3. SITE 250

The Shipboard Scientific Party[1]

SITE DATA

Locality: Southeast corner of Mozambique Basin

Position:
lat 33°27.74'S
long 39°22.15'E

Dates Occupied: 8-14 September 1972

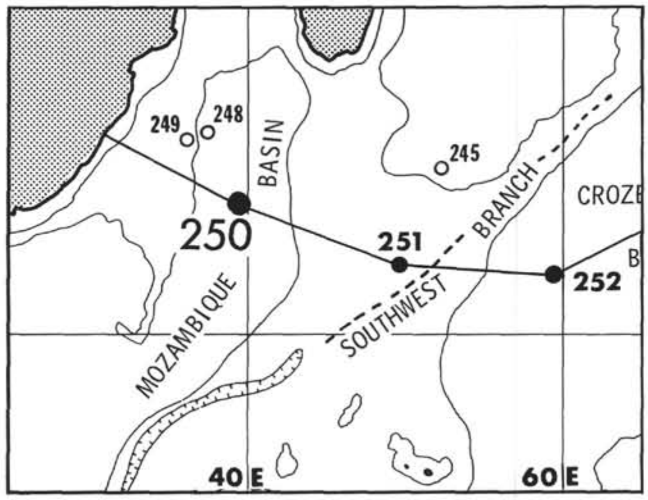
Water Depth: 5119 meters

Penetration: 738.5 meters

Number of Cores: 29

Oldest Datable Sediment Cored:
Depth (subbottom): 700.5-710.0 meters (Hole 250A, Core 23)
Nature: Brown detrital clay
Age: Coniacian

Basement:
Depth encountered (subbottom): 725.3 meters
Nature: Olivine basalt
Penetration: 13.2 meters



Principal Results: The olivine basalt basement is overlain by 22 meters of Coniacian gray detrital clays. The contact between the clay and the basalt appears depositional, not intrusive, and is devoid of fossils. Above the gray clays are 66 meters of Coniacian to lower Miocene brown clays and 522 meters of mid Miocene to Pliocene olive-green detrital clay. There is probably an unconformity between Coniacian and Miocene sediments, although this could not be proved. The top of the section is 116 meters of Plio-Pleistocene coccolith ooze and detrital silty clay.

BACKGROUND AND OBJECTIVES

Site 250 is located in the southeast corner of the Mozambique Basin near the north flank of the southwest Indian Ocean Ridge (Figure 1). The basin has a depth near 4.5 km and is bounded west and east by the north-south-trending Mozambique and Madagascar rises, respectively. Sediment thickness in the Mozambique Basin varies from 0.5 to 1.5 sec DT (Ewing et al., 1969). Much of this sediment is thought to derive from the Zambezi Canyon and Fan system which transports sediments from East Africa and Madagascar south to the Mozambique Basin. Evidence exists of redistribution of sediments in the basin by bottom currents, with northward flow following the east scarp of the Mozambique Rise, then turning east across the Zambezi Fan and then flowing south along the west edge of the Madagascar Rise (Heezen and Hollister, 1971). Bottom photos show ripple marks on the east side of the basin (Heezen and Hollister, 1971) and seismic profiles show dune-like sedimentary structures here (Ewing et al., 1969).

The age of the crust beneath the Mozambique Basin is unknown. This region is apparently devoid of magnetic anomalies which would indicate sea-floor ages. McKenzie and Sclater (1971) indicate that the crust here should be older than 75 m.y. based on interpretation of magnetic anomalies in the western Indian Ocean. Dating of the crust at Site 250, combined with dates from Sites 248 and 249 of Leg 25, should aid in determining the absolute ages and age gradients in the vicinity of southern Africa and thereby provide constraints on the date and mode of break-up of Africa and Antarctica.

Seismic reflection profiles from R/V *Conrad*, Cruise 14, and *Glomar Challenger* show about 0.8 sec DT of sediment at Site 250 (Figures 2 and 3). The section is

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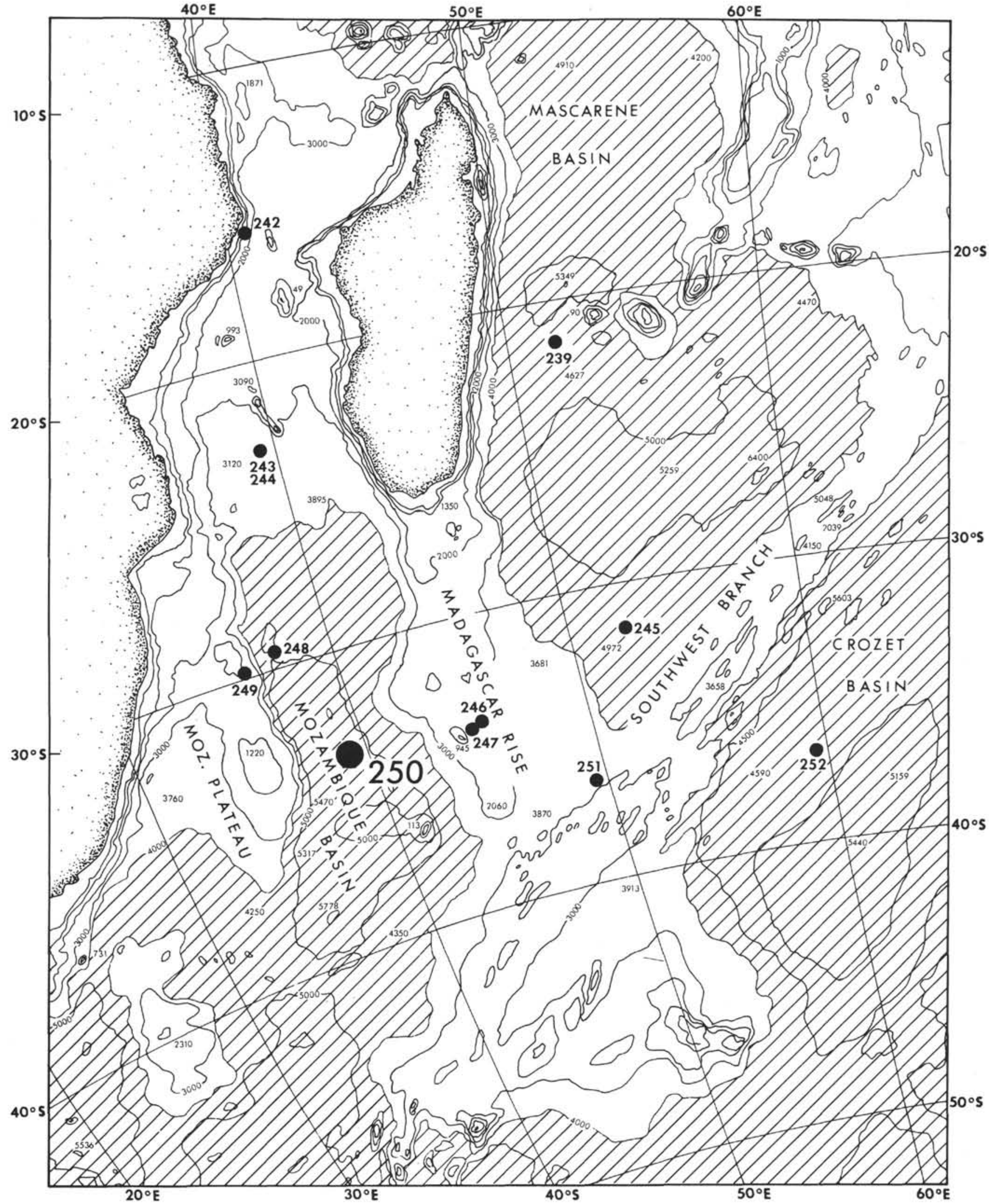


Figure 1. *Base chart and locality of Site 250. Other sites from DSDP Legs 24 and 25 are also shown. (Adapted from the Russian bathymetric chart of the Indian Ocean.)*

