bouma, A. H., Coleman, J. M., Meyer, A. W., et al., *Init. Repts. DSDP*, 96: Washington (U.S. Govt. Printing Office).

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OPERATIONS

Table 1. Site 614 coring summary.

Core[a]	Date (Oct. 1983)	Time	Depth from drill floor (m)	Depth below seafloor (m)	Length cored (m)	Length recovered (m)	Amount recovered (%)
Hole 614							
1H	2	0112	3314.1-3323.5	0.0-9.4	9.4	9.33	99
2H	2	0437	3323.5-3332.8	9.4-18.7	9.3	9.56	>100
3H	2	0555	3332.8-3342.1	18.7-28.0	9.3	8.35	90
4H	2	1000	3342.1-3344.1	28.0-30.0	2.0	1.92	96
5H	2	1650	3344.1-3351.1	30.0-37.0	7.0	7.91	>100
					37.0	37.07	100
Hole 614A							
1H	3	0122	3351.1-3359.1	37.0-45.0	8.0	8.53	>100
2H	3	0253	3359.1-3368.4	45.0-54.3	9.3	9.42	>100
3H	3	0432	3368.4-3374.9	54.3-60.8	6.5	6.67	>100
4H	3	0550	3374.9-3384.3	60.8-70.2	9.4	6.92	74
5H	3	0715	3384.3-3393.7	70.2-79.6	9.4	5.65	60
6H	3	0841	3393.7-3403.1	79.6-89.0	9.4	6.79	72
7H	3	0951	3403.1-3412.6	89.0-98.5	9.5	1.60	17
8H	3	1131	3412.6-3422.1	98.5-108.0	9.5	3.61	>38
9H	3	1300	3422.1-3431.6	108.0-117.5	9.5	1.78	19
10H	3	1420	3431.6-3441.1	117.5-127.0	9.5	0.98	10
11H	3	1532	3441.1-3445.3	127.0-131.2	4.2	3.44	82
12X	3	1655	3445.3-3454.8	131.2-140.7	9.5	0.19	2
13X	3	1835	3454.8-3464.4	140.7-150.3	9.6	0.09	1
					113.3	55.67	49

[a] H following core number indicates hydraulic piston core, X indicates extended core barrel core.

Ft. Lauderdale Port Call

Leg 96 had its official beginning at 0654 hr., 26 September 1983 with the first mooring line at Berth Two of Port Everglades in Fort Lauderdale, Florida. Shortly after arrival, it was necessary to shift to Berth One. This was accomplished by 1000 hr., and port call activities then officially began.

Principal work items included the top overhaul of number nine engine, repair of number one gyrocompass, U.S. Coast Guard inspection of *Glomar Challenger*, crew change, off-loading of cores, on-loading of 1000 sacks of barite and miscellaneous freight, and an open house for local visitors. With all scheduled work completed, the vessel departed her berth at 1808 hr., 29 September.

Ft. Lauderdale to Site 614

Excellent speed was achieved on the transit to the initial operating area. A nearshore countercurrent of the Gulf Stream, combined with a following wind and calm seas, produced a speed of over 11 knots as *Challenger* rounded the Florida Peninsula and turned west past the Florida Keys. A few hours after leaving the countercurrent, the vessel encountered another current (Loop Current) which carried her toward the operating area at speeds increasing to about 13 knots. This unexpectedly strong current hampered maneuvering for the relatively complex preliminary profiling survey. After a 4½-hr. survey, a positioning beacon was launched at 1332 hr., 1 October, marking arrival at Site 614. The drill site was located about 120 mi. west-northwest of the Dry Tortugas Islands and about 150 mi. north-northwest of Cuba.

Hole 614

The approach profile was extended about 15 min. beyond the beacon drop point before the vessel was turned and the towed seismic gear retrieved. While the vessel approached the beacon to take station, the beacon's acoustic signal weakened abruptly and developed pulse characteristics that were rejected by the positioning system. Using LORAN-C navigation, the ship struggled back to the drop coordinates against the strong current and an alternate-frequency beacon was dropped at 1510 hr.

Satisfactory positioning was finally achieved at 1645 hr., and the pipe trip began. The current pushed the bottom-hole assembly (BHA) so strongly against the moonpool bracing that it was necessary to let the vessel drift momentarily to facilitate setting the upper guide horn into position. The drill string continued to be forced strongly against the pipe restraint and to vibrate violently for the duration of the pipe trip.

The precision depth recorder (PDR) reading estimated the seafloor to be between 3310 and 3320 m below the rig floor. The core bit was positioned at 3314 m for the first attempt with the advanced hydraulic piston corer (APC). The corer stroked to 3323.5 m and was recovered nearly filled with core (9.33 m) (Table 1). One joint of pipe was set back and another core was "shot" from 9.5 m higher to ascertain that no sediment had been missed. It was necessary to interrupt this operation for 1 hr. when the current and wind pushed the vessel about 60 m off station. The corer was recovered with no trace of sediment, and the water depth was established at 3314.1 m.

Two additional mud cores of good quality were taken to 28 m below the seafloor, where soft, loose sand was encountered. Penetration and recovery were reduced to zero, and the same interval was cored three times before a 2-m sand core was recovered (Core 614-4; Table 1). As the corer was being lowered for the next attempt, a sudden drop in sand line weight indicated that the coring assembly had been lost. On recovery of the sand line, it was found that the wireline swivel had come apart, leaving the APC, the sinker bar assembly, and the lower portion of the swivel in the pipe. The dimensions of the swivel prohibited recovery from the pipe by wireline fishing. A round trip was therefore necessary to continue operations. In the meantime, however, the dressed corer had settled into position in the outer core barrel. The bit was lowered to the bottom of the hole and the pipe was pressured to actuate the corer before the drill string was recovered.

The corer was recovered from the BHA at the drill floor at 1700 hr., 2 October, containing about 8 m of loose sand (Core 614-5; Table 1).

Hole 614A

With the round trip complete, Hole 614A was spudded at 2341 hr., 2 October. The bit was "washed" down to 37 m below seafloor, the total penetration of Hole 614 (Table 1). Another 10 m of loose sand was cored before mud and clay strata were again encountered. APC coring continued in sediments consisting of alternating sand and mud beds, with sand predominating. Core recovery was unexpectedly high, although penetration of the corer, as expected, was limited. This was held to as little as 2 m in the cleaner and coarser sands. At about 115 m sub-bottom, the clay became much stiffer and became a factor in both reduced penetration and increased overpull on retrieval. At 131 m sub-bottom, the APC was retired in favor of the extended core barrel (XCB). Two XCB cores were attempted with only a few centimeters recovered each time. At this point, the scientific objectives were considered to be sufficiently accomplished and coring operations were terminated at a total drill string depth of 3464.4 m. The drill string was recovered and the vessel was under way at 0140 hr., 4 October.

SEISMIC STRATIGRAPHY AND ACOUSTIC FACIES

At Site 614, the modern Mississippi fan lobe is approximately 200 m thick. Two regional seismic reflection horizons of late Pleistocene age ("20" and "30"; see introductory chapter, this volume) have been correlated with the detailed seismic stratigraphy in the Mississippi Canyon area. Horizon "20" is the base of the modern fan lobe and was a primary target for hydraulic piston coring at this site. The seismic coverage for this site is shown in Figure 1.

Seismic Stratigraphy

Site 614 was located near the western end of *Conrad* Line 70 in an area of numerous relatively continuous, closely spaced, subparallel reflection horizons as seen on the water-gun record (Fig. 2). The detailed survey shows that the site is near the western margin of an area of slightly convex-upward relief that might indicate either a depositional lobe or a broad levee feature. Several prominent reflection horizons in the upper 500 m of profile can be traced across this part of the fan. These horizons may correlate with lithologic contacts at Sites 614 and 615.

Acoustic Facies

The 3.5-kHz shipboard profiles and the 4.5-kHz deeptow data can be used to define at least four separate surficial acoustic facies units within the general survey area (O'Connell et al., this volume). Site 614 is located within the acoustic facies that is characterized by short, multiple, subparallel reflectors of variable width (Figs. 3A, B). Depth of acoustic penetration varies between 25 and 50 ms. This type of acoustic unit also underlies the western levee of the main fan channel just above its termination (Site 615).

Both the 3.5- and 4.5-kHz profiles (Figs. 3A, B) show that locally convex-upward relief on sub-bottom reflectors in this acoustic facies extend over distances of a kilometer. In addition, some of these irregular deeper reflectors are strong and diffuse in character, similar to

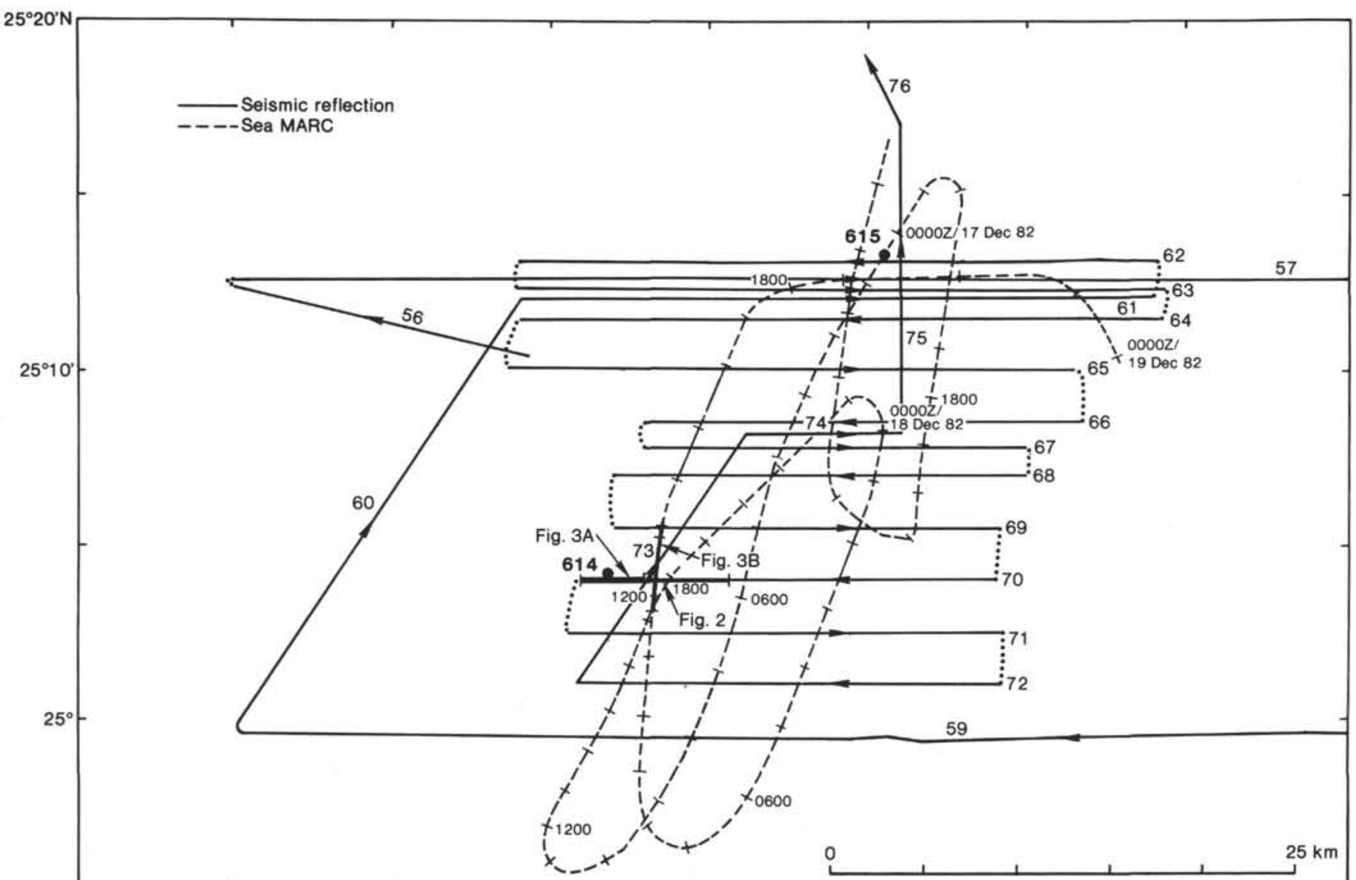


Figure 1. Map showing *Conrad* site survey tracklines and lower fan Sites 614 and 615. Locations of profiles shown in Figures 2 and 3 are indicated with heavy lines.

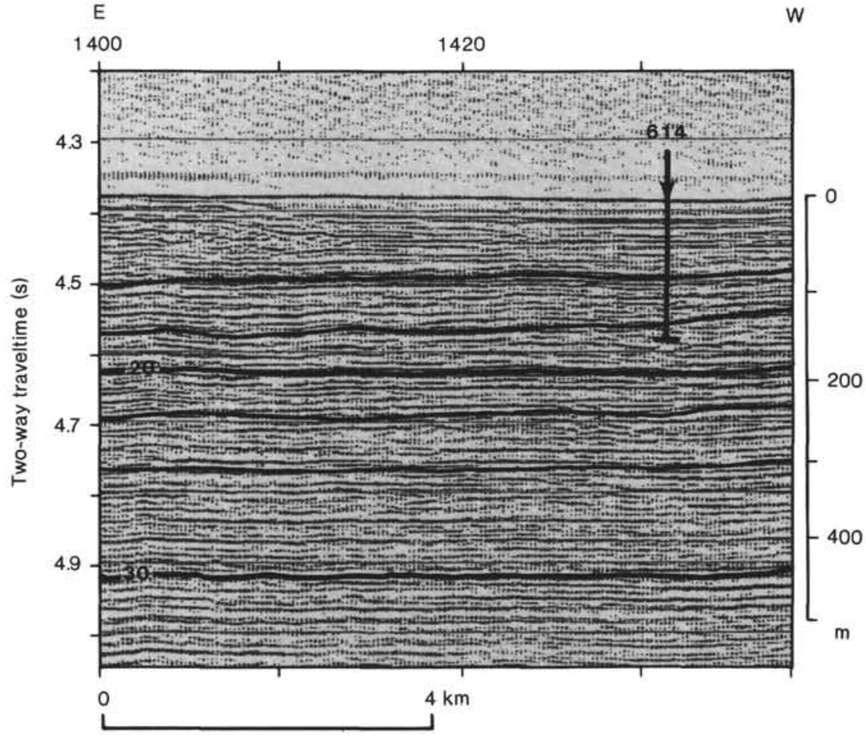


Figure 2. Water-gun seismic profile from *Conrad*, Line 70 site survey that passes near Site 614 (see Fig. 1 for location).