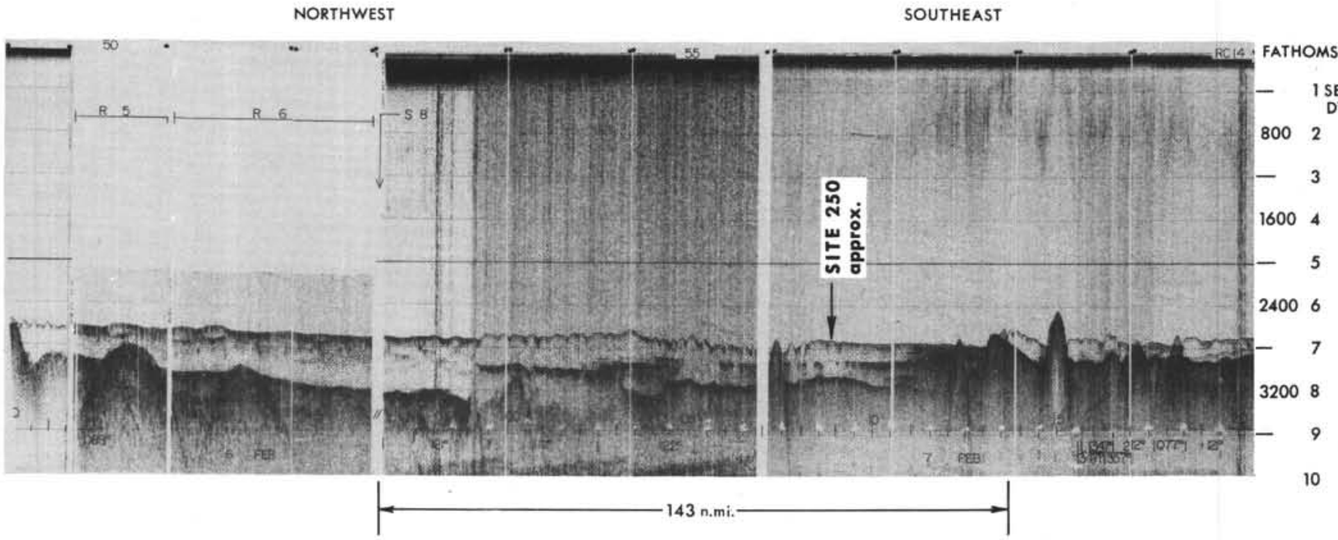


Figure 2. *Seismic reflection profile through Site 250, taken on cruise* Conrad-*14 of the Lamont-Doherty Geological Observatory. (Used with permission of J. Ewing.)*

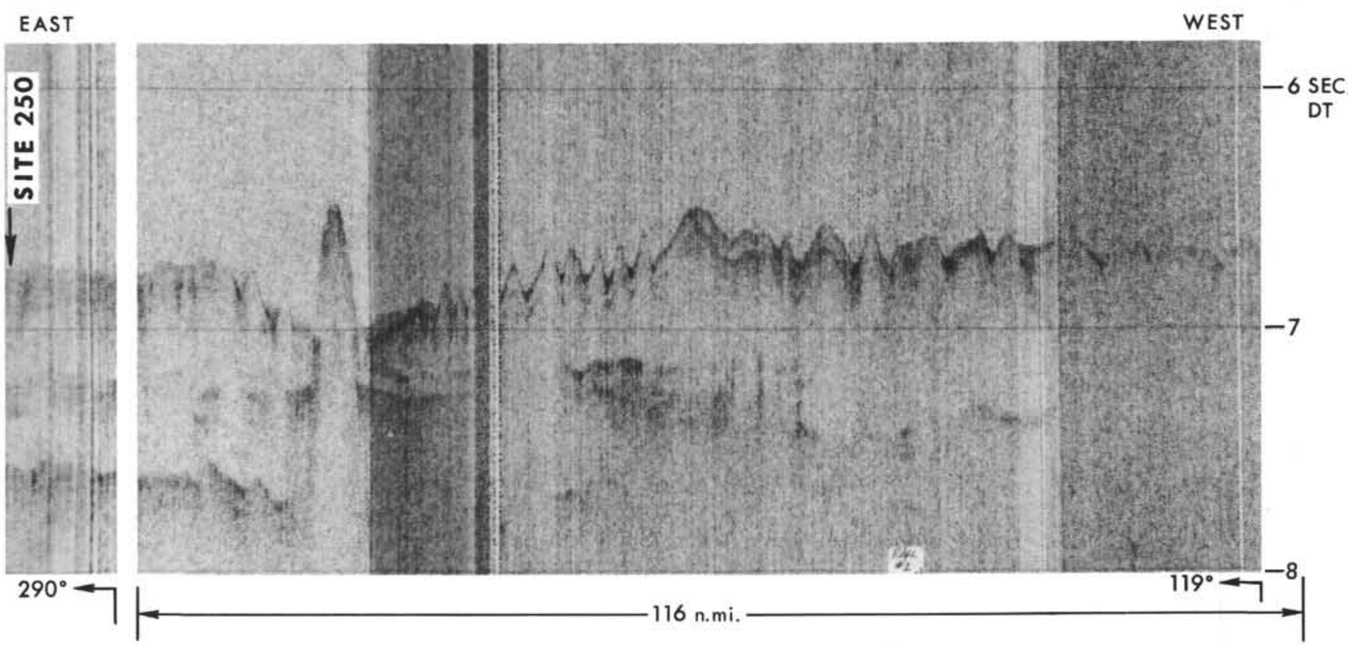


Figure 3. *Seismic reflection profile onto Site 250, taken from D/V* Glomar Challenger.

basically transparent with a single laterally discontinuous reflector at about 0.45 sec DT. The seawater-sediment interface shows dune-like structures of about 0.1 sec DT amplitude reminiscent of the lower continental rise hills off eastern North America and suggesting active bottom current deposition-redeposition of sediments. A postsite seismic survey was conducted for about 4½ hr. The survey pattern differed considerably from that planned because of high seas, low ship speed, and infrequent satellite fixes (Figure 4). The seismic records show that the structure at Site 250 persists for several miles in various directions; i.e., about 0.8 sec DT of transparent sediments with a laterally intermittent reflector at 0.45-0.55 sec DT (see Chapter 12, this volume, fig. 3). From the orientation of the tracks it appears that the sedimentary "dune" features have a north-south orientation. The character of the acoustic basement suggests that it is oceanic layer 2 although it appears somewhat smoother than elsewhere in the southwestern Indian Ocean.

OPERATIONS

Two holes were drilled at Site 250 and a total of 29 cores cut. Depths of the cored intervals and details of the cores recovered are given in Table 1.

The approach to Site 250 was along the same track as R/V *Conrad*, Cruise 14 (Figure 4). As the site was approached speed was reduced to a nominal 7 knots in

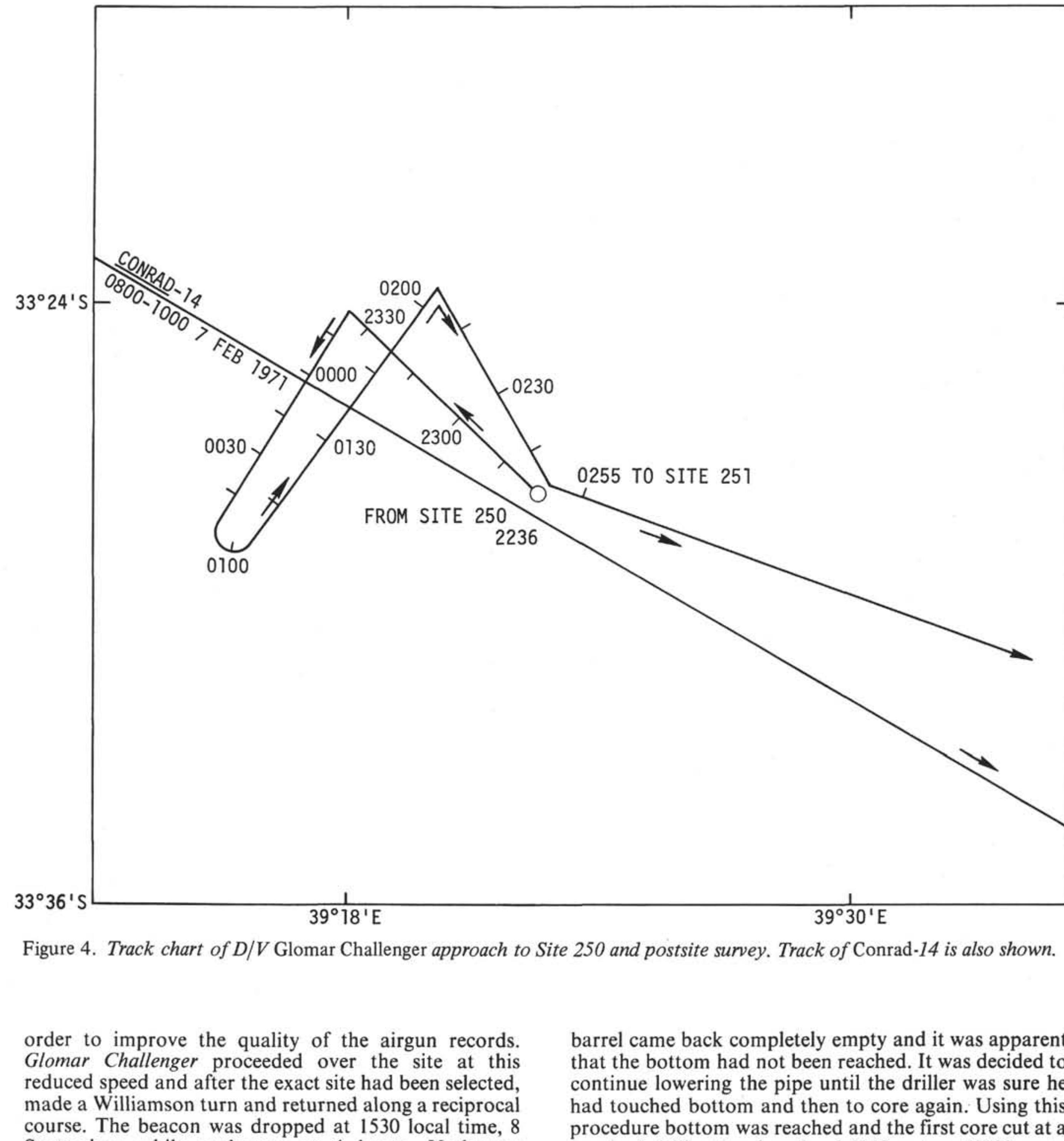


Figure 4. *Track chart of D/V* Glomar Challenger *approach to Site 250 and postsite survey. Track of* Conrad-*14 is also shown.*

order to improve the quality of the airgun records. *Glomar Challenger* proceeded over the site at this reduced speed and after the exact site had been selected, made a Williamson turn and returned along a reciprocal course. The beacon was dropped at 1530 local time, 8 September, while underway at 4 knots. Underway survey gear was then retrieved and *Glomar Challenger* returned to take up position over the beacon. The ship was stabilized in position and we commenced lowering the drill string by approximately 1700. Water depth at the site was 5119 meters, corrected by Matthews' tables, 5129 meters from the rig floor. At the time we occupied the site there were strong southwest winds and fairly heavy seas which hampered operations on the rig floor.