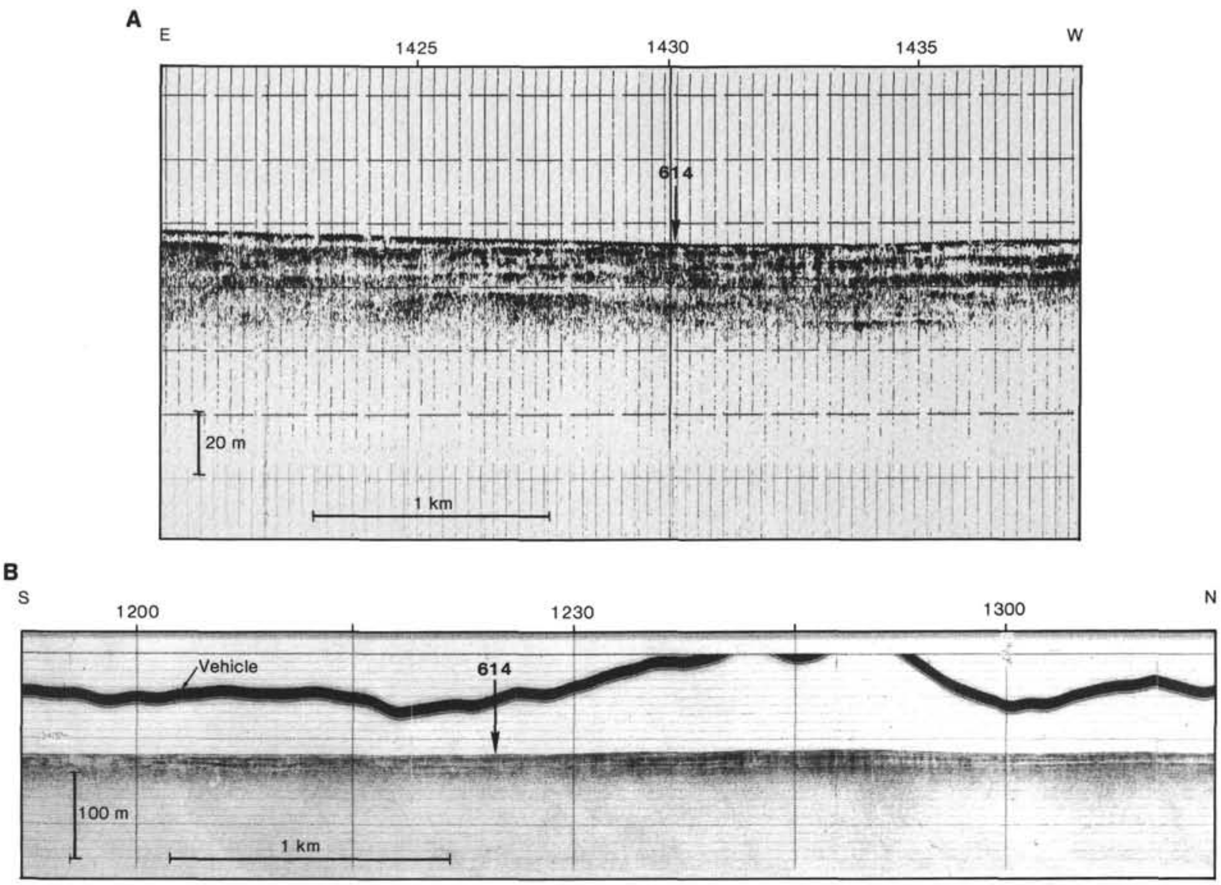


Figure 3. Sub-bottom reflection profiles from site survey cruise that passes near Site 614 (see Fig. 1 for location). A. 3.5-kHz profile. B. Deep towed 4.5-kHz profile (Sea MARC I).

seafloor reflections in areas of sand deposition on other fans (Damuth, 1978; Normark et al., 1979; see O'Connell et al., this volume).

Seismic Stratigraphy Results

Drilling at Site 614 penetrated two prominent reflectors above seismic Horizon "20" (Fig. 2). These reflectors can be traced across this part of the fan and should have been encountered near 85 and 147 m sub-bottom depth. The upper reflector should have been located in Core 614A-6, however, only 10 cm of sand were recovered in this interval. The deepest core from Hole 614A may have penetrated the deeper of the two reflectors at 147 m, but again the only sample recovered was 8 cm of sand in the core catcher (Core 614A-13). Thus no lithologic boundaries were cored at Site 614 that correlate with the relatively continuous reflection horizons in the area. Where these same horizons were cored at Site 615, the upper reflector has been tentatively correlated with the top of a thick sand bed (or section) and the lower reflector occurs near the top of a muddy section underlying interbedded sand and mud.

The general character of the single-channel seismic profiles shows numerous, discontinuous reflecting surfaces with variable amplitude and irregular relief, especially above 250 m (Fig. 2). This character is consistent with the predominantly sandy sequences encountered at Site 614. The sections between each area-wide reflection horizon show slight (tens of meters) changes in thickness over the width of the detailed survey area, suggesting changes in local source and some compensation for local relief created during each interval. The shallowest reflectors observed at this site correspond to the reflectors seen on the 3.5-kHz profiles that mark some of the shallowest sand beds in the area.

Coring at this site confirmed the sandy nature of the upper 150 m of section, but the interpretation of the acoustic stratigraphy requires correlation with the section at Site 615. The results from this site suggest that 3.5-kHz records are valuable for deriving acoustic facies maps indicating areas of sand deposition for both the seafloor and shallow sub-bottom reflectors.

BIOSTRATIGRAPHY AND SEDIMENTATION RATES

Biostratigraphy

The section penetrated in Holes 614 and 614A is Quaternary and correlates with the planktonic foraminifer Zone N23 and the calcareous nannofossil Zone NN21. This interval includes the Holocene Zone Z and upper Wisconsin glacial Zone Y of Ericson and Wollin (1968) (see Explanatory Notes, this volume). The warm interstadial of the Wisconsin (Zone X or the *Globorotalia flexuosa* Zone) was not encountered to the total cored depth of 150.3 m (Fig. 4).

The Y Zone contained mostly reworked Cretaceous foraminifers and calcareous nannofossils within the displaced sands and muds.

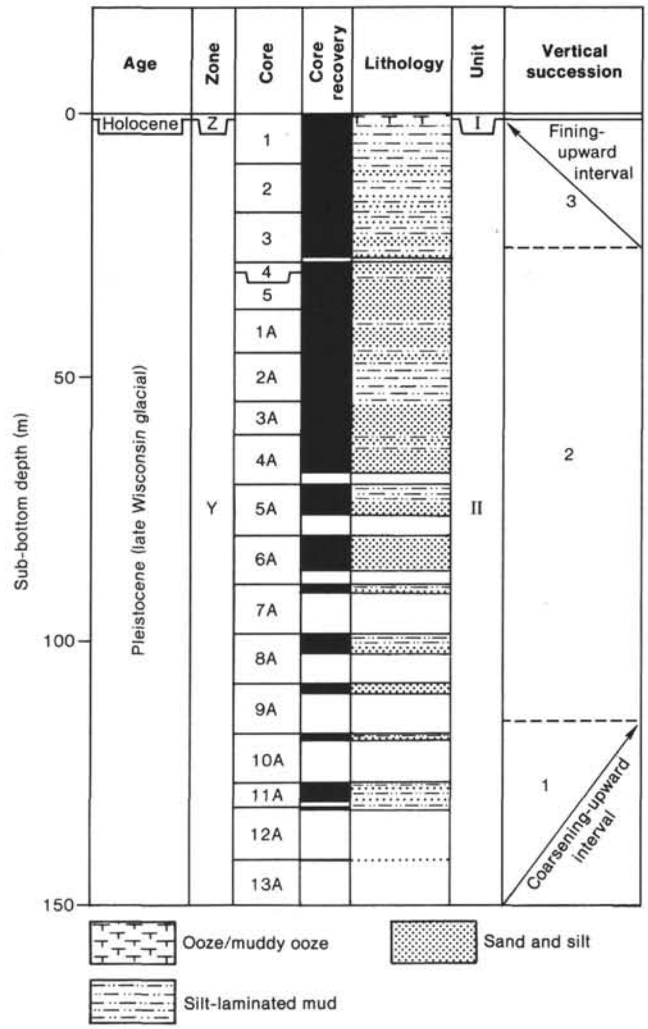


Figure 4. Lithostratigraphic summary of Site 614 showing age, core recovery, lithology, and lithologic units and intervals.

Foraminifers

Foraminifers from Holes 614 and 614A are Quaternary, Zone N23 (Blow, 1969). A warm-water high-diversity planktonic ooze occurs at the top of Core 614-1. This fauna contains abundant *G. menardii* and *G. tumida*, along with bathyal benthic foraminifers such as *Cibicides wuellerstorfi* and *Melonis pompilioides*.

The remainder of Hole 614 and all of Hole 614A contain interbedded sands and muds of Pleistocene age with a very poorly developed foraminiferal fauna. Reworked Cretaceous foraminifers and radiolarians occur throughout this interval.

The occurrence of shallow-water (neritic) foraminifers such as *Amphistegina gibbosa, Hanzawaia* spp., and *Elphidium* spp. suggests that some of the Pleistocene sand and mud has been displaced from a neritic environment. Rapid sedimentation is indicated by the absence of bathyal benthic foraminifers.

No hemipelagic muds were encountered below the Holocene but there is a slight increase in Pleistocene planktonic foraminifers in Sample 614A-13,CC.

Calcareous Nannofossils

All samples observed at this site are interpreted to be in the *Emiliania huxleyi* Zone (NN21) of Martini (1971). The foraminifer ooze in Section 614-1-1 contains abundant, well-preserved calcareous nannofossils. These samples are dominated by very small coccoliths, which can only tentatively be identified as *E. huxleyi*. Few reworked Cretaceous nannofossils are contained in this ooze.

Reworked Cretaceous nannofossils are the major constituent of the remainder of Hole 614 and all of Hole 614A. Because of the rapid sedimentation rate at this site, only trace to rare Pleistocene nannofossils are present in the samples examined. A slight increase in Pleistocene species is encountered in the bottom of Hole 614A in Sample 614A-13,CC. Probable *E. huxleyi* is identified in this sample.

No distinction between the sand and mud lithologies in this interbedded sand-mud sequence can be made on either the abundance or diversity of calcareous nannofossils. Both the sands and muds appear to have been deposited by the same depositional process.

Sedimentation Rates

The sedimentation rates are calculated on the basis of two datums. An age of 0.012 Ma is used for the Holocene/Pleistocene boundary (Z/Y zonal boundary) and an age of 0.085 Ma for the Y/X zonal boundary (see Explanatory Notes, this volume).

A sedimentation rate of 4.2 cm/1000 yr. is computed for the Holocene. This is a minimum rate assuming complete Holocene recovery (Fig. 5).

The Y/X zonal boundary was not encountered. By using a seismic projection to the top of the X Zone (468 m for seismic Horizon "30"; see introductory chapter, this volume), a projected minimum sedimentation rate of 640 cm/1000 yr. is computed for the Y zone.

These calculations were based on nondecompacted sediment thicknesses.

LITHOSTRATIGRAPHY

At Site 614 we recognize two lithologic units on the basis of composition (Table 2, Fig. 4).

Lithologic Unit I: Ooze and Muddy Ooze

This unit occurs in a thin layer (about 40 cm thick) at the very top of the section. It is a light-colored biogenic ooze composed mainly of planktonic foraminifers with less than 10% calcareous nannofossils and siliceous organisms, and with minor terrigenous material. It appears homogeneous and is probably thoroughly bioturbated.

Lithologic Unit II: Muds, Silts, and Sands

Sand and Silt Facies

The dominant facies at Site 614 is silty sand, comprising 54% of the recovered section and an estimated 70% of the complete section (Fig. 6A). It occurs in me-

Table 2. Lithologic units of Site 614.

Lithologic unit	Sediment	Cored interval	Sub-bottom depth (m)
I	Ooze and muddy ooze	614-1-1, 0–40 cm	0–0.4 m
II	Muds, silts, and sands	614-1-1, 40 cm through 614-5; 614A-1 through 614A-13	0.4–150.3 m

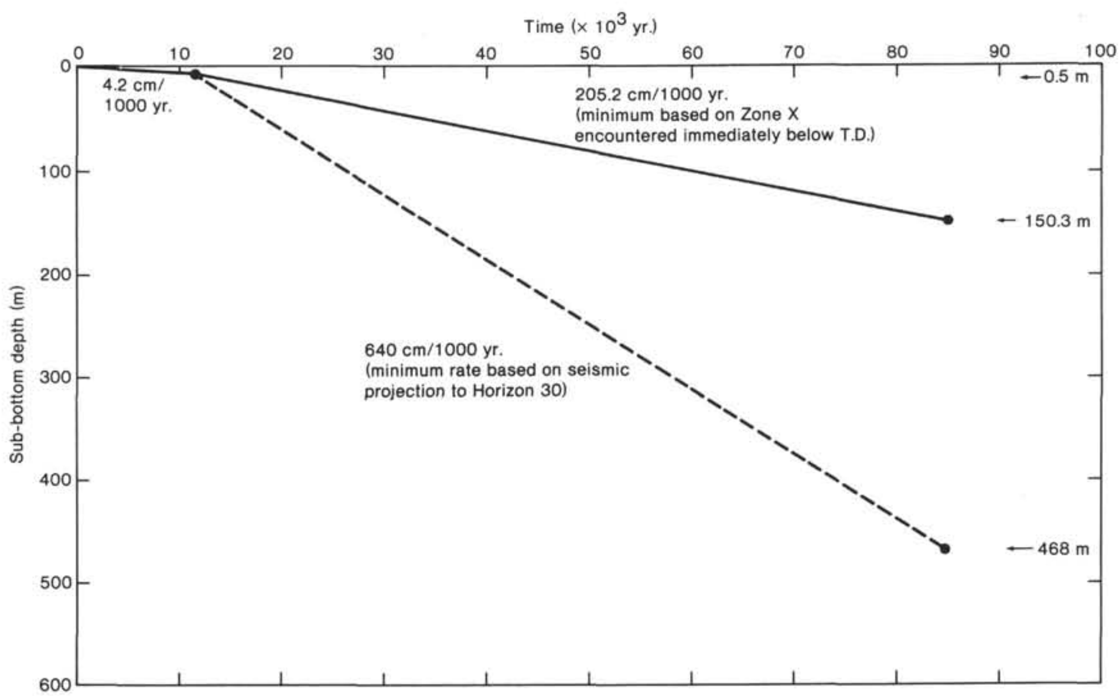


Figure 5. Site 614 sedimentation rates.

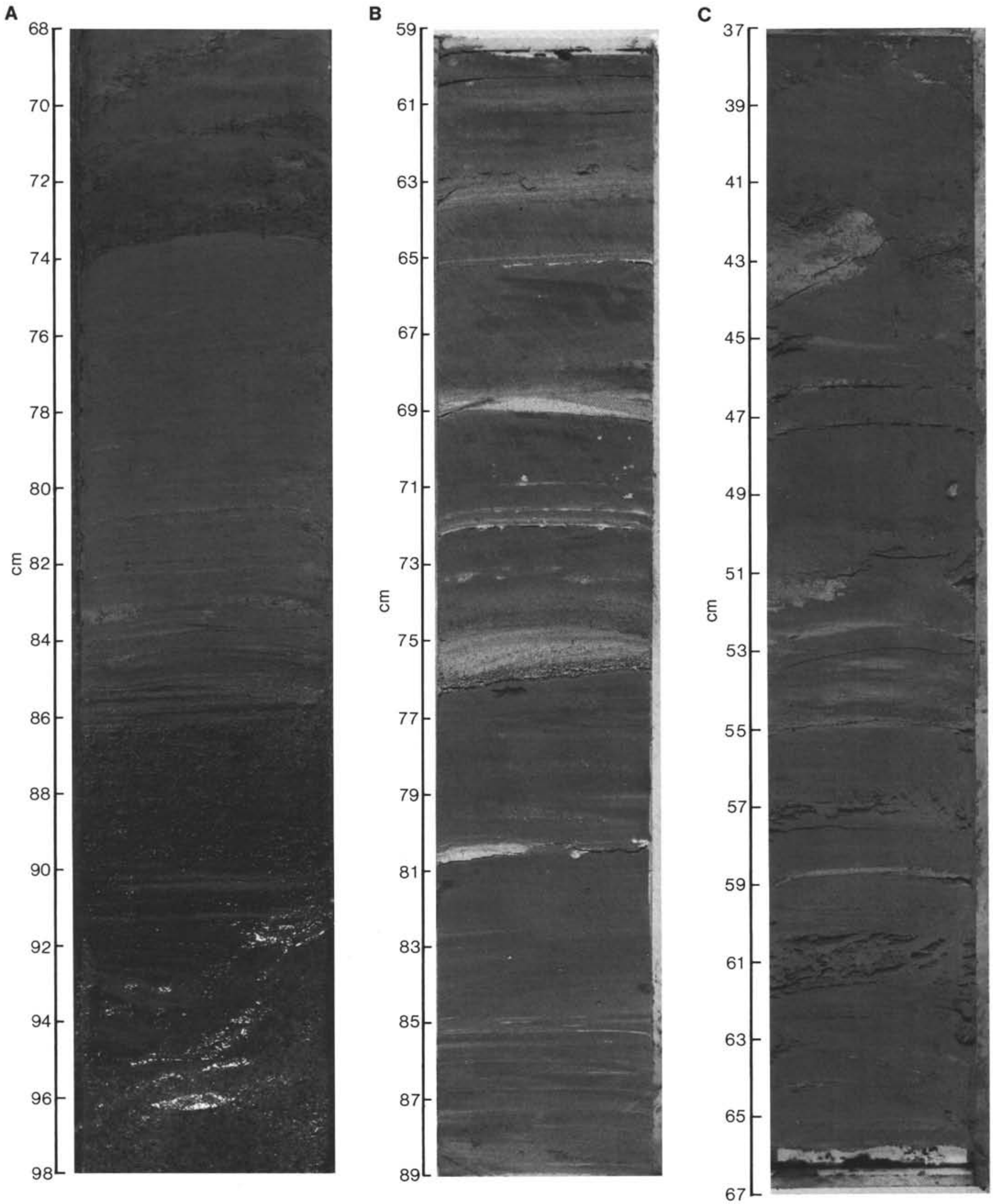


Figure 6. Examples of lithologic facies from Holes 614 and 614A. A. Graded sand and silt beds with some silt laminae (Sample 614A-7-1, 68–98 cm). B. Silt laminae in mud overlying sand (Sample 614A-8-2, 59–89 cm). C. Silt laminae in mud (Sample 614A-1-3, 37–67 cm).

dium to very thick beds, from 10 cm to at least 12 m in thickness. Many of the thicker sandy intervals recovered commonly show loss of sand by washout or an increase of sand due to flow-in during the coring process.

Most of the sand beds appear structureless. Poorly developed normal grading occurs in some of the medium-bedded sands. A coarse-tail grading is observed over several meters in the thicker layers. Rare reverse grading was found at the base of some beds. Both top and bottom contacts are sharp, more rarely gradational, and locally scoured at the base. Large mud clasts (1-5 cm diameter) occur in the middle of a few beds.

All the sands are very poorly sorted, with a maximum grain size of 700 to 1000 μm (coarse to very coarse sand), a mean grain size of 120 to 150 μm (fine sand), and a relatively high proportion of silt. Many of the larger grains are well rounded and some appear well polished, whereas smaller grains are commonly subangular to angular.

The sand composition is mainly terrigenous (95-98%) comprising dominant quartz (clear, white, orange, and rose), secondary feldspars, micas, calcite and heavy minerals (especially amphiboles and opaques), and accessory glauconite and lithic fragments. The small biogenic component (2-5%) includes reworked foraminifers, broken shell debris, and variable amounts of lignite and woody material.

Silt-Laminated Mud Facies

Muds, silty muds, clayey muds, and silts are the second most important sediments at Site 614, making up over 40% of the recovered section (Fig. 6B, C). They occur in sections from a few centimeters to over 10 m thick between sand beds. Individual silt beds form layers from less than 1 mm to about 15 cm thick within the mud sections.

The muds appear structureless, slightly banded or laminated. In some sections they have dispersed silt and sand grains and lenses. The silts most commonly display a range of sedimentary structures typical of fine-grained turbidites. These include sharp scoured bases, parallel and cross-lamination, and low-amplitude ripples. Additional structures include convolute layers, discontinuous lamination, and probable microburrowing. They are typically normally graded, have both sharp and gradational contacts with the overlying mud, and show compositional sorting. Both silts and muds are locally highly disturbed, either because of coring or as a result of sediment movement.

Texturally, the muds are mainly silty or very silty. The silts range from fine-grained and clayey to medium- or coarse-grained and may be moderately well sorted. The grains are granular to subrounded in shape.

Most of the muds are terrigenous, commonly containing up to 10-15% calcareous nannofossils. The silts have a terrigenous character similar to the sands described above, with dominant quartz but a higher proportion of carbonate grains of indeterminate origin. Lignite and other woody debris is locally present and a few silt layers are rich in volcanic ash.

Vertical Succession

The lower half of the 150-m section was incompletely cored, and much of the washed-out material was probably sand. The facies recovered are arranged in three distinct intervals, which we describe from bottom to top:

1. An incomplete coarsening-upward interval from 150- to about 115-m depth of turbidite muds and silts passing upward into sands.
2. A "blocky succession" of thick sands interbedded with thin to thick muds from 115 to about 25 m. The sands are massive or poorly graded and have very abrupt top and bottom contacts with the interbedded muds, giving a blocklike appearance to the section.
3. A fining-upward interval over the top 25 m of section with sands decreasing in thickness and silt laminae decreasing in frequency upward. The uppermost mud then grade into ooze and muddy ooze facies of lithologic Unit I.

GEOCHEMISTRY

Organic Geochemistry

Very low levels of gaseous hydrocarbons were observed in Holes 614 and 614A. At this site, interstitial water sulfate levels remain near seawater values throughout, so that a sulfate-free zone where methanogenic bacterial activity might have occurred was not observed.

Inorganic Geochemistry

Six whole-round samples of 10-cm length were collected for interstitial water analyses. Below Core 614A-6 (89 m sub-bottom) the cores are very short and sandy, making interstitial water analyses impossible.

The shipboard results show a relatively constant salinity, a minor increase in pH with depth, and a significant initial increase in alkalinity with depth (see Ishizuka, Kawahata, et al., this volume).

PHYSICAL PROPERTIES

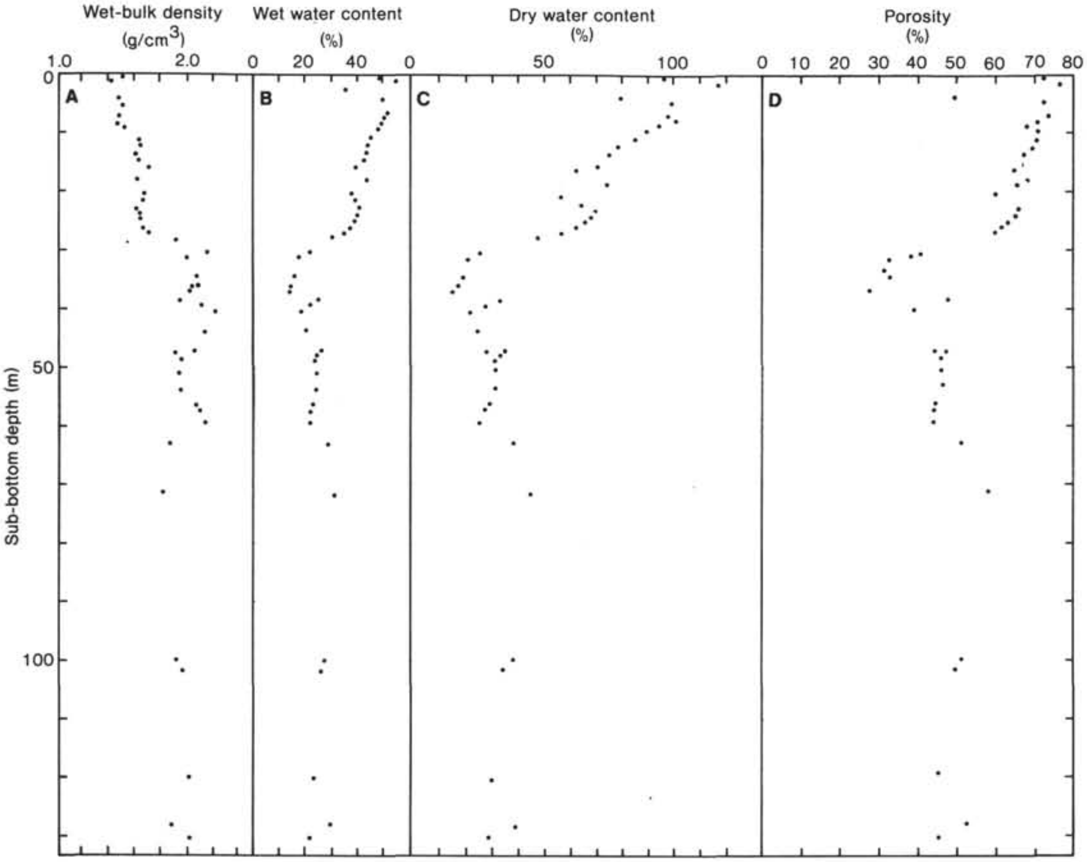
Wet-bulk density increases from a low of 1.4 g/cm^3 measured in muds at the seafloor to a high of 2.2 g/cm^3 at 40-m depth. The highest values reflect the presence of sandy sediments. Deeper in the sediment column, values between 1.8 and 2.0 g/cm^3 are found (Fig. 7A).

Wet water content reflects a rapid change in the physical properties from the seafloor to a depth of 27 m, the start of the sands. Over this interval, the wet water content ranges from 55 to 20% (Fig. 7B). Below 27 m sub-bottom, water content ranges from 37 to 14% and averages about 30%.

Porosity and void ratio (Fig. 7D) reflect trends similar to bulk density and water content. This is not unusual since they are all interrelated.

Grain density varies widely in the upper 50 m but averages about 2.75 g/cm^3, which is the density of the particular type clays found in this area. Sand density averages 2.80 g/cm^3.