The drill string apparently touched bottom at 0510, 9 September, and a core was taken. However, the core barrel came back completely empty and it was apparent that the bottom had not been reached. It was decided to continue lowering the pipe until the driller was sure he had touched bottom and then to core again. Using this procedure bottom was reached and the first core cut at a nominal drill string length of 5148 meters (5139 m to bottom). For subsequent subbottom depth calculations this depth was corrected to the PDR depth of 5129 meters from the rig floor. The discrepancy can be readily explained by the uncertainties of Matthews' tables and by the fact that there was considerable vertical movement of the ship, due to large swells, which contributed to the difficulties of measuring accurately the length of drill pipe below the ship.

Two cores were recovered, and a third one had been cut when a power failure caused the ship's dynamic

TABLE 1
Cores Cut at Site 250

Core	Date (Sept. 1972)	Time	Depth from Drill Floor (m)	Depth Below Sea Floor (m)	Length Cored (m)	Reco-vered (m)	Reco-very (%)
Hole 250							
1	9	0827	5129.0-5138.0	0.0-9.0	9.0	8.7	97
2	9	1012	5138.0-5147.5	9.0-18.5	9.5	8.1	86
Drilled			5147.5-5184.5				
3	10	0500	5184.5-5194.0	55.5-65.0	9.5	4.5	48
Total					28.0	21.3	77
Hole 250A							
1	11	0115	5183.5-5193.0	54.5-64.0	9.5	6.5	68
2	11	0253	5193.0-5202.5	64.0-73.5	9.5	0.0	0
3	11	0430	5202.5-5212.0	73.5-83.0	9.5	9.4	100
Drilled			5212.0-5240.5				
4	11	0630	5240.5-5250.0	111.5-121.0	9.5	7.8	82
Drilled			5250.0-5278.5				
5	11	0818	5278.5-5288.0	149.5-159.0	9.5	8.0	84
Drilled			5288.0-5316.5				
6	11	1025	5316.5-5326.0	187.5-197.0	9.5	5.9	62
Drilled			5326.0-5364.0				
7	11	1355	5364.0-5372.5	235.0-243.5	8.5	5.9	69
Drilled			5372.5-5421.0				
8	11	1644	5421.0-5430.0	292.0-301.0	9.5	5.8	61
Drilled			5430.0-5478.0				
9	11	2030	5478.0-5487.5	349.0-358.5	9.5	4.5	47
Drilled			5487.5-5535.0				
10	11	2345	5535.0-5544.5	406.0-415.5	9.5	5.9	62
Drilled			5544.5-5592.0				
11	12	0305	5592.0-5601.5	463.0-472.5	9.5	9.3	98
Drilled			5601.5-5649.0				
12	12	1045	5649.0-5653.0	520.0-524.0	4.0	0.7	18
Drilled			5653.0-5696.5				
13	12	1635	5696.5-5706.0	567.5-577.0	9.5	5.5	58
Drilled			5706.0-5734.5				
14	12	2104	5734.5-5744.0	605.5-615.0	9.5	3.5	37
Drilled			5744.0-5753.5				
15	13	0105	5753.5-5763.0	624.5-634.0	9.5	5.1	55
16	13	0400	5763.0-5772.5	634.0-643.5	9.5	3.3	35
17	13	0640	5772.5-5782.0	643.5-653.0	9.5	4.4	46
18	13	0845	5782.0-5791.5	653.0-662.5	9.5	2.4	25
19	13	1211	5791.5-5801.0	662.5-672.0	9.5	3.3	35
20	13	1555	5801.0-5810.5	672.0-681.5	9.5	2.6	27
21	13	1959	5810.5-5820.0	681.5-691.0	9.5	2.2	23
22	13	2215	5820.0-5829.5	691.0-700.5	9.5	5.4	57
23	14	0035	5829.5-5839.0	700.5-710.0	9.5	2.8	29
24	14	0245	5839.0-5848.5	710.0-719.5	9.5	2.2	23
25	14	0545	5848.5-5858.0	719.5-729.0	9.5	4.3	45
26	14	0917	5858.0-5867.5	729.0-738.5	9.5	7.5	79
Total					240.5	124.2	52

Note: Echo-sounding depth (to drill floor): 5129 meters for Holes 250 and 250A; drill-pipe length to bottom: 5148 meters for Hole 250.

positioning system to fail. Two attempts were made to recover Core 3 but each of these failed. After the second attempt it was decided to trip the pipe since by then it was known that the power failure had resulted in an excursion of some 4000 ft from the hole. The bottom hole assembly was only partially buried at the time (Core 3 was cut from 55.5 to 65 m subbottom) so it was certain that the drill string had been dragged out of the hole and the bottom hole assembly was either lost or, at best, damaged. This would account for our lack of success in attempting to recover Core 3. After the ship had returned to position the string was picked up very slowly, and since there appeared to be no weight loss it was clear that the bottom hole assembly was still intact. However, the erratic behavior of the pipe when rotated made it clear that the assembly had been damaged.

The bottom hole assembly was retrieved soon after midnight on 10 September and Core 3 recovered from the outer core barrel at about 0500. Three drill collars and two bumper subs had been bent. Repairs were effected and we commenced lowering the drill string to spud Hole 250A soon after noon. All emergency power circuits were tested and functioned perfectly. The cause of the previous day's power failure remains a mystery. The weather at this time was moderating considerably. Bottom was reached and Hole 250A spudded about 2300, 10 September. The primary objective here was to determine the basement age. The section here was thick and, we discovered, not very fossiliferous , the weather conditions were uncertain and 30 hr had already been lost due to the failure of the positioning system. Hence, Hole 250A was only cored intermittently down to a depth of 625 meters.

Drilling and coring proceeded uneventfully until the morning of 12 September, when, after recovering Core 11, a second failure of the positioning system resulted in an excursion of 1300 ft. Drilling operations were halted and the drill string was partially withdrawn from the hole while the computer was reprogrammed. After some debate it was decided that the bottom hole assembly was probably undamaged and, after dynamic positioning was restored, operations resumed in steadily deteriorating weather conditions.

Continuous coring commenced at 625 meters with Core 15 and proceeded down to basement which was encountered at 725.3 meters in Core 25, on the morning of 14 September. The weather had once again moderated and conditions at this time were excellent although there was still some swell from a storm to the south of us. It was decided to cut one more core into basement before abandoning Hole 250A, further penetration being precluded by shortage of time. While recovering this core, weather conditions suddenly deteriorated with squalls moving in from the southwest. At the same time the computer controlling the dynamic positioning system lost its heading and would not accept the new program, positioning was therefore in manual mode while we retrieved this last core and commenced pulling pipe. The reason for the computer failure is unknown, but it could have been due to interference from signals from the newly installed vessel motion instrumentation.

These operational difficulties would have forced us to abandon Site 250, had that decision not already been made because of shortage of time.

We commenced pulling out of the hole at 0920, 14 September and the tools were laid down and secured by 2236.

LITHOLOGY

At Site 250 two holes were drilled and cored. Hole 250 penetrated 65 meters beneath the sea floor and yielded 21.5 meters of sediment core. Hole 250A drilled 738.5 meters beneath the sea floor, penetrating 18.5 meters of basement basalt. From 26 cores attempted in Hole 250A, 124.4 meters of sediment and 12.4 meters of olivine basalt were recovered. Core 3 of Hole 250 and Core 1 of Hole 250A were taken from the same depth below the sea floor: 54.5-64.0 meters.

The sediments generally consist of gray-green-black detrital clays, characterized by a high proportion of quartz and feldspars (30%-40%). The continental provenance of the material is further emphasized by the clay minerals: mica/illite (including a little glauconite) approaches montmorillonite in abundance for the only time on Leg 26, but kaolinite is only present in significant amounts in the upper 400 meters. Site 250 is also of interest for containing siderite nodules (Core 7); this carbonate was not recorded elsewhere on Leg 26. In addition to megascopic nodules, small patches consisting of "wormlike" concretions of rhombic siderite blades are present in Core 13 (Figures 5 and 6). Similarly, traces of dolomite and Mg-calcite were recorded in this hole (Core 4), but are not recorded elsewhere; gibbsite and pyrite (pseudomorphing burrows) also occur.