Undrained shear strength measurements are plotted in Figure 7E. Shear strength increases at an average rate



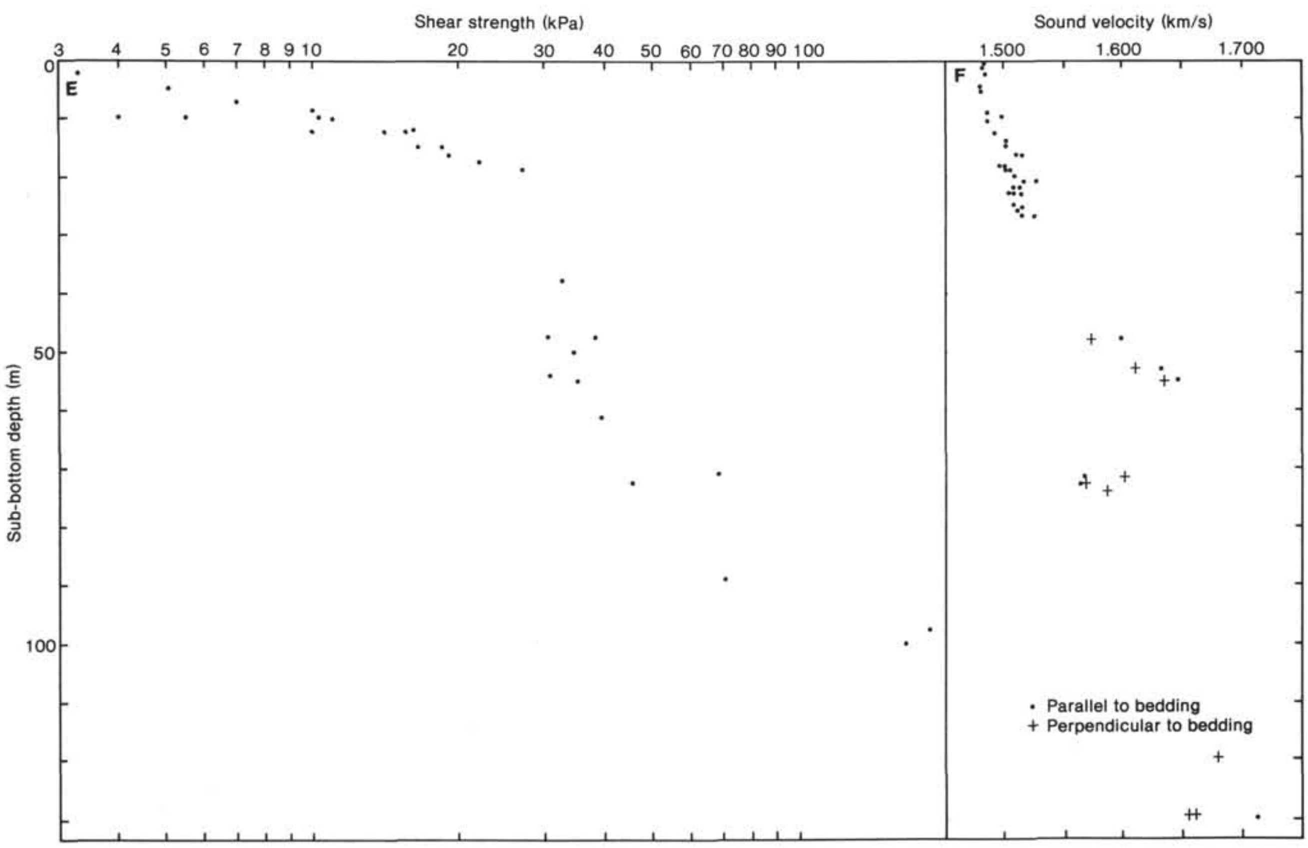


Figure 7. Mass physical properties of Site 614 sediments. A. Wet-bulk density. B. Water content related to weight of wet sediment. C. Water content related to weight of dry sediment. D. Porosity. E. Undrained shear strength. F. Sound velocity.

of 0.8 kPa/m to a sub-bottom depth of 90 m. Below the 90-m level the sediments have anomalously high undrained shear strengths. At the 100-m level, the shear strength ranges from 160 to 180 kPa.

Sonic velocity in the upper 27 m of sediments is less than that of seawater at the same temperature, 1.522 km/s (Fig. 7F). The lowest velocity measured was 1.480 km/s in Section 614-1-2. The highest value (1.527 km/s) was found in Section 614-1-2 at 60.5-m depth.

No attempt was made to measure the sonic velocity of the sands found in the cores of Hole 614A. It was felt that any such measurements would be highly misleading because of the disturbed nature of the material.

In Hole 614A, anomalously high velocity clays are encountered between 48 and 54 m sub-bottom (Fig. 7F). The clays in this region also possess a high acoustic anisotropy. The velocity parallel to the bedding is up to 10% higher than that measured perpendicular to it. This is also true for the sediments of Section 614A-11-2 at 127 m. The velocity at the 70-m level averages around 1.580 km/s. These are the velocities expected of clay at that depth. The velocity of the sediments at the 118- and 127-m levels is anomalously high for clayey sediments at those depths. The anomalously high velocities of certain sediments in Holes 614 and 614A are attributed to the presence of sand and silt (for details see Bryant et al., this volume).

SUMMARY AND CONCLUSIONS

At Site 614, we drilled two holes, Holes 614 and 614A, and cored to a total penetration of 150.3 m below the mud line. The site was located in the lower fan. Strong currents, an abundance of sand, and stiff Pleistocene clay resulted in incomplete core recovery, but the data acquired satisfied the major objectives outlined for this site.

The lower fan region of the Mississippi Fan is characterized by numerous overlapping fan lobes, with the youngest lobe consisting of approximately 150 to 200 m of late Wisconsin sediments derived from the shelf and delivered to the lower fan via a single, large sinuous channel. In the lower fan, numerous small channels, switching through time, have laid down a thick sequence of coarse sandy sediment capped by alternating fine sands, silts, and clays. With the exception of the upper 1.5 m (Holocene foraminifer ooze), the entire cored section seems to be within Ericson's Zone Y, the late Wisconsin glacial stage. The *Globorotalia flexuosa* Zone, dated at 0.085 Ma, was not reached, thus the total cored sequence was extremely young in age. The sediments comprising the section were very poor in pelagic foraminifers and included benthic microfauna, indicating transport from a shelf edge or shallower water environment.

The vertical sequence is dominated by sandy sediment, with fine sand comprising some 4.4% of the upper 20 m of cored section and 71.8% of the lower 130.3-m cored section. In the lowermost section of the hole, stiff, possibly overconsolidated, clays were encountered. These clays display some fine intercalated silt layers. The sands and sandy muds contain large quantities of organic material, much of it highly lignitic, which suggest that it is of an older origin. In some instances, zones consisting of high percentages of transported organics were present. Sedimentary structures in the interbedded sand, silt, and clay sequences indicate transport by unidirectional currents, and only a few zones of distorted (slump) sediments were encountered. The clays display some scattered bioturbation, but in general burrowing was minimal throughout the sequence. The coarser-grained sequence contains a large number of graded beds, and most of the thinner sands show fining-upward (turbidite) sequences. The thicker sands were commonly disturbed by coring operations, and sedimentary structures were poorly defined.

Visual inspection of the cores did not reveal the presence of gas within the cored sections. None of the cores displayed expansion out of the liners.

The preliminary conclusions are as follows:

1. The sediment section penetrated in Holes 614 and 614A is Quaternary, correlating with the planktonic foraminifer Zone N23 and the calcareous nannofossil Zone NN21. This interval includes the Holocene (< 1 m thick) and upper Wisconsin glacial (Zone Y). The warm interstadial of the Wisconsin (Zone X or *G. flexuosa* Zone) was not encountered to a total depth at 150.3 m. The Y Zone contains mostly reworked Cretaceous foraminifers and calcareous nannofossils within the displaced sands and muds.

2. Relatively coarse displaced sediments have been transported some 600 km from the shelf edge near the head of the Mississippi Canyon to the site during the late Wisconsin glacial stage. A minimum thickness of 149 m of displaced sediments has accumulated at Site 614 in a relatively short period of geologic time.

3. The lithologic breaks in the upper 20 m of section are recognizable on 3.5-kHz profiler records. The top and base of the dominant sandy section (20–118 m) can be recognized in the seismic records and can be used to map this facies.

4. Medium to thick bedded, very fine medium-grained sand turbidites form 54% of the section recovered and an estimated 70% of the total section penetrated. Coring distortion obliterated many lithologic contacts, and it can only be stated that individual units up to 12 m thick are present. The sands contain significant proportions of terrigenous plant debris.

5. Muds and silts form 46% of section, interbedded with thick sands. They were deposited from turbidity currents or other low concentration flows. Pelagic and hemipelagic sediments are almost entirely absent except in the upper half meter.

6. The lower 35 m of the section appears to be a coarsening-upward sequence related to lower fan lobe development. The middle 90 m is a "blocky sequence" of thick sands and thinner muddy interbeds. The uppermost 25 m is a fining-upward sequence thought to be related to climatic amelioration and sea level rise through the latest Wisconsin and Holocene. It can be concluded that the area of this site has been relatively inactive for the past 12,000 to 15,000 yr.

7. No observable gas expansion cracks or bubbles sufficient for collection and analysis were observed. The lack of substantial accumulation of gaseous hydrocarbons may be a result of: (1) the rapid rates of sediment

accumulation, (2) the coarseness of the sediment, (3) low microbial activity because of low temperatures, high pressure, and low organic content, (4) the low geothermal gradient, and (5) loss of gas during coring operations.

8. The concept of the development of a fan lobe and of sand transport to the lower fan area has maintained its validity and no evidence has been found at this site that disagrees with the basic premise.

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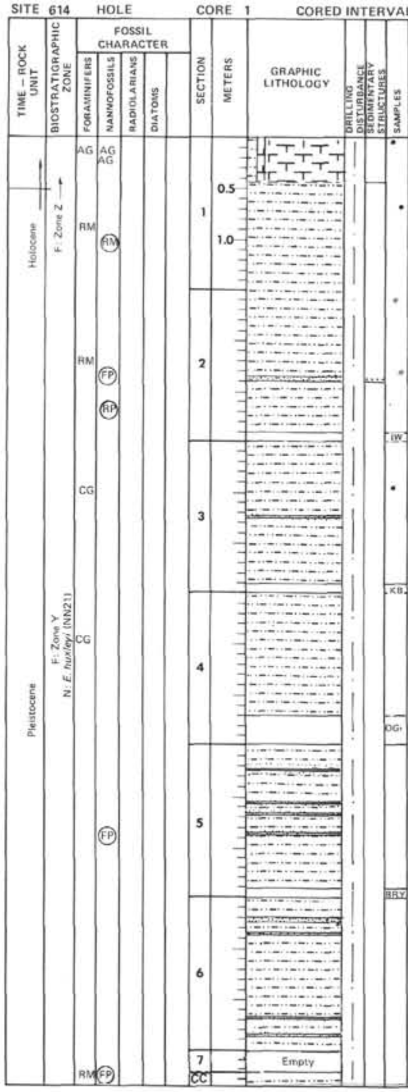
SITE 614 HOLE CORE 1 CORED INTERVAL 3314.1–3323.5 mbsl; 0.0–9.4 mbsf



LITHOLOGIC DESCRIPTION

Section 1, 0–42 cm: MUDDY NANNO FORAM OOZE, olive brown to dark brown (2.5Y 4/4–10YR 4/3) in color.

Section 1, 42 cm–Core Catcher: SILTY MUD and CLAYEY MUD, dark gray brown to dark gray (10YR 3/2–5Y 4/1) with thin SILT and SANDY SILT layers.

MUDS appear structureless, rarely with possible bioturbation, and are dominantly detrital (quartz and carbonate silts and clays).

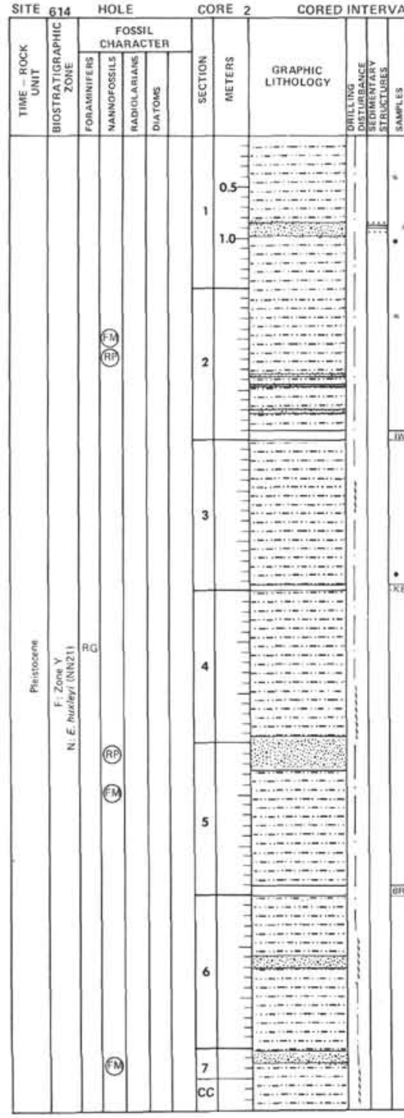
SILTS and SANDY SILTS are less than 1–5 cm thick. They are commonly disturbed, and are dominantly detrital (quartz with minor feldspar and carbonate). Some of the silt layers are graded (probably turbiditic); some may be silt-filled burrows.

SMEAR SLIDE SUMMARY (%):

	2, 15	2, 87
	D	M
Texture:		
Sand	2	20
Silt	65	70
Clay	33	10
Composition:		
Quartz	25	40
Feldspar	3	5
Mica	5	–
Heavy minerals	3	5
Clay	33	10
Carbonate unspec.	20	–
Calc. nannofossils	1	T
Plant debris	T	–
Other (terrigenous unspecified and altered)	10	40

CARBONATE BOMB DATA:
•1, 6–8 cm = 39%
1, 70–72 cm = 0.5%
3, 48–50 cm = 1.5%

SITE 614 HOLE CORE 2 CORED INTERVAL 3323.5–3332.8 mbsl; 9.4–18.7 mbsf



LITHOLOGIC DESCRIPTION

SILTY MUD and CLAYEY MUD, dark gray to dark olive gray (10YR 4/1–5Y 3/2) with thin SILT and SANDY SILT layers and laminae, and thin SAND beds.

MUDS appear structureless, becoming irregularly laminated toward the base of the core. Bioturbation is rare. Muds are dominantly terrigenous (quartz, carbonates, clays).

SILTS and SANDY SILTS are commonly less than 1–5 cm in thickness, but range up to 10 cm thick as shown. They have sharp to gradational contacts, are probably turbidites, and are dominantly terrigenous (quartz, carbonate, heavy minerals).

SANDS are typically 10–30 cm thick, silty, appear structureless or slightly graded, and are probably turbidites. Composition of the sands is dominantly terrigenous (quartz-rich).

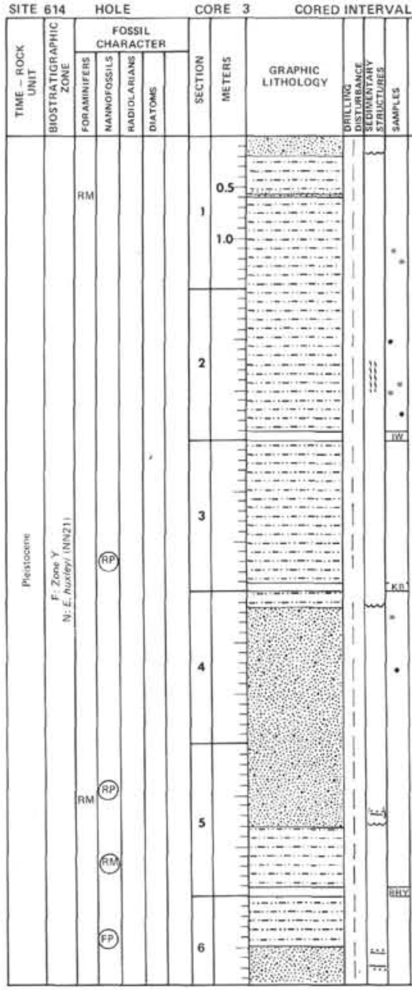
Note that the number of silt layers recovered in this core is greater than that which appears in the Graphic Lithology column. These silts are too numerous and thin to illustrate on this Barrel Sheet.

SMEAR SLIDE SUMMARY (%):

	1, 40	1, 90	2, 30
	D	M	D
Texture:			
Sand	0	55	0
Silt	35	40	20
Clay	65	5	80
Composition:			
Quartz	15	70	8
Feldspar	2	3	–
Mica	T	2	–
Heavy minerals	2	3	–
Clay	65	5	80
Volcanic glass	T	T	–
Glauconite	–	T	–
Carbonate unspec.	10	5	4
Calc. nannofossils	3	1	3
Plant debris	–	1	–
Other	2	10	7

CARBONATE BOMB DATA:
•1, 106–108 cm = 7.0%
3, 136–138 cm = 0.5%

SITE 614 HOLE CORE 3 CORED INTERVAL 3332.8–3342.1 mbsl; 18.7–28.0 mbsf



LITHOLOGIC DESCRIPTION

SILTY MUD and CLAYEY MUD, dark gray to dark olive gray (10YR 4/1–5Y 3/2) with thin SILT layers and laminae and thicker SAND beds.

MUDS are mainly laminated with either fine silt or darker mud laminae. Some zones are irregularly laminated; other zones are completely structureless. The muds are dominantly detrital; mainly turbiditic.

SILTS range from less than 1 mm to a few cm in thickness. They are internally laminated, and show typical fine-grained turbidite structures and grading. Dominantly terrigenous.

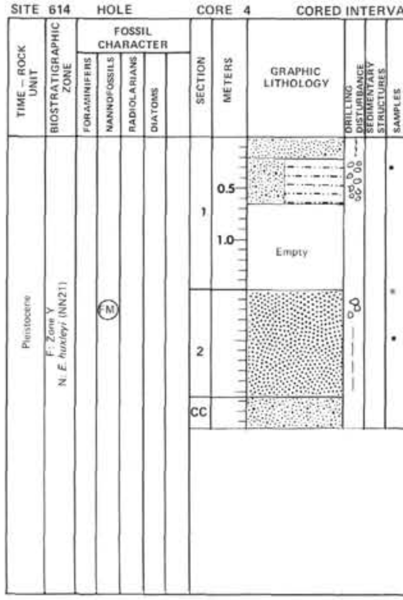
SANDS are dominantly terrigenous (quartz-rich) and very poorly sorted (maximum grain size is about 700 μm). The thickest sand bed is 2.15 m thick, and is apparently massive with only very subtle grading evident.

SMEAR SLIDE SUMMARY (%):

	1, 118	1, 124	2, 96	2, 100	4, 26
	D	M	D	D	M
Texture:					
Sand	3	20	15	0	60
Silt	40	65	35	35	35
Clay	57	15	50	65	5
Composition:					
Quartz	20	30	15	10	75
Feldspar	5	15	8	–	5
Mica	T	2	1	–	3
Heavy minerals	5	10	5	1	5
Clay	57	15	50	65	5
Glauconite	–	–	T	–	–
Carbonate unspec.	5	T	–	7	3
Foraminifers	–	T	–	–	1
Calc. nannofossils	5	–	1	15	1
Plant debris	–	–	–	T	2
Altered minerals	3	28	20	2	–

CARBONATE BOMB DATA:
2, 54–56 cm = 1.5%
2, 128–130 cm = 2.0%
4, 80–82 cm = 0.0%

SITE 614 HOLE CORE 4 CORED INTERVAL 3342.1–3344.1 mbsl; 28.0–30.0 mbsf



LITHOLOGIC DESCRIPTION

SAND, dark gray to dark olive gray (5Y 4/1–5Y 3.5/2) in color. Silty, poorly sorted (maximum grain size is about 200 μm), structureless, partly disturbed, and dominantly terrigenous (quartz and altered grains). Probably turbiditic.

Section 1 contains zones of drilling breccia with mud clasts.

Note: Section 1 is a composite of two unsuccessful attempts at coring this interval. Section 2 and Core Catcher include all of the material recovered during the third coring attempt. Actual stratigraphic position of the recovered sediments within the cored interval is unknown.

SMEAR SLIDE SUMMARY (%):

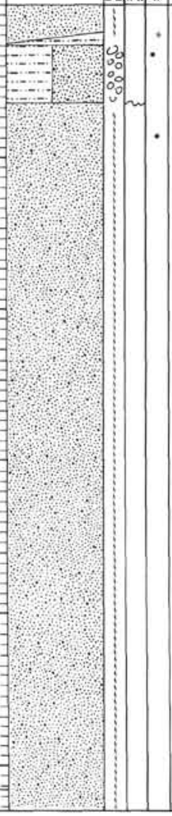
	2, 3
	D
Texture:	
Sand	60
Silt	40
Clay	0
Composition:	
Quartz	50
Feldspar	20
Heavy minerals	5
Altered minerals	25

CARBONATE BOMB DATA:
• 1, 31–33 cm = 6.0%
2, 50–52 cm = 3.0%

SITE 614 HOLE CORE 5 CORED INTERVAL 3344.1–3351.1 mbsl; 30.0–37.0 mbsf

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
Pleistocene	F: Zone Y N: *E. huxleyi* (NN21)	RP	FM			1, 2, 3, 4, 5, 6, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

Section 1, 0–30 cm: SAND.

Section 1, 30–40 cm: deformed MUD layer.

Section 1, 40–95 cm: SAND and MUD drilling breccia.

Section 1, 95 cm–5, Core Catcher: thick SANDY SILT to SILTY SAND bed. Apart from normal grading from SILTY SAND at the base (maximum grain size = 800 µm) to SANDY SILT at the top (maximum grain size = 250 µm), this bed is apparently structureless. It is dominantly terrigenous (quartz-rich). Olive gray (5Y 4/2).

SMEAR SLIDE SUMMARY (%):

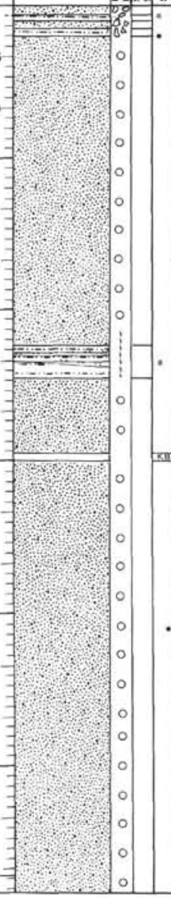
	1, 35
	D
Texture:	
Sand	2
Silt	60
Clay	38
Composition:	
Quartz	41
Feldspar	3
Mica	T
Heavy minerals	3
Clay	38
Carbonate unspec.	5
Calc. nannofossils	10

CARBONATE BOMB DATA:
1, 50–52 cm = 2.0%
1, 130–132 cm = 0.5%

SITE 614 HOLE A CORE 1 CORED INTERVAL 3351.1–3359.1 mbsl; 37.0–45.0 mbsf

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS
Pleistocene	F: Zone Y N: *E. huxleyi* (NN21)		CM			1, 2, 3, 4, 5, 6, CC	0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

SILTY SAND WITH INTERBEDDED MUD and SILT.

Most of this core consists of massive, very poorly sorted, homogeneous, SILTY SAND that changes in color from dark olive gray (5Y 3/2) to very dark gray (5Y 3/1) down core. These silty sands are dominantly terrigenous and contain a lot of black (7.5YR 2/0) organic material, especially at Section 2, 40 and 105 cm and Section 3, 90–110 cm.

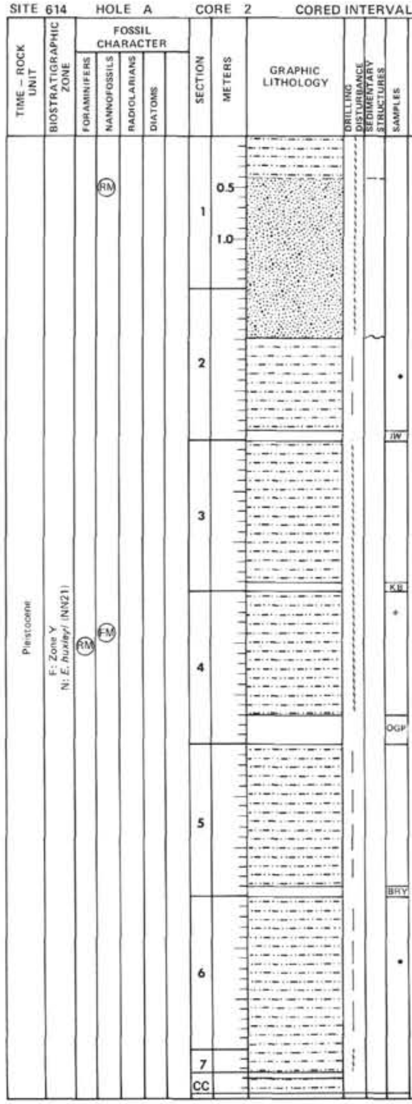
Interbedded MUD and SILT (SANDY SILT) layers occur at Section 1, 0–30 cm and Section 3, 35–67 cm. The SILTS are olive gray (5Y 4/2); the MUDS range from very dark gray (5Y 3/1) to dark olive gray (5Y 3/2).

SMEAR SLIDE SUMMARY (%):

	1, 10	3, 53
	D	D
Texture:		
Sand	0	0
Silt	25	80
Clay	75	20
Composition:		
Quartz	15	47
Feldspar	1	5
Mica	1	2
Heavy minerals	1	3
Clay	75	–
Glauconite	T	–
Micronodules	–	2
Carbonate unspec.	5	40
Calc. nannofossils	1	1
Plant debris	1	–

CARBONATE BOMB DATA:
1, 31–33 cm = 11.0%
*5, 18–20 cm = 0.5%

SITE 614 HOLE A CORE 2 CORED INTERVAL 3359.1–3368.4 mbsl; 45.0–54.3 mbsf



LITHOLOGIC DESCRIPTION

MUD and SILTY SAND.

Most of this core consists of highly disturbed, homogeneous (apparently structureless), organic-rich, dark olive gray (5Y 3/2) MUD.

A homogeneous, dark olive gray (5Y 3/2) SILTY SAND layer occurs in Section 1, 39 cm–Section 2, 45 cm.

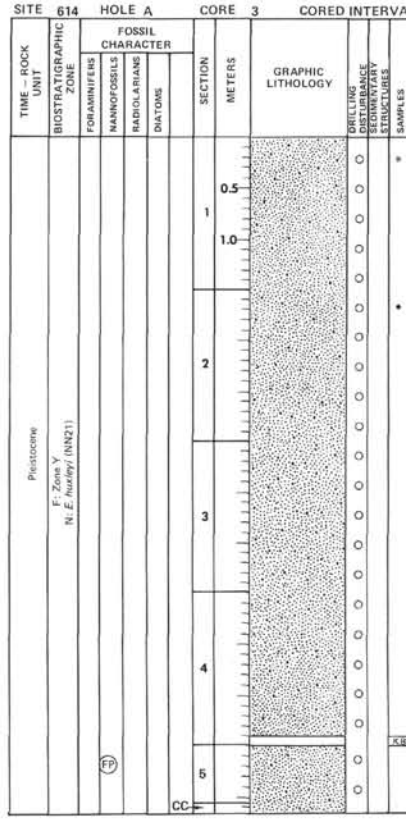
Note: vertical clay dikes occur in Section 7 and the Core Catcher. This, plus vertical organic fragments, suggests that some or all of this core may be flow-in.

SMEAR SLIDE SUMMARY (%):

	4, 20
	D
Texture:	
Sand	10
Silt	30
Clay	60
Composition:	
Quartz	15
Feldspar	2
Mica	1
Heavy minerals	2
Clay	60
Carbonate unspec.	10
Calc. nannofossils	2
Plant debris	1
Altered minerals	7

CARBONATE BOMB DATA:
* 2, 86–88 cm = 8.0%
6, 67–69 cm = 9.0%

SITE 614 HOLE A CORE 3 CORED INTERVAL 3368.4–3374.9 mbsl; 54.3–60.8 mbsf



LITHOLOGIC DESCRIPTION

SILTY SAND.

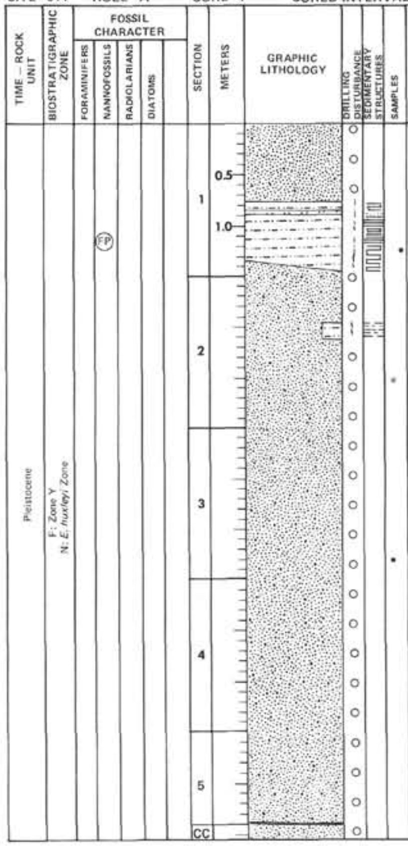
Entire core consists of slightly soupy, dark olive gray (5Y 3/2), quartz-rich, homogeneous SILTY SAND.

SMEAR SLIDE SUMMARY (%):

	1, 20
	D
Texture:	
Sand	40
Silt	58
Clay	2
Composition:	
Quartz	65
Feldspar	2
Mica	1
Heavy minerals	2
Carbonate unspec.	20
Calc. nannofossils	T
Plant debris	1
Altered minerals	10

CARBONATE BOMB DATA:
* 2, 20–22 cm = 0.0%

SITE 614 HOLE A CORE 4 CORED INTERVAL 3374.9–3384.3 mbsl; 60.8–70.2 mbsf



LITHOLOGIC DESCRIPTION

SILTY SAND with interbedded SILTY MUD, SILT, and MUD laminae.