Examination of the core reveals five lithostratigraphic sedimentary units overlying the basement basalts. These units are distinguished from each other by the presence or absence of calcareous nannofossils and the predominant color (Table 2).

Unit 1

This unit, at least 116 meters thick, is composed of soft light gray clayey coccolith ooze, olive-green, and gray coccolith detrital silty clay and olive-green and gray detrital silty clay. Extreme deformation of the recovered core obscures the depositional relationships between these sediment types.

The most common terrigenous components are quartz and micas. Quartz is most abundant and may range up to 10%; the detrital micas rarely exceed 1% or 2%. Very minor amounts of diatoms, sponge spicules, and fish debris are common. Pyrite nodules range up to 0.5 × 2 cm.

Unit 2

Unit 2 consists of soft to stiff olive-green, olive-gray, dark gray, and greenish-black detrital clay. The presence of small amounts (<5%) of silty clayey coccolith ooze, clay-rich coccolith ooze, and coccolith-rich clay throughout the uppermost 135 meters allows this interval to be recognized as a separate lithostratigraphic unit, Subunit 2a. Subunit 2b (217 m) is devoid of any apparent biogenic contribution and consists only of detrital clay. It is appreciably more consolidated than Subunit 2a.

The most noticeable petrographic feature of Unit 2 is seen in the clay minerals where the development of boxwork-like rims of different optic orientation to the original grain suggests either authigenic recrystallization or replacement. This petrographic feature becomes increasingly well developed in the successively older units.

Quartz and micas are the only other common terrigenous components. Quartz is present in amounts of up to 2%. Subunit 2a does contain fish fragments, sponge spicules, and foraminifera in trace amounts, but these all appear to be absent from Subunit 2b.

Throughout Unit 2 the only widespread authigenic minerals are small patches (<5 mm) of authigenic carbonate; and pyrite nodules pseudomorphing burrows occur in Subunit 2a. Authigenic alkali feldspar in trace amounts occurs in Subunit 2b.

At 521 meters, 8 cm of laminated fine sand consists of an abundant micritic carbonate matrix containing

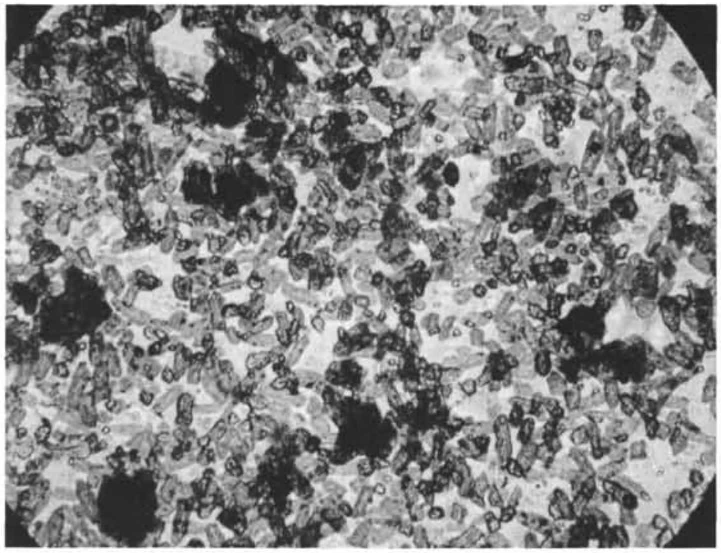


Figure 5. *Wormlike concretions of siderite from Hole 250A, Core 13 (X 110).*

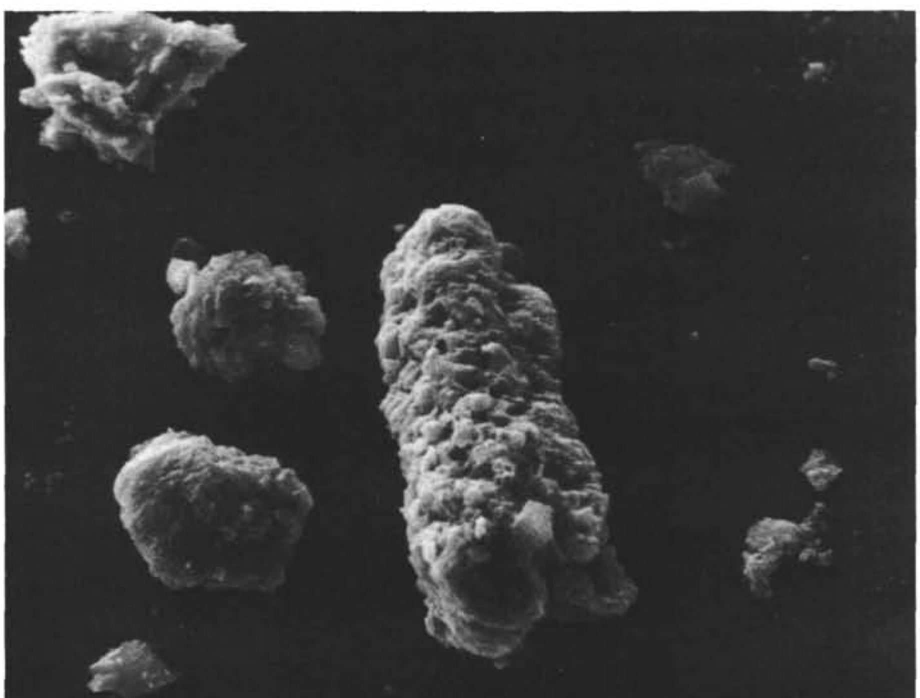


Figure 6. *SEM photo of siderite nodule from Hole 250A, Core 13 (X 1000).*

scattered grains of quartz, feldspar, biotite, and opaque ferruginous granules. This sand may represent an altered pyroclastic. A similar sand 10 cm thick occurs at 568 meters.

Unit 3

Unit 3 is approximately 70 meters of semilithified interlaminated detrital clay of contrasting colors. Greenish-black, olive-gray, and moderate brown clay intervals alternate, the individual color intervals usually varying from 2 to 50 cm. One meter of light olive-gray coccolith ooze and nannofossil-bearing silty clay occurs at 636 meters near the base of the unit.

The detrital sediments are composed of about 80% clay-size components except for the lowermost horizons which contain up to 66% silt. Minor constituents are quartz and micas ranging up to 10% and 6%, respectively. Heavy minerals in trace amounts include zircon, apatite, sphene, and opaque iron oxides. Authigenic minerals are carbonate and extremely rare alkali feldspar and a few grains of glauconite. Minor mottling is apparent and some burrows act as areas of authigenic carbonate concentration.

TABLE 2
Lithologic Summary, Site 250

Unit/ Subunit	Hole/ Core	Depth Below Sea Floor (m)	Thickness (m)	Description
1	250/1-3 250A/1-5	0-116.0	116	Light gray clayey coccolith ooze interbedded with olive-green and gray coccolith detrital silty clay and detrital silty clay
2a	250A/5-9	116.0-351.0	235	Olive-green, olive-gray, and grayish-black detrital clay with very minor silty coccolith ooze, clay-rich coccolith ooze, and coccolith-rich clay
2b	250A/9-13	351.0-568.0	217	Olive-green, olive-gray, and grayish-black detrital clay
3	250A/13-16	568.0-638.0	70	Interbedded greenish-black, olive-gray, and moderate brown detrital clay
4	250A/16-23	638.0-703.5	65.5	Moderate brown detrital clay
5	250A/24, 25	703.5-725.3[a]	21.8	Olive-gray, greenish-gray, and olive-black detrital clay
6	250A/25, 26	725.3[a]-738.5	13.2	Olivine basalt

[a]The depth to the top of Unit 6 is estimated from drilling records rather than from core recovery.

Unit 4

Semilithified detrital brown clay makes up virtually the entire 65.5 meter[2] sequence. There is no evidence of Eocene or Oligocene sedimentation, only lower Miocene and Upper Cretaceous microfaunas having been recovered. The cores themselves show no features to suggest either erosion or a prolonged cessation of sedimentation. The brown clay is remarkably uniform throughout. Slight olive-gray mottling and some burrowing do occur, frequently most abundant at particular horizons.

From 691 to 703 meters the detrital clay changes in composition to zeolite-bearing and nannofossil zeolite-bearing clay. Within the same interval widespread nodules up to 1.5 cm diameter of iron or manganese oxides occur. Finely disseminated iron or manganese oxides also form striking dark bands or diffuse lighter-colored patches in the brown clay. Authigenic alkali feldspar is present in trace amounts.

Overall, the silt contribution averages around 15%. Minor terrigenous constituents are the same as in the overlying units, namely quartz and micas ranging from trace amounts to a few percent. In addition, some detrital feldspar was noted.