This core consists principally of slightly soupy, dark olive gray (5Y 3/2), quartz rich, homogeneous, SILTY SAND.

Section 1, 75–137 cm contains laminated and bedded MUDS with silty bases and one SILT bed (86–90 cm). The dark laminae and beds are dark olive gray (5Y 3/2); the light ones are dark gray (5Y 4/1). The amount of organic matter increases from 112–118 cm; the color of the organic-rich laminae is black (2.5Y 2/0). The SILTY SAND bed is normally-graded with sharp bottom and gradational top contacts.

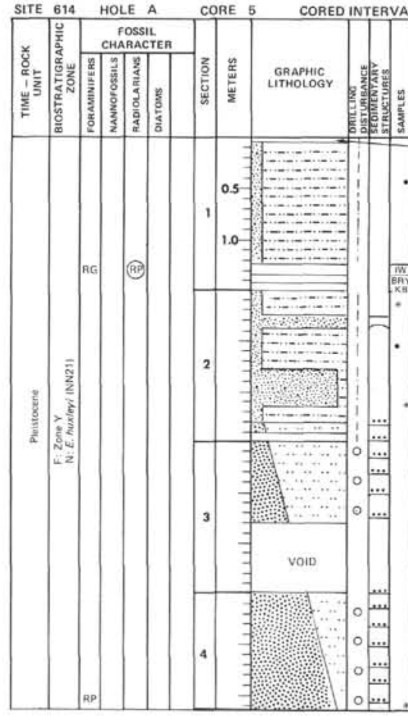
Section 2, 50–65 cm contains interbedded SILTY SAND and SILTY MUD with gradational contacts.

SMEAR SLIDE SUMMARY (%):

	2, 100
	D
Texture:	
Sand	60
Silt	30
Clay	10
Composition:	
Quartz	65
Feldspar	2
Mica	1
Heavy minerals	2
Clay	10
Glauconite	2
Carbonate unspec.	15
Calc. nannofossils	1
Plant debris	T
Other	2

CARBONATE BOMB DATA:
•1, 129–131 cm = 7.0%
3, 132–134 cm = 1.0%

SITE 614 HOLE A CORE 5 CORED INTERVAL 3384.3–3393.7 mbsl; 70.2–79.6 mbsf



LITHOLOGIC DESCRIPTION

Section 1, 0 cm–Section 2, 130 cm: this interval consists of slightly to moderately deformed interbedded MUD, SILTY MUD, and SILTY SAND. MUD and SILTY MUD blebs and layers are dominantly dark olive gray (5Y 3/2); SILTY SANDS are olive gray (5Y 5/2). Varying proportions of MUD/SILTY MUD and SILTY SAND downcore are illustrated in the Graphic Lithology column.

Section 2, 130 cm–Section 4,115 cm: this interval consists of a single, normally-graded, quartz-rich, very dark gray (5Y 3/1), homogeneous SAND layer.

SMEAR SLIDE SUMMARY (%):

	2, 18	2, 116	4, 112
	D	D	D
Texture:			
Sand	3	60	90
Silt	70	40	10
Clay	27	0	0
Composition:			
Quartz	30	70	70
Feldspar	9	2	20
Mica	1	1	–
Heavy minerals	8	2	10
Clay	27	T	–
Pyrite	–	2	–
Carbonate unspec.	10	10	–
Calc. nannofossils	15	–	–
Plant debris	–	2	–
Other	–	10	–

CARBONATE BOMB DATA:
• 1, 48–50 cm = 2.0%
2, 57–59 cm = 1.5%

SITE 614 HOLE A CORE 6 CORED INTERVAL 3393.7–3403.1 mbsl; 79.6–89.0 mbsf

TIME – ROCK UNIT: Pleist.

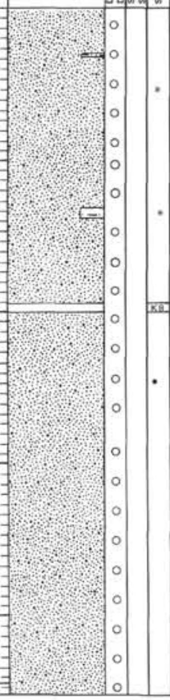
BIOSTRATIGRAPHIC ZONE: F: Zone Y; N: *E. huxleyi* (NN21)

FOSSIL CHARACTER: Nannofossils: CP

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

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

SILTY SAND.

Entire core consists of slightly soupy, dark olive gray (5Y 3/2), very poorly sorted, quartz-rich, homogeneous SILTY SAND.

Small MUD blebs (rip-up clasts?) occur at Section 1, 40–42 cm and Section 2, 47–55 cm.

Somewhat denser (less soupy) SILTY SAND intervals occur at Section 1, 25–44 cm; Section 2, 8–17 cm, 45–55 cm, and 99–110 cm; and Section 5, 25–60 cm.

SMEAR SLIDE SUMMARY (%):

	1, 80	2, 52
	D	D
Texture:		
Sand	55	0
Silt	40	15
Clay	5	85
Composition:		
Quartz	65	3
Feldspar	2	–
Mica	1	–
Heavy minerals	2	–
Clay	5	85
Pyrited/opaques	2	–
Carbonate unspec.	20	2
Foraminifers	–	T
Calc. nannofossils	T	10
Plant debris	–	T
Other	2	–

CARBONATE BOMB DATA:
•3, 70–72 cm = 0.0%

SITE 614 HOLE A CORE 7 CORED INTERVAL 3403.1–3412.6 mbsl; 89.0–98.5 mbsf

TIME – ROCK UNIT: Pleistocene

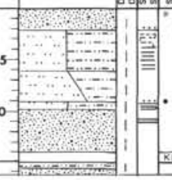
BIOSTRATIGRAPHIC ZONE: F: Zone Y; N: *E. huxleyi* (NN21)

FOSSIL CHARACTER: Foraminifers: None; Nannofossils: FM, RP

SECTION: 1, CC

METERS: 0.5, 1.0

GRAPHIC LITHOLOGY / DRILLING DISTURBANCE / SEDIMENTARY STRUCTURES / SAMPLES



LITHOLOGIC DESCRIPTION

Section 1, 0–20 cm: SILTY SAND. Slightly deformed, olive gray (5Y 4/2), very poorly sorted, quartz-rich, normally-graded, and homogeneous.

Section 1, 20–62 cm: organic-rich, laminated SILT (SILTY MUD) and MUD. Light colored laminations are dark olive gray (5Y 3/2); dark colored laminations are black (5Y 2/1). These laminations range from 0.1–1.0 cm thick, and are somewhat indistinct at Section 1, 20–30 cm.

Section 1, 62–90 cm: MUD with discontinuous layers and blebs of SILT. MUD is dark olive gray (5Y 3/2); SILT is dark gray (5Y 4/1). Number of discontinuous silt layers increases downcore. Base may be graded.

Section 1, 90–95 cm: SILTY MUD. Well-laminated, and organic-rich.

Section 1, 95–140 cm: SILTY SAND. Slightly deformed, dark olive gray (5Y 3.5/2), very poorly sorted, quartz-rich, and homogeneous. Two thin organic-rich layers occur at 104 and 105 cm.

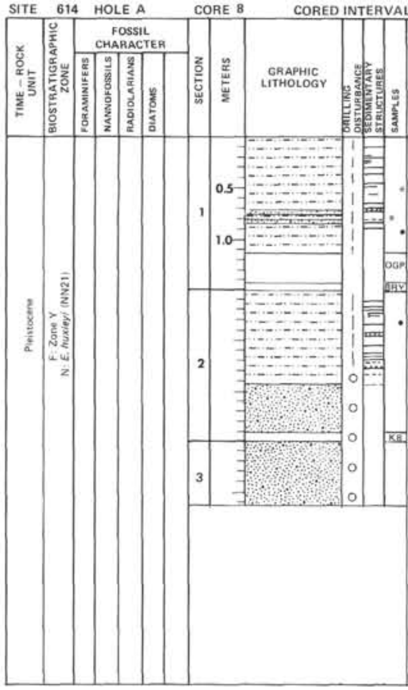
Core Catcher: well laminated MUD (Core Catcher, 0–3 cm) and SILTY SAND (Core Catcher, 3 cm–base). Laminations are 1 mm thick.

SMEAR SLIDE SUMMARY (%):

	1, 1	1, 26
	D	D
Texture:		
Sand	60	1
Silt	35	70
Clay	5	29
Composition:		
Quartz	80	50
Feldspar	3	2
Mica	1	1
Heavy minerals	3	2
Clay	5	29
Pyrite/opaques	–	2
Carbonate unspec.	3	5
Foraminifers	1	1
Calc. nannofossils	1	1
Plant debris	2	2
Altered minerals	1	5

CARBONATE BOMB DATA:
•Section 1, 92–94 cm = 2.0%

SITE 614 HOLE A CORE 8 CORED INTERVAL 3412.6–3422.1 mbsl; 98.5–108.0 mbsf



LITHOLOGIC DESCRIPTION

Section 1, 0 cm–Section 2, 91 cm: MUD interbedded with numerous SILTY MUD, MUDDY SILT, and SANDY SILT layers. The MUD is dark olive gray (5Y 3.5/2). Interbedded SILTS are thin (less than 1 to 3 cm thick); some are graded and cross-laminated.

Section 2, 91 cm–Section 3, 63 cm: homogeneous dark gray/olive gray (5Y 4/1.5), quartz-rich SILTY SAND.

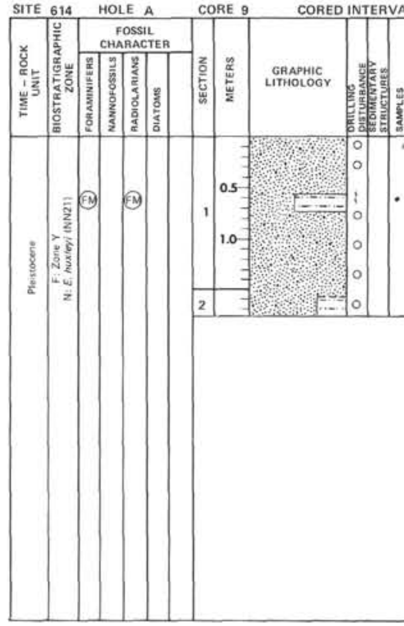
Note: locations of interbedded SILTS are schematically shown by solid lines in the Sedimentary Structures column.

SMEAR SLIDE SUMMARY (%):

	1, 57	1, 80
	M	D
Texture:		
Sand	0	55
Silt	80	40
Clay	20	5
Composition:		
Quartz	38	60
Feldspar	T	5
Mica	T	2
Heavy minerals	T	2
Clay	20	5
Palagonite	15	–
Pyrite/opaques	T	2
Carbonate unspec.	25	15
Foraminifers	–	T
Calc. nannofossils	2	1
Plant debris	–	T
Altered minerals	–	8

CARBONATE BOMB DATA:
•1, 99–101 cm = 8.0%
2, 36–38 cm = 6.0%

SITE 614 HOLE A CORE 9 CORED INTERVAL 3422.1–3431.6 mbsl; 108.0–117.5 mbsf



LITHOLOGIC DESCRIPTION

SILTY SAND.

This core consists dominantly of dark olive gray (5Y 3.5/2), slightly soupy, poorly sorted, quartz-rich, homogeneous SILTY SAND.

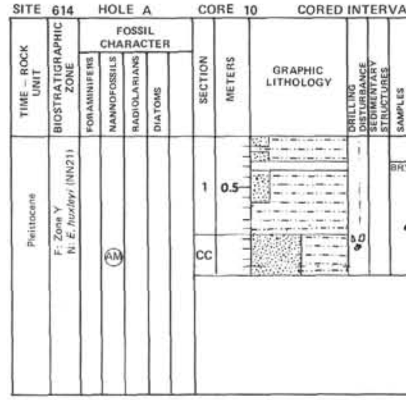
The SILTY SAND in Section 1, 55–72 cm and Section 2 contains dark olive gray (5Y 3/2) MUD clasts and blebs. The MUD clast at Section 1, 55–60 cm is laminated.

SMEAR SLIDE SUMMARY (%):

	1, 10
	D
Texture:	
Sand	74
Silt	25
Clay	1
Composition:	
Quartz	70
Feldspar	5
Mica	2
Heavy minerals	3
Clay	1
Pyrite/opaques	3
Carbonate unspec.	16
Foraminifers	T
Calc. nannofossils	T
Plant debris	T
Altered minerals	5

CARBONATE BOMB DATA:
•Section 1, 62–64 cm = 0.0%

SITE 614 HOLE A CORE 10 CORED INTERVAL 3431.6–3441.1 mbsl; 117.5–127.0 mbsf



LITHOLOGIC DESCRIPTION

Section 1 is only 98 cm long and consists primarily of very dark gray (5Y 3/1) MUD. This MUD contains blebs and thin, discontinuous layers of SILTY MUD from 0–10 cm, 14–22 cm, and 32–64 cm.

The Core Catcher was badly disturbed during coring and deck handling and consists of intermixed dark olive gray MUD (5Y 3/2) and SILTY SAND (5Y 3.5/2).

Note: This liner was deformed, and some of the core was lost because liner sections could not be removed from the barrel.

CARBONATE BOMB DATA:
•Section 1, 86–88 cm = 4.5%

SITE 614 HOLE A CORE 11 CORED INTERVAL 3441.1–3445.3 mbsl; 127.0–131.2 mbsf

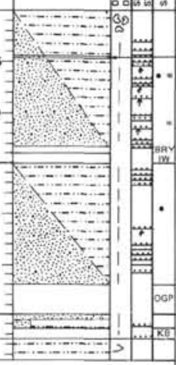
TIME – ROCK UNIT: Pleistocene

BIOSTRATIGRAPHIC ZONE: F: Zone Y; N: *E. huxleyi* (NN21)

FOSSIL CHARACTER: FOSSIL CHARACTER: Foraminifers RM; Nannofossils CM

SECTION: 1, 2, 3, CC

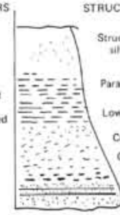
METERS: 0.5, 1.0



LITHOLOGIC DESCRIPTION

Whole core consists of repeated fine grained turbidites of variable thickness (ranging from less than 1 to more than 20 cm). These turbidites are typically graded from FINE SILT or SANDY SILT at the base to MUD at the top, with the standard vertical sequences of colors and structures detailed in the diagram below.