Unit 5

Unit 5 consists almost entirely of semilithified olive-gray clay. Minor variations are dark greenish-gray and olive-black clay. The age of the unit is not known, but as the overlying Unit 4 contains Upper Cretaceous fossils at least a minimum age can be assigned.

The clay is burrowed but shows few primary sedimentary structures. Lamination is not obvious. Silt comprises about 5%-7% of the sediment and the most prominent minor constituents are quartz, feldspar, and micas, each present in amounts of up to 1%. Heavy minerals include garnet, apatite, rutile, and anatase, all in trace proportions.

Unit 6

There is no reason to suppose the contact of the basement olivine-rich basalt with the overlying detrital clay of Unit 5 is not conformable. The actual contact was not recovered, but unmetamorphosed clay was found filling two cavities within the uppermost basalt. This clay appears in every way similar to the detrital clay of Unit 5. The absence of any metamorphism or deuteric alteration in any of the clays (those within the cavities mentioned above, and the detrital clay of Unit 5) make it most unlikely that the basalts are a younger intrusion into the sediments. The basalts show a moderate degree of weathering or alteration down to approximately 734 meters. The upper 4 meters are traversed by numerous calcite and serpentine-filled veins and fractures. These are much less common beneath 728 meters. Three thin sections were cut from the basalt at the following intervals:

1) 725.3 meters: fine-grained to glassy olivine basalt;
2) 725.5 meters: coarse subophitic olivine basalt;
3) 736.9 meters: olivine basalt.

1) Fine-grained olivine basalt (725.3 m): The weathered originally glassy olivine basalt is reddish-brown. It contains radiating lath-shaped micro-

[2]The thicknesses stated for Units 4 and 5, 65.5 and 21.8 meters, respectively, are at best approximate only as there was no core recovery for several meters between the two units.

phenocrysts and microlites of labradorite, between 0.1 and 0.7 mm in length, in a largely devitrified subvariolitic reddish-brown matrix containing dark dendritic crystallites. The feldspar laths show slight zoning. Also present are occasional crystals of olivine (0.2 mm) completely altered to iddingsite-bowlingite aggregates. Numerous minute iron-oxide granules (?magnetite) and a few grains of pyroxene are also present. There are scattered vesicles and patches of microcrystalline celadonite. The mineral is pleochroic from pale green to greenish-yellow and has a radiating habit. In vesicles the green mineral is enclosed within a chloritic mesostasis.

2) Coarse subophitic olivine basalt (725.5 m): The dark gray rock is remarkable for the abundance (34%) of its clove-brown titaniferous pyroxene (2Vγ ca 45°). Long crystals of the pyroxene (up to 1.2 mm) subophitically enclose long, narrow, zoned laths (up to 0.9 mm) of labradorite plagioclase. In addition, crystals of euhedral olivine (ca 0.6 mm long) occur, completely altered and pseudomorphed by a greenish bowlingite aggregate, and there are many skeletal crystals of ilmenite (up to 0.4 mm long). The remainder of the rock consists of a chlorite-serpentine mesostasis, studded with grains and minute rods of ilmenite. Slightly saussuritized interstitial plagioclase and "pools" of carbonate are also present. There is no evidence of quartz-alkali feldspar mesostasis.

3) Olivine basalt (736.9 m): The dark gray basalt has an intersertal texture. Numerous zoned plagioclase laths (0.1-1.0 mm in length), with some tabular crystals, are enmeshed with laths (0.5 mm), and smaller grains of pyroxene. Olivine crystals (up to 0.2 mm) are completely altered to iddingsite-bowlingite. Small skeletal ilmenite rods and grains are scattered throughout, especially among the pyroxenes and the interstitial chlorite-serpentine mesostasis. Blebs and skeletal crystals of hematite and rare vesicles and veins of green pleochroic celadonite, with carbonate and occasionally serpentine are present.

The basalts are olivine (oceanic) tholeiites. The fine-grained glassy olivine basalt sectioned is an inclusion occurring within the coarser subophitic basalt. There is some evidence to suggest the olivine basalt samples at 736.9 meters represents a separate igneous event. It is finer grained than the overlying subophitic basalt and contains abundant calcite-filled vesicles immediately below the level at which a change in megascopic appearance suggests a lithologic contact.

Summary

The salient features of the five units comprising the sedimentary sequence at Site 250 are as follows:

1) Predominantly green- or gray-colored clay (Units 1 and 2) passes downwards via a transitional interbedded zone (Unit 3) to brown clay (Unit 4).

2) A biogenic contribution to the sediments is abundant only in Unit 1 (1-116 m) and over a 1-meter interval (at 636 m) near the base of Unit 3.

3) A terrigenous silt component is abundant only in Unit 1. In all older units the amount of silt is very minor and shows no definite trend. Throughout the core the terrigenous silt contribution is similar consisting mainly of quartz and micas. Feldspar is very rare.

4) The boundary between Units 1 and 2 coincides with a marked change in the petrography of the clay minerals.

5) The degree of consolidation is generally stiff or semiconsolidated beneath Subunit 2a.

6) Evidence of bioturbation and similar organic activity is most apparent (or best preserved) in the brown clay of Unit 4.

7) There is a relative abundance of authigenic zeolite in the lower part of Unit 4 between 691 and 703 meters. Zeolites are absent from the underlying Unit 5.

8) Authigenic carbonate is common between 150 and 630 meters.

9) Trace amounts of authigenic alkali feldspar (?albite) occur between 352 and 697 meters.

10) Two thin intervals (at 521 and 568 m) of very fine calcareous sand in Subunit 2b may represent separate pyroclastic episodes.

11) The sediment-basalt contact is conformable.

SHIPBOARD GEOCHEMICAL MEASUREMENTS

Aboard ship, only analyses for *p*H, alkalinity, and salinity are conducted. Routinely, a 5-10-cm length of whole core is taken approximately at 50-meter intervals, or every fifth core in a continuously cored sequence, usually from the bottom of the penultimate section of the sampled core. This sampling is continued as close to the total sediment-penetration depth as possible. The sample is allowed to reach room temperature (20°-23°C) before shipboard analysis is started. Enough sample is squeezed to yield approximately 20 ml of filtered interstitial water. With the exception of the very minor volume of this interstitial water used in shipboard analyses, most of the yield is split into two 10-ml aliquots stored at 4°C, one in a fused glass ampoule, the other in a polyvinyl tube. These aliquots are sent to the DSDP West Coast Repository for archiving.

A small quantity of the interstitial water is used for the *p*H, alkalinity, and salinity determinations. Salinity is calculated from the water's refractive index, measured with a Goldberg refractometer. The *p*H is determined on all samples by inserting the interstitial water into a glass capillary electrode; this process is referred to as the flow-through method. In the softer sediments *p*H is also determined by the punch-in method, by inserting electrodes into the unsqueezed sediment. Alkalinity is measured by titrating a 1-ml aliquot of the interstitial water with hydrochloric acid, using one drop of Bromcresol green-methyl red as indicator.

Results

The measurements taken on sediments from Holes 250 and 250A are summarized in Table 4 and are presented in graphic form in Figure 7.

Salinity

Salinity, after an initial decrease down the hole from 34.9‰ at the sediment surface to 33.0‰ 81 meters below the sea floor, does not appear to change significantly with greater depth in the hole, with the

TABLE 3
Modes of the Basalts, Site 250

	Glassy Olivine Basalt	Coarse Subophitic Olivine Basalt	Olivine Basalt
Plagioclase	35	30	32
Pyroxene	3	34	40
Olivine	1	15	8
Iron ore	7	6	10
Glass or mesostasis	54	15	10

exception of an unexplained isolated low value of 31.9‰ 353.5 meters below the sea floor, where an anomalously high alkalinity value also was measured.

pH

Despite the agreement between punch-in and flow-through calibrations with standard seawater (Table 4), *p*H values obtained with the punch-in method were consistently between 0.39 and 0.86 *p*H unit lower than the flow-through measurements obtained from the interstitial waters. Such discrepancies have been ascribed to the loss of dissolved carbon dioxide from the interstitial water during squeezing (Gieskis, unpublished Shipboard Report, DSDP Leg 25, Site 241). The difference appears unusually high at Site 250. It is possible that the relatively high clay content of the sediments, requiring higher extraction pressures, may be responsible for the magnitude of the difference.

The *p*H of interstitial waters from the surface sediments is slightly lower than the 7.8-8.3 range for normal seawater. Values decrease to a minimum of 7.28 at a depth of 81 meters; with greater depth the *p*H increases, attaining values within the normal seawater range (8.12) 189 meters below the sea floor. From this depth downward the values fluctuate within the narrow range of 8.19-8.40; however, the deepest measurement, from sediment taken 713 meters below the sea floor and 7 meters above the sediment-basalt contact, is again low (7.53).

Alkalinity

Alkalinity in the uppermost sediments measured 5.66 meq/kg, increasing strongly down the hole to an impressively high maximum of 21.91 meq/kg at a depth of 60 meters below the sea floor. Values remain high down to a depth of 119 meters, and decrease strongly with depth to 8.43 and 3.13 meq/kg at depths below the sea floor of 189 and 298 meters, respectively. The magnitudes of alkalinity maxima in interstitial waters have been observed to correlate directly with sedimentation rates, the relationship being ascribed to the incomplete decomposition of organic matter at the water-sediment interface due to rapid burial (Gieskis, unpublished Shipboard Report, DSDP Leg 25, Sites 241, 242). The unreduced organic matter is oxidized at depth by sulfate-reducing bacteria, the reaction releasing free sulfide ions and carbon dioxide. Subsequently, the sulfide ions are removed as pyrite by reacting with iron oxides and the iron in clays. Occurrences of pyrite nodules in Unit 1 of the sedimentary sequence of Site 250 tend to support this interpretation. The magnitude of the alkalinity maximum is remarkably high; however, the estimated sedimentation rates of 45-55 m/m.y. for the Pleistocene and 43 m/m.y. for the Pliocene at this site are also strikingly high.

At depths greater than 300 meters below the sea floor, the remaining alkalinity values decrease slightly with depth, to 1.95 meq/kg at 713 meters, the deepest sample analyzed. This fairly smooth trend is broken by one unexplained departure: at 353 meters the alkalinity measured 13.70 meq/kg. It is at this depth that salinity was found to be anomalously low.

TABLE 4
Summary of Shipboard Geochemical Measurements, Site 250

Sample (Interval in cm)	Depth Below Sea Floor (m)	Lab Temp (°C)	*p*H Punch-in Flow-through	Alkalinity (meq/kg)	Salinity (°/oo)
(Reference seawater)	–	–	8.23/8.23	2.15	35.5
Hole 250					
1-1, 0-5	0.00-0.05	21.4	6.63/7.49	5.66	34.9
Hole 250A					
1-5, 0-6	60.50-60.56	22.4	6.88/7.37	21.91	33.6
3-6, 0-6	81.00-81.06	22.7	6.89/7.28	21.30	33.0
4-6, 0-5	119.00-119.05	22.4	7.13/7.67	16.80	33.0
6-2, 0-6	189.00-189.06	22.4	8.12	8.43	32.4
8-5, 0-6	298.00-298.06	22.5	7.63/8.31[a]	3.13	33.0
9-4, 0-6	353.50-353.56	22.5	/8.29[a]	13.70	31.9
10-6, 0-8	413.50-413.58	22.5	/8.19[a]	2.44	33.6
11-6, 140-150	472.40-472.50	22.2	/8.40[a]	2.79	32.7
13-1, 140-150	570.40-570.50	22.6	/8.24[a]	2.88	33.3
16-3, 140-150	634.40-634.50	22.5	/8.31[a]	2.00	33.3
20-2, 0-10	673.50-673.60	22.0	/8.21[a]	2.17	33.8
24-2, 140-150	712.90-713.00	20.6	/7.53[a]	1.95	

[a]Too stiff to measure punch-in.

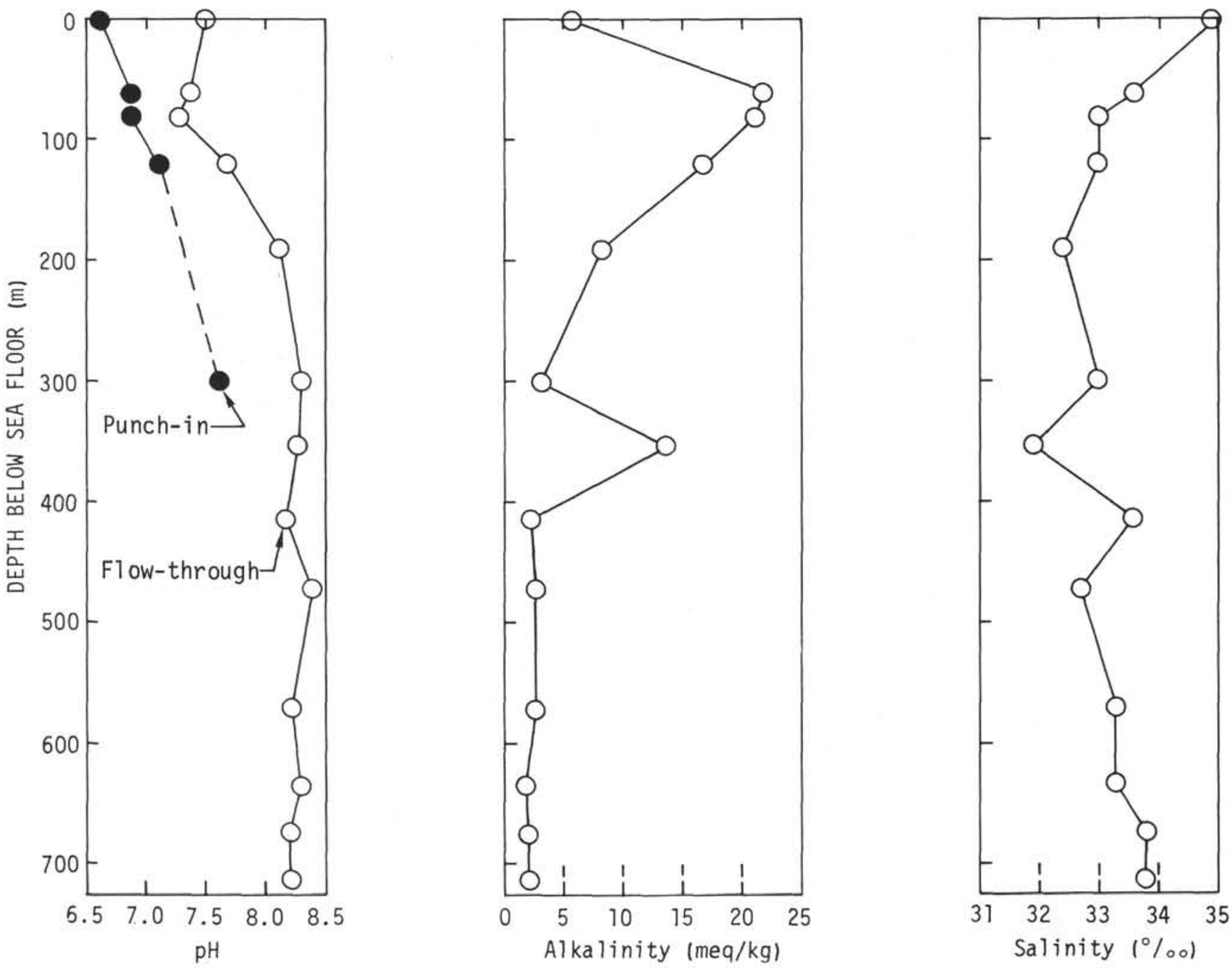


Figure 7. *Graphic summary of geochemical measurements taken at Site 250.*

PHYSICAL PROPERTIES

Procedures

At Site 250, physical property measurements included bulk density, water content, porosity, acoustic velocity, acoustic impedance, and thermal conductivity. The measurement techniques are discussed in the Explanatory Notes (Chapter 2). Densities were determined from the total weight and volume of each core section, by the syringe technique involving weighing and oven drying 0.5-1.0 cc of sediment, and by the gamma ray attenuation (GRAPE) method. Porosity and water content were also obtained by the syringe method and from the GRAPE data using a shore program. Acoustic velocities were measured using a Hamilton Frame. The results are shown in the hole summary diagrams. The thermal conductivities were obtained with the needle-probe technique (see section on geothermal measurements, Chapter 13).

Density, Porosity, and Water Content

Sediment bulk densities determined by the GRAPE and syringe methods are shown in the hole summary diagrams. The GRAPE and syringe values are consistently higher than those from the section weight and volume. The latter estimate will be generally low because of incomplete filling of the liner and mixing and disturbance of the sediment. Densities by the syringe method are probably the most reliable, but the amount of material sampled is small. Syringe samples can only be taken in unconsolidated sediments.

Starting with this hole, small cylinder samples were taken for ship and shore GRAPE and density measurements to attempt to determine attenuation coefficients for different sediment types. The results are used to correct for variations in attenuation coefficients in core measurements.

Bulk densities increase linearly with depth from 1.5 g/cc near the surface to 2.0 just above the basalt, indicating a rather uniform consolidation with depth.

Acoustic Velocity

The acoustic or sonic velocity increases nearly linearly with depth from just under 1.5 km/sec near the surface to 1.8 km/sec near 700 meters, just above basement, following a uniform consolidation with depth. There is a pronounced broad peak in velocity between 250 and 300 meters. There is no associated difference in density. The peak is associated with the seismic reflector at about 0.45 sec DT. The drilling site was chosen where the reflector was weak to minimize difficulties in drilling sand or chert that might be associated with it, so the reflector is not well defined. Sediment composition changes at this depth are minor.

The mean velocity of three basalt samples measured in the Hamilton Frame is 5.77 km/sec. This value is higher than found for basalts on most previous DSDP holes and higher than commonly found layer 2 velocities (see section on basalt velocities, this volume, Chapter 16). There is an acoustic impedance contrast of a factor of more than three between the bottom sediments and the basalt. There is little energy reflected by reflectors in the rather transparent sediment section, so this contrast produces a strong basement reflection.