Variations: some of the turbidites grade from muddy silt at the base to mud upsection and are of a darker grayish color. Some of the turbiditic silts are whiter in color (5Y 6/1) and very fine grained with sharp contact and flame structures between silt and the overlying mud. The mud intervals may be slightly burrowed.



SMEAR SLIDE SUMMARY (%):

	1, 62 D	1, 112 D
Texture:		
Sand	10	10
Silt	80	60
Clay	10	30
Composition:		
Quartz	52	37
Feldspar	4	T
Mica	2	T
Heavy minerals	3	2
Clay	10	30
Palagonite	–	T
Pyrite/opaques	3	2
Micronodules	T	–
Carbonate unspec.	20	18
Foraminifers	–	2
Calc. nannofossils	T	10
Plant debris	1	3
Altered minerals, etc.	5	2

CARBONATE BOMB DATA:
1, 63–65 cm = 7.0%
2, 48–50 cm = 2.0%

SITE 614 HOLE A CORE 12 CORED INTERVAL 3445.3–3454.8 mbsl; 131.2–140.7 mbsf

TIME – ROCK UNIT: Pleistocene

BIOSTRATIGRAPHIC ZONE: F: Zone Y; N: *E. huxleyi* (NN21)

SECTION: 1

LITHOLOGIC DESCRIPTION

Section 1, 0–9 cm: MUD with tiny SILTY MUD blebs and one discontinuous SILTY MUD layer at 5 cm. MUD is dark olive gray (5Y 3/2).

Section 1, 9–20 cm: a composite of the MUD chunks found in the Core Catcher. This mud is identical to that recovered in Section 1, 0–9 cm.

SITE 614 HOLE A CORE 13 CORED INTERVAL 3454.8–3464.4 mbsl; 140.7–150.3 mbsf

TIME – ROCK UNIT: Pleistocene

BIOSTRATIGRAPHIC ZONE: F: Zone Y; N: *E. huxleyi* (NN21)

FOSSIL CHARACTER: Foraminifers FG; Nannofossils CM

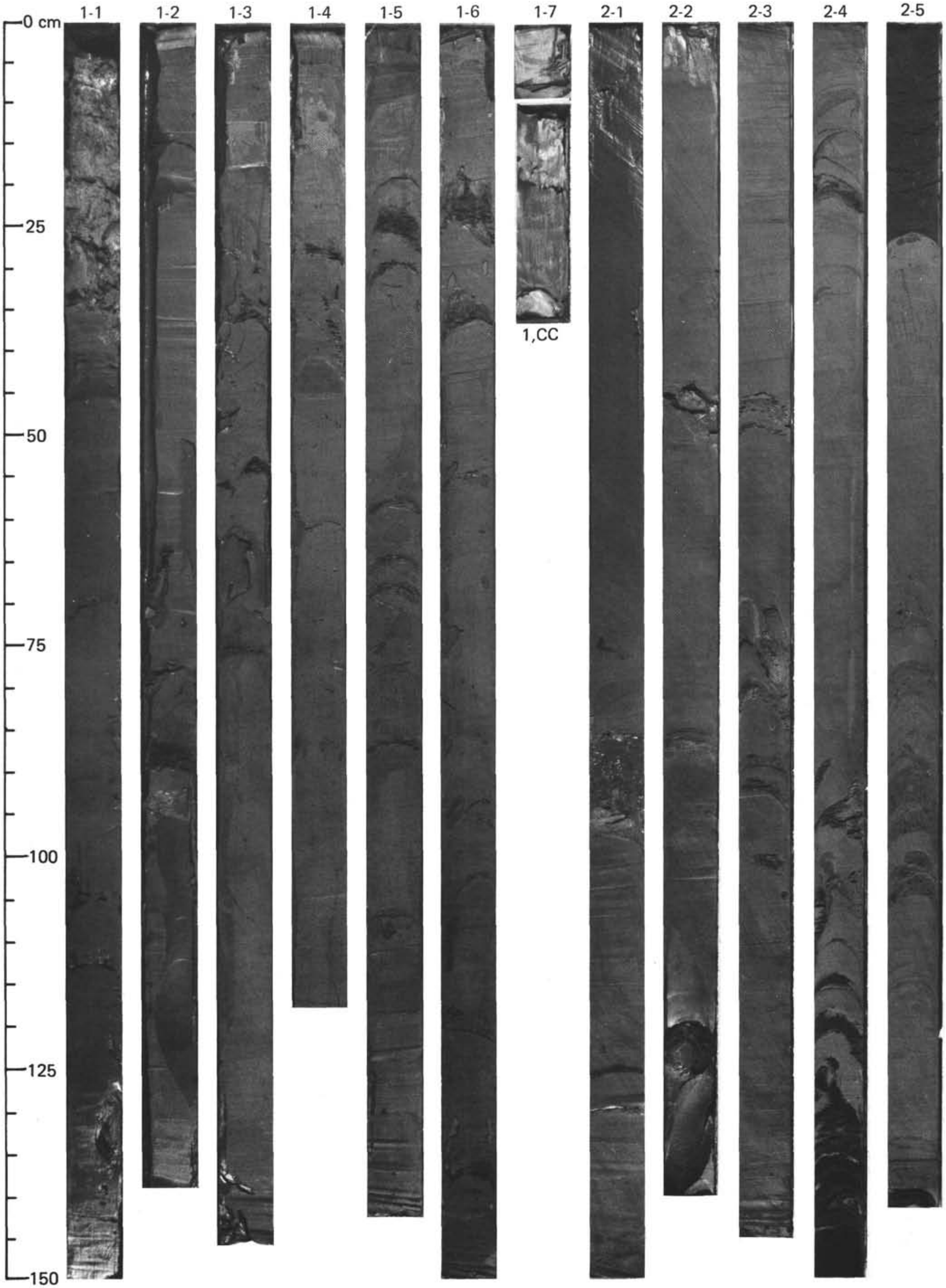
SECTION: CC

LITHOLOGIC DESCRIPTION

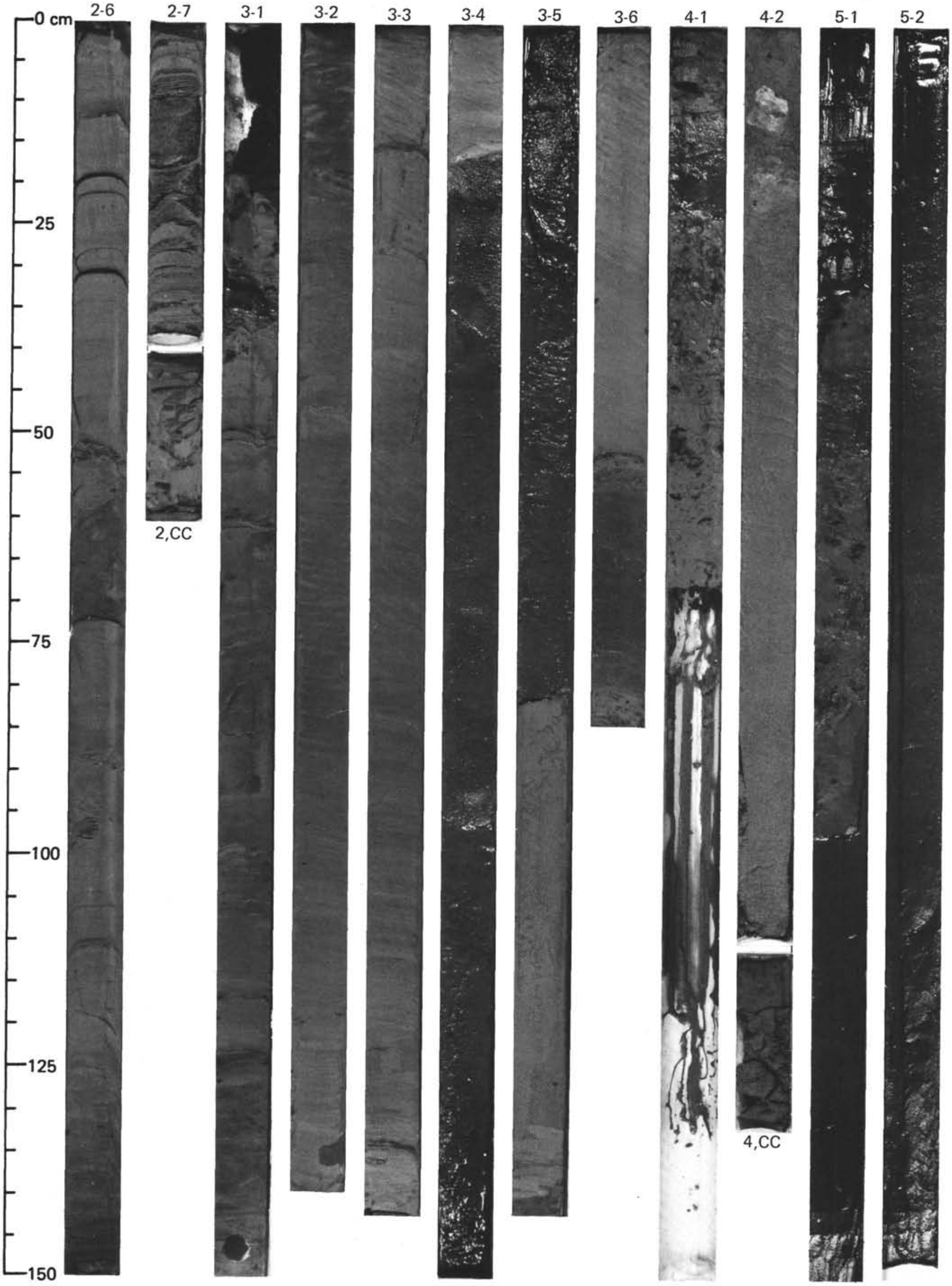
SILTY SAND with one ball of MUD.

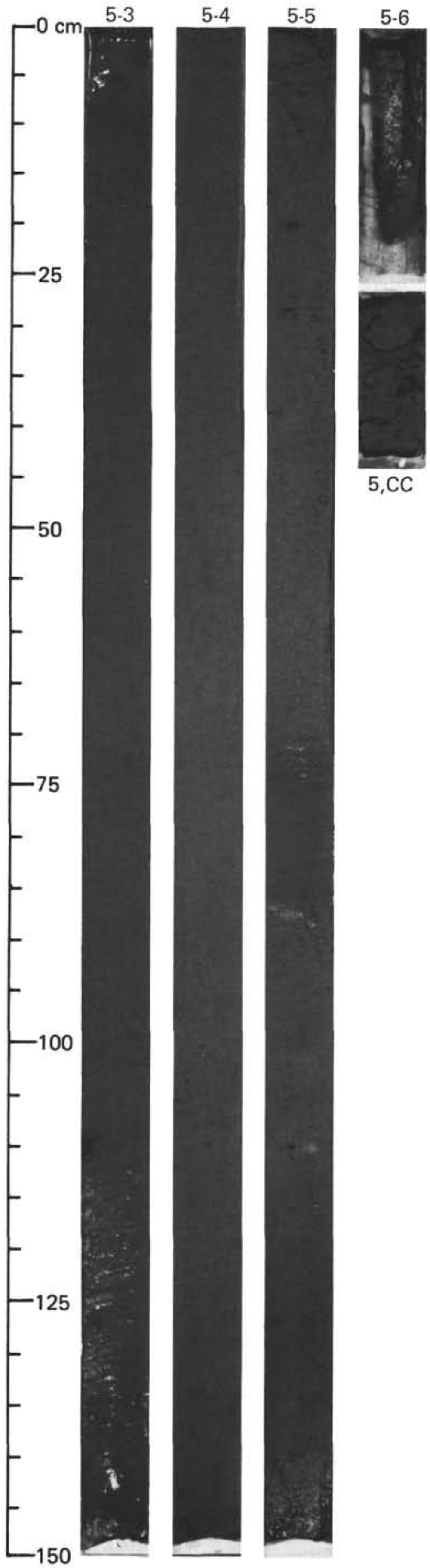
SILTY SAND is dark olive gray (5Y 3/2) and poorly sorted. MUD is black (5Y 2/2).