CORRELATION OF SEISMIC REFLECTION PROFILE WITH DRILLING RESULTS

Prominent subbottom reflections at Site 250 are at 0.45 and 0.8 sec DT, the latter being the acoustic basement. Based on measured seismic velocities, the 0.45 sec reflector should have been encountered between 350 and 400 meters subbottom. No significant lithologic changes are evident in this interval. An abrupt drop in measured acoustic velocity around 310-360 meters subbottom may constitute the reflection interface. Again, no lithologic contrasts are evident in this interval. Besides seismic velocity, other parameters showing variation between 300 and 400 meters are alkalinity and core deformation. Alkalinity increases in this interval, and deformation is more pronounced above 250 meters (Core 7) and below 350 meters (Core 9). Acoustic velocities measured on the samples indicate that the basement should be at 691 meters subbottom, yet the drill contacted basement at about 720 meters.

PALEONTOLOGY

Biostratigraphic Summary

In the sediments penetrated at this site, Quaternary, Pliocene, lower to middle Miocene, and Upper Cretaceous ages could be determined by means of planktonic foraminifera and nannoplankton.

A thick Quaternary-Pliocene section of at least 235 meters, possibly more, occurs here. It contains planktonic foraminifera, deep-water benthonic foraminifera, and nannoplankton, but in most of the samples, the populations are at least affected, if not partly or completely destroyed, by dissolution. This indicates deposition in depths within or below the lysocline.

In the Miocene part of the section the nannoplankton are considerably etched, and in many samples foraminiferal tests were almost completely destroyed by dissolution. Reworked middle Eocene to Oligocene planktonic foraminifera occur in the lower part of the Miocene section. In addition, shallow-water benthonic foraminifera were found and indicate sediment transport from shallower areas.

In the lowermost part of the section (Cores 22-24) nannoplankton and radiolarian assemblages prove an Upper Cretaceous age. This age assignment is also supported by a fragment of *Inoceramus.* Planktonic foraminifera could not be found in this part of the section, but the nannoplankton assemblages could be assigned to the Coniacian.

The Cretaceous/Tertiary boundary is tentatively placed between Cores 21 and 22 (690 m) where a slight color change in the red-brown clay sequence can be recognized.

Foraminifera

Foraminiferal assemblages from this site show strong solution effects and are completely dissolved in many parts of the sequence. They are poor qualitatively and quantitatively and not very suitable either for use in age determination or for drawing ecological conclusions.

At least the uppermost 83 meters are Quaternary in age. Recent and Pleistocene sediments could not be separated from each other. The foraminiferal assemblage recorded from the Quaternary deposits is evidently of a temperate zone type. *Globorotalia inflata s.l.* which is a typical cold-water species, is predominant. It is accompanied by: (a) cold-water species, for example, *Globigerina pachyderma* (dex.), *G. quinqueloba, Globorotalia truncatulinoides/tosaensis;* (b) warm-temperate species, *Globorotalia hirsuta, G.* cf. *humilis, Globigerinella aequilateralis;* and (c) a few warm-water species, *Globorotalia menardii, Globigerinoides ruber, G. conglobatus, G. elongatus.* The whole assemblage indicates lower temperature than observed in the same area today. Benthonic species indicative of great depths were found (*Cibicides kullenbergi, Epistominella japonica, Nonion soldanii,* many typical deep-water *Fissurina, Parafissurina, Lagena,* etc.). The assemblages do not show significant changes in composition within the Quaternary deposits.

Cored material found below the Quaternary deposits is late Pliocene in age. It contains more or less the same poor fauna but without *Globorotalia truncatulinoides. G. tosaensis* was found, however, The thickness of the upper Pliocene sediments is at least 43.5 meters. It is very probably more since some parts of the underlying material were not cored, and a part of the cored section appeared to be barren.

Neither middle nor lower Pliocene deposits were recorded.

At 235 meters depth upper Miocene (Zones N16-N18) was found. The fauna is qualitatively and quantitatively even poorer than the Pliocene one. The absence of several typical Pliocene species (*Globorotalia inflata s.l., G. crotonensis, Sphaeroidinella dehiscens, Pulleniatina obliquiloculata s.s.,* and some others) indicates a Miocene age.

A thick sequence of completely barren sediments (about 300 m) was drilled below the upper Miocene section. Only one sample in this section contained debris of some arenaceous benthonic foraminifera.

Below this sequence about 40 meters of lower Miocene were encountered. This section was partially barren, but in places contained a rather typical lower

Miocene fauna (*Globorotalia kugleri, G. peripheroronda, Globigerinita dissimilis dissimilis*). It can be considered as representing Zones N4-N8. In addition, some evidently reworked Eocene and Oligocene foraminifera were recorded from these lower Miocene sediments. Some arenaceous benthonic foraminifera with very large stratigraphic ranges were found also.

An assemblage of calcareous benthonic foraminifera found in the core catcher of Core 18 is of special interest and rather enigmatic. This assemblage consisted of specimens of *Rotalia cubensis, Reussella spinulosa, Bolivina tortuosa, Elphidium crispum, Nodobaculariella cassis, Sphaeroidina bulloides, Quinqueloculina bradyana*, and some other shallow-water species typical of subtropical or even tropical zones. All the specimens were in a very good state of preservation and are of species found in the Recent fauna, although it is possible that they lived during the Miocene also. If this assemblage had contained Recent planktonic foraminifera in addition to the benthonic species, it would appear most likely that it is the result of contamination aboard *Glomar Challenger*. However, no typical specimens of Recent planktonic species were found in the sample. Thus it seems more likely that the benthonic assemblage mentioned is the result of sediment transport from shallower areas having occurred during the lower Miocene.

A very few damaged benthonic calcareous specimens were recorded in the core catcher of Core 17; however, no typical shallow-water dwellers were found among them.

Cores 20-25 contain only meager assemblages of primitive arenaceous foraminifera, which in most samples are restricted to well-preserved, fine-grained *Ammodiscus* sp. and *Glomospira* sp. Specimens belonging to the genera *Reophax, Haplophragmoides*, and *Cribrostomoides* were recognized in some of the samples. In one case only (Sample 22-3, 138-144 cm) a calcareous benthonic form was recognized, *Anomalina nelsoni* Berry, which indicates Upper Cretaceous. Additional support for an Upper Cretaceous age in the lower part of Site 250 is the occurrence of a fragment of *Inoceramus* in Sample 22-4, 35-42 cm. The Cretaceous/Tertiary boundary is therefore located between Core 19 and these samples.

Calcareous Nannoplankton

Stratigraphy: The extent of the calcareous nannoplankton zones encountered and their correlation with the foraminiferal and radiolarian stratigraphy are summarized on the biostratigraphic and lithologic summary diagram included in the site report.

A total of 108 samples from the two holes was prepared, but only 36 contained nannofossils. The age correlations by means of foraminifera and calcareous nannoplankton are in good agreement, except for Core 18, where exclusively middle to upper Eocene nannofossils and lower to middle Miocene (with reworked Paleogene) foraminifera are found. Although the abundance and preservation of the Cretaceous nannofossil assemblages are not good, they can be well correlated with the Coniacian assemblages on the Naturaliste Plateau (Site 258) in the eastern Indian Ocean. Reworked middle to upper Eocene nannofossils are found in Hole 250, Cores 2 and 3, and in Hole 250A, Cores 3, 4, 5, 7, 8, 9, 11, 15, 16, and 18. Reworked Upper Cretaceous nannoplankton are encountered in Hole 250, Core 3, and in Hole 250A, Cores 3, 5, 7, 8, 9, 15, and 16.

Preservation: Two samples in the lower part of Core 5 (Hole 250A) showed overgrowth. All other nannofossil assemblages are slightly to strongly etched.

Paleoecology: Any paleoecologic interpretation of the Cretaceous assemblages is prevented by their scarcity and poor preservation. Paucity of fossiliferous layers and great variability in preservation indicate a depositional depth around the calcium carbonate compensation depth throughout the Neogene. Influx of transported deposits must be assumed from the reworked nearshore Eocene and the Cretaceous nannofossils. The relative abundance of discoasters, sphenoliths, and scyphospheres indicates a temperate environment during the Neogene.

SEDIMENTATION RATES

Only very rough figures for sedimentation rates can be computed for this site, since the stratigraphic boundaries between the different series of the Tertiary cannot be determined precisely. In calculating the following rates, the consolidation of the sediment was not taken into account. Age dates were used according to Berggren (1972).

Taking into account these uncertainties and assuming an age of 5 m.y. for the Miocene/Pliocene boundary gives a sedimentation rate of roughly 47 m/m.y., for the period lower Pliocene-Recent. For the lower Pleistocene-Recent interval the rate may be between 45 and 55 m/m.y. For the Pliocene approximately 43 m/m.y., if the Pliocene/Pleistocene boundary is placed at 1.8 m.y. For an oceanic basin these figures are extremely high.