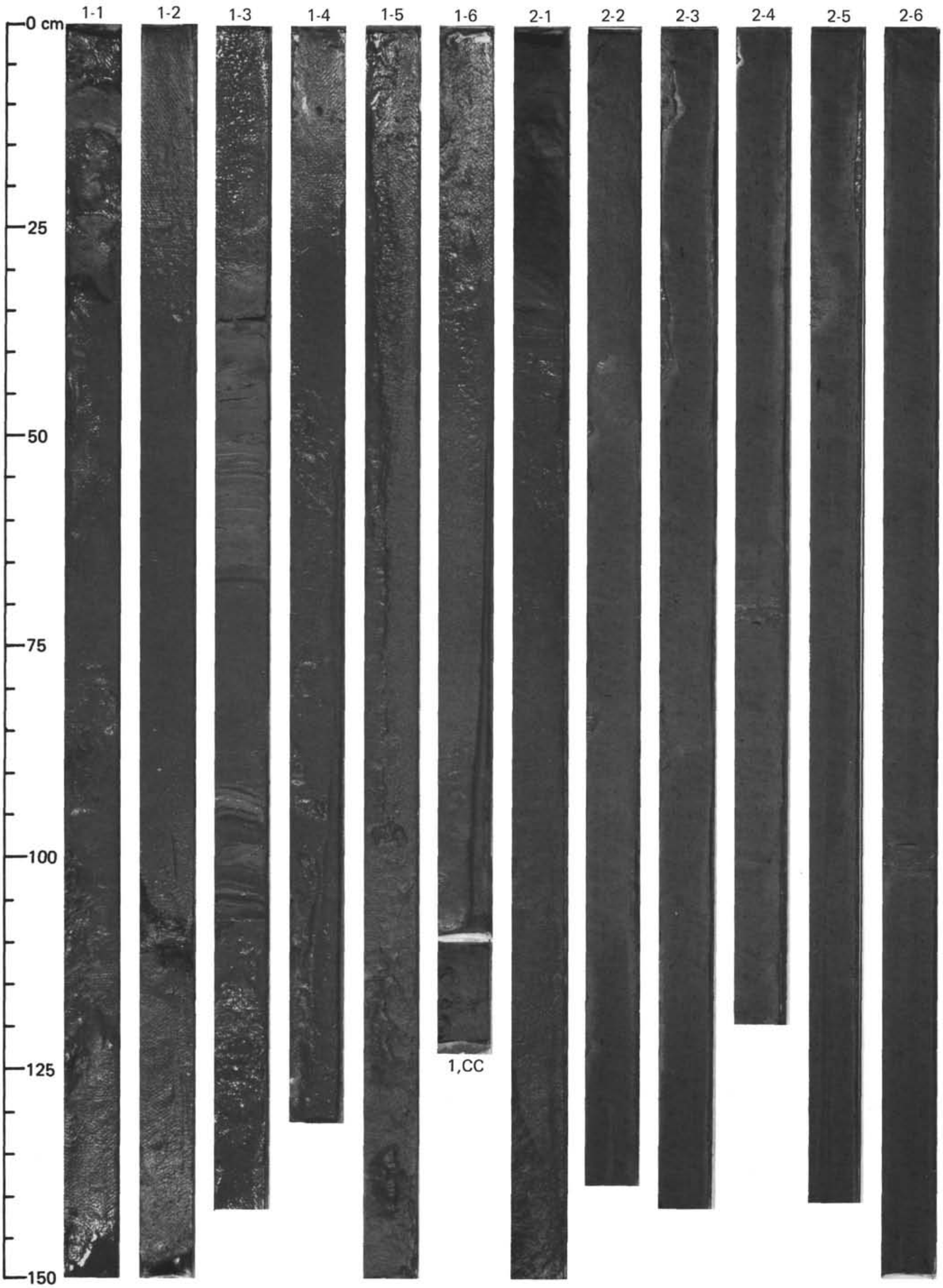
Note: Recovered sediment in the Core Catcher only. Rest of the core barrel was empty.

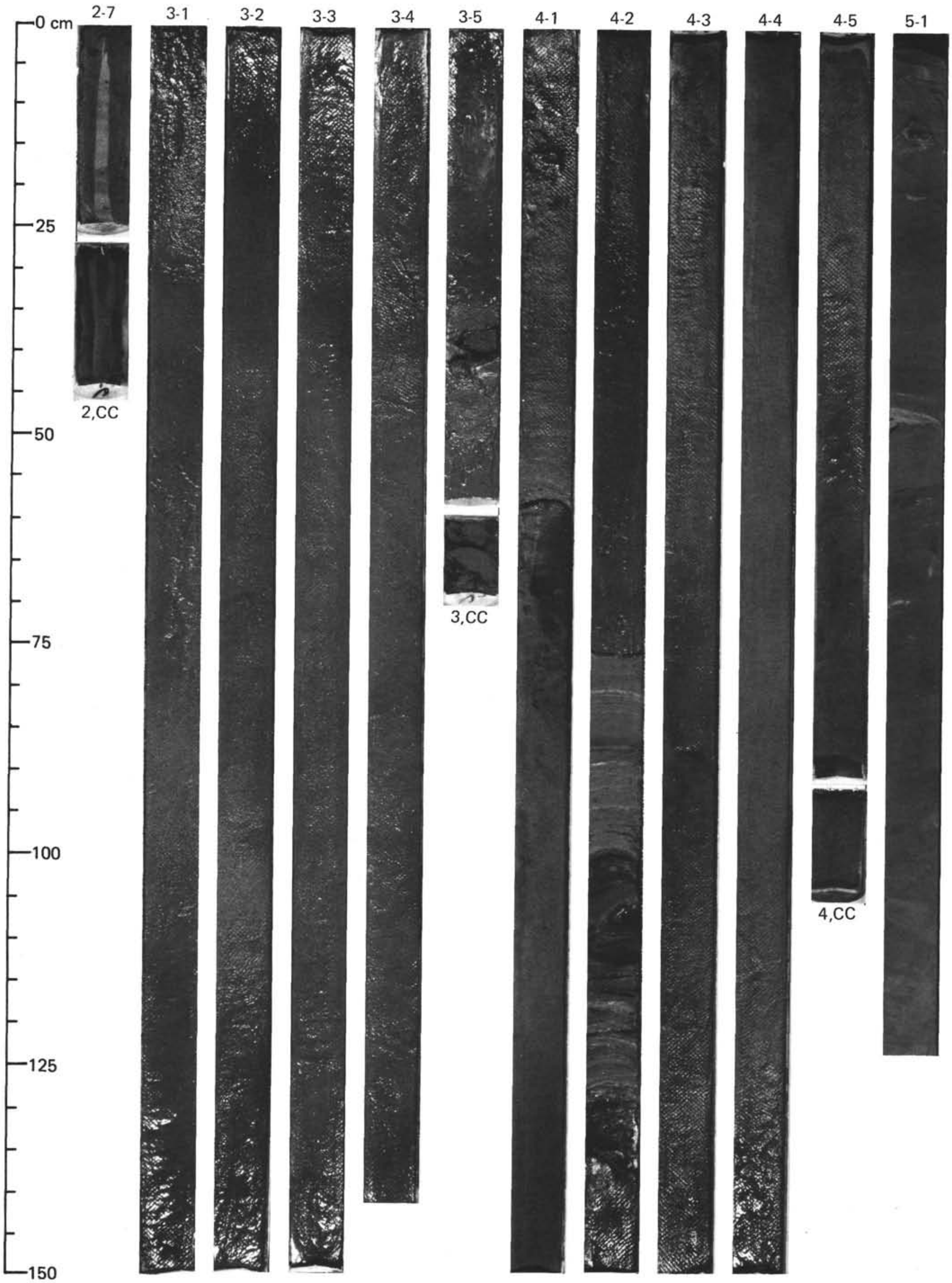


1-1
1-2
1-3
1-4
1-5
1-6
1-7
2-1
2-2
2-3
2-4
2-5
1,CC
0 cm
25
50
75
100
125
150


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


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


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


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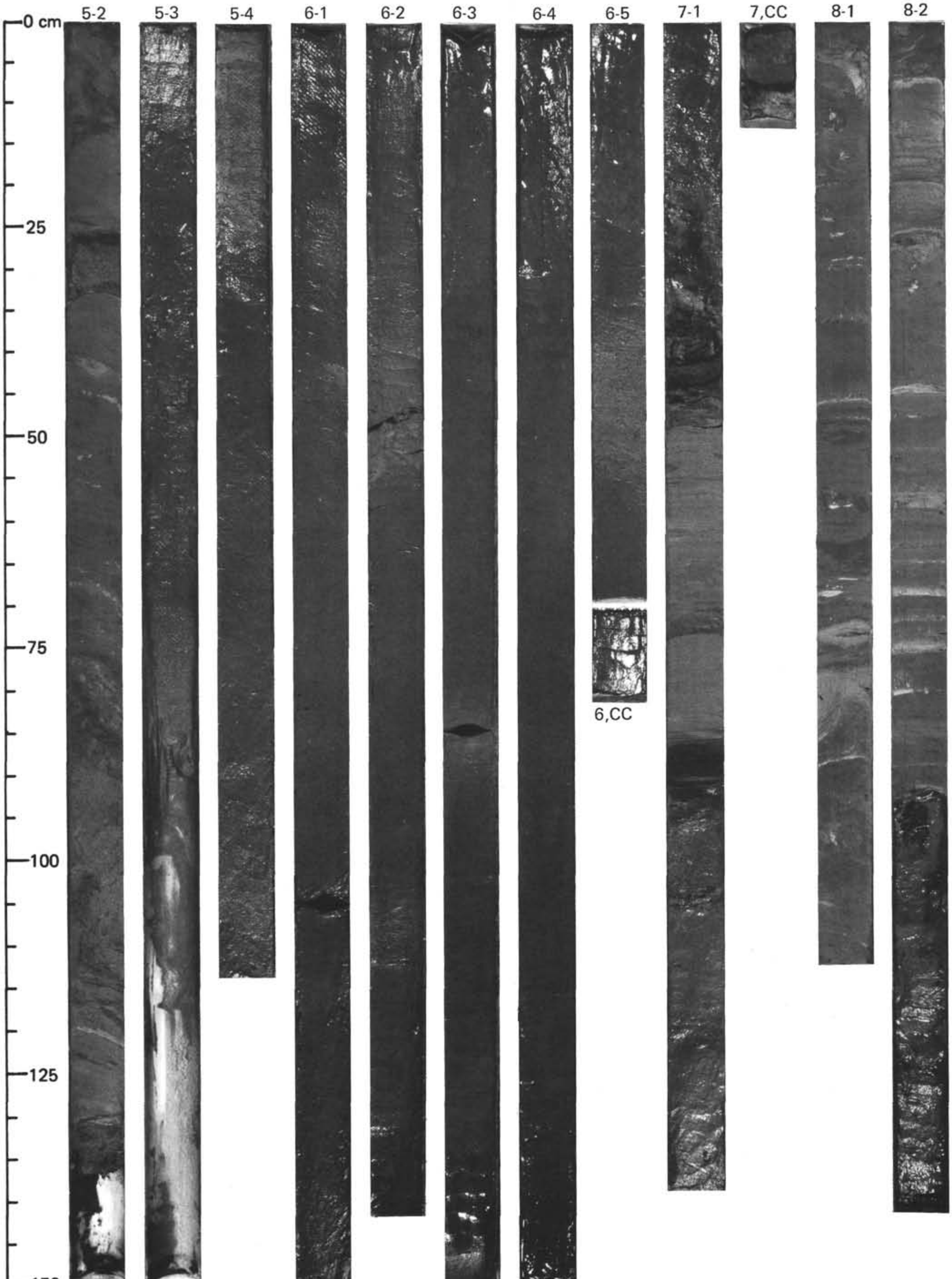
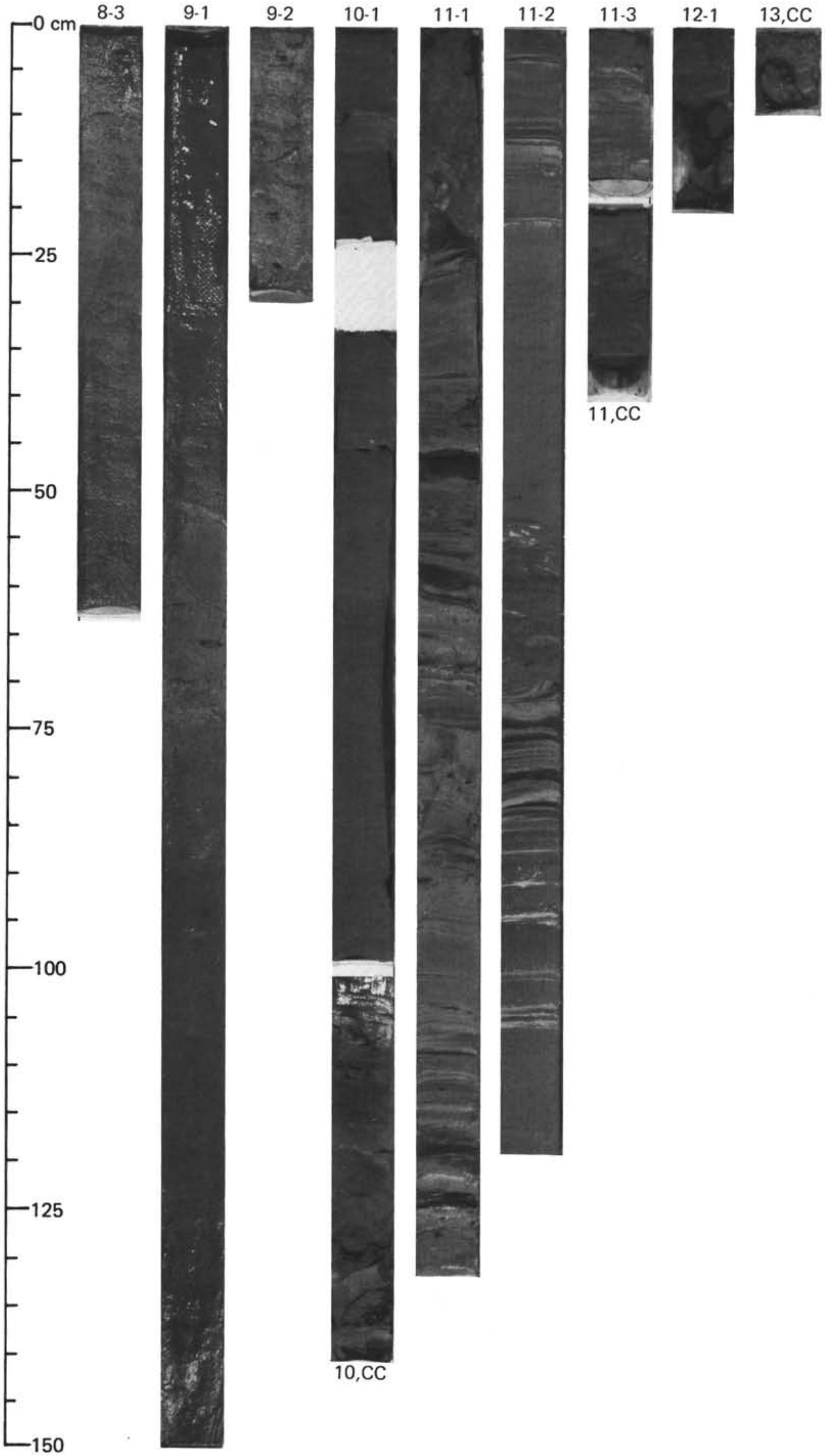
125
150
2-7
3-1
3-2
3-3
3-4
3-5
4-1
4-2
4-3
4-4
4-5
5-1
2,CC
3,CC
4,CC



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


0 cm
25
50
75
100
125
150
8-3
9-1
9-2
10-1
11-1
11-2
11-3
12-1
13,CC
11,CC
10,CC