During the Miocene the sedimentation was certainly much slower. Exact figures cannot be given, since the biostratigraphic data are insufficient, but available data suggest a rate about 25 m/m.y.

Upper Cretaceous has been encountered 30 meters below the lowermost Miocene recorded. An important unconformity is most probable, although no direct evidence of this can be observed in the recovered cores. A calculation of sedimentation rates below the Miocene is not possible.

SUMMARY AND CONCLUSIONS

Site 250 was drilled in 5119 meters of water on the southeast side of the Mozambique Basin. The site was selected in order to try to date the crust in an area apparently devoid of magnetic anomalies. Seismic reflection profiles show approximately 0.8 sec DT of transparent sediment overlying basement with a discontinuous intermediate reflector at 0.45 sec DT. The seabed shows dune-like structures of 0.10 sec DT amplitude and moats around seamounts, both suggesting active bottom currents.

Summary of Results

Two holes were drilled to a maximum penetration of 738.5 meters and a total of 29 cores cut (268.5 m cored;

145.8 m recovered). Olivine basalt, assumed to be basement, was reached 725.3 meters below the seabed and two cores were cut into the basalt with a total recovery of 11.2 meters. The contact between the basalt and the overlying sediment appears to be depositional, rather than intrusive, and, although the sediments immediately above the basalt are unfossiliferous, extrapolation from the oldest datable sediments, 15 meters above basalt, gives an age of Late Cretaceous (Coniacian) or older for the basalt. Examination of the cores reveals five lithostratigraphic units in the overlying sedimentary section. These are distinguished on the basis of color and the presence or absence of calcareous nannofossils. Unit 1, extending from the seabed to a depth of 116 meters, is a light gray clayey coccolith ooze, interbedded with olive-green and gray coccolith detrital silty clays and detrital silty clays, of late Pliocene and Quaternary age. Nothing in the textural character of the sediments of Unit 1 suggests the bottom current activity which is supposed to prevail in the neighborhood of the site. Unit 2 can be subdivided into two subunits. Subunit 2a, from 116 to 351 meters subbottom, is olive-green, gray, and grayish-black detrital clays with minor coccolith ooze horizons, of upper Miocene to Pliocene age, whereas Subunit 2b, from 351 to 568 meters, consists only of detrital clays and is of mid-lower Miocene age. Unit 3, from 568 to 638 meters subbottom, is lower Miocene black, gray, and brown detrital clays, interbedded; and Unit 4 (638-703.5 m) is entirely moderate brown detrital clay. The top of Unit 4 is lower Miocene in age, whereas the bottom of the unit is Coniacian. The middle of the unit is unfossiliferous, but it seems probable that there is a major disconformity in this unit between Cretaceous and Miocene sediments. The bottom part of Unit 4 shows extensive bioturbation and abundant zeolites, authigenic overgrowths on the clay minerals, and development of siderite as the predominant iron mineral, rather than pyrite. The basal sediment, Unit 5, is 16.5 meters of gray detrital clay.

The Micoene and Cretaceous parts of the section are essentially devoid of calcareous fossils. Those nannofossils which are found in the Cretaceous part of the section are heavily etched and may be reworked. The Miocene part of the section contains reworked Oligocene and Eocene fossils throughout and shallow-water foraminifera in the uppermost part (Subunit 2b).

Sediment accumulation rates are high, 47 m/m.y. for the lower Pliocene-Recent part of the section, and lower (25 m/m.y.) for the Miocene and Cretaceous parts of the section, though still high for a deep ocean basin.

Preliminary Conclusions

From the evidence of the airgun profiles, high sedimentation rates, the presence of shallow-water foraminifera, and the major terrigenous component of the sediments, it is apparent that sedimentation at this site has been under the control of active bottom current circulation since sometime in the Miocene. These currents presumably flow in a clockwise direction around the Mozambique Basin (Heezen and Hollister, 1971) and bring terrigenous and shallow-water debris to the vicinity of Site 250 from East Africa, through the Zambezi Fan, and from Madagascar. At Site 250 sedimentation rates increased greatly in the Miocene and there was a major influx of terrigenous material in the Pliocene.

Prior to the onset of active bottom current circulation, and after an initial accumulation of the basal detrital clay above the basalt, sedimentation seems to have proceeded from the Late Cretaceous into the Miocene at the much gentler pace associated with "normal" deep-ocean basin sedimentation. This is evidenced by the thinness of the section, the extensive bioturbation, the oxidized nature of the sediment (except the basal layer), and the development of zeolites and dissolution facies in the lower part of the section. Sediment accumulation seems to have been below the carbonate compensation depth prior to the Coniacian and from Coniacian to early Miocene. At other times sedimentation was always below the lysocline or carbonate compensation depth.

The section at Site 250 is comparable to that at Site 248, drilled on Leg 25, on the western side of the Mozambique Basin. However, the sequence at Site 248, although stratigraphically more complete, is thinner than at Site 250 being only 422 meters thick and extending back into the Paleocene. Also, the sediments at Site 248 are much coarser than those at Site 250, consisting mostly of silty clays and clayey silts, even some sand layers, with a major influx of terrigenous material in the mid Miocene. This suggests tectonic events on land in the early Tertiary which resulted in a flood of terrigenous material into the western Mozambique Basin in mid Miocene times. The coarse material accumulated close to the source, but the finer material found at Site 250 was carried farther from the source by bottom currents. A major influx of detrital sediment at Site 250 began at the beginning of the Pliocene.

Site 249, on the Mozambique Ridge adjacent to Site 248, gives an age of mid Cretaceous for the crust here. The ages at Sites 250 and 249 then suggest increasing crustal ages to the north and that the age of the South African continental margin (the age of Africa-Antarctica rifting) is mid Cretaceous. These age relationships fit most tectonic hypotheses for the break-up of this portion of Gondwanaland.

Disconformities corresponding to the major Miocene-Cretaceous disconformity implied at Site 250 also appear at Sites 248 and 249 where mid Miocene sediments overlie Eocene and Late Cretaceous sediments, respectively. Another disconformity is suggested by a barren section (Cores 14 and 15) in the early Miocene.

REFERENCES

Berggren, W. A., 1972. A Cenozoic time-scale—some implications for regional geology and paleobiogeography: Lethaia, v. 5, p. 195-215.

Ewing, M., Eittreim, S., Truchan, M., and Ewing, J. I., 1969. Sediment Distribution in the Indian Ocean: Deep-Sea Res., v. 16, p. 231-248.

Heezen, B. C. and Hollister, C. D., 1971. The face of the deep: New York (Oxford University Press).

McKenzie, D. and Sclater, J. G., 1971. The evolution of the Indian Ocean since the Late Cretaceous: Roy. Astron. Soc. Geophys. Jr., v. 25, p. 437-528.

APPENDIX A
Grain-Size Determinations for Site 250

Core, Section, Top of Interval (cm)	Subbottom Depth (m)	Sand (%)	Silt (%)	Clay (%)	Classification
Hole 250					
1-1, 124	1.2	0.1	21.0	78.9	Clay
1-3, 90	3.9	0.1	16.8	83.2	Clay
1-5, 90	6.9	0.0	15.3	84.7	Clay
2-2, 12	10.6	0.0	17.2	82.8	Clay
2-4, 132	14.8	0.0	16.0	84.0	Clay
2-6, 90	17.4	0.0	15.5	84.5	Clay
3-1, 29	55.8	0.0	19.5	80.5	Clay
3-1, 90	56.4	0.0	22.5	77.5	Clay
3-3, 24	58.7	0.0	15.5	85.0	Clay
Hole 250A					
1-2, 90	56.9	0.1	15.6	84.2	Clay
1-4, 90	59.9	0.0	15.3	84.7	Clay
1-5, 90	61.4	0.0	14.8	85.2	Clay
3-2, 90	75.9	0.0	99.6	.4	Silt
3-5, 90	80.4	0.1	12.9	87.0	Clay
4-2, 122	114.2	0.0	18.0	81.9	Clay
4-4, 90	116.9	0.0	13.7	86.3	Clay
4-6, 90	119.9	0.1	16.0	83.9	Clay
5-2, 90	151.9	0.0	16.5	83.5	Clay
5-6, 90	157.9	0.0	23.7	76.3	Clay
6-2, 90	189.9	0.0	19.2	80.7	Clay
6-4, 90	192.9	0.1	20.2	79.7	Clay
7-1, 21	235.2	0.0	13.2	86.8	Clay
7-3, 90	238.9	0.2	18.6	81.2	Clay
7-5, 9	241.1	0.3	16.5	83.2	Clay
8-1, 90	292.9	0.2	20.0	79.8	Clay
8-3, 10	295.1	0.1	16.7	83.1	Clay
8-5, 92	298.9	0.1	20.9	78.9	Clay
9-2, 101	351.5	0.1	10.2	89.8	Clay
9-4, 90	354.4	0.0	13.5	86.5	Clay
10-2, 20	407.7	0.0	13.1	86.9	Clay
10-2, 100	408.5	0.0	11.9	88.1	Clay
10-5, 90	412.9	0.2	14.0	85.8	Clay
11-3, 90	466.9	0.0	12.3	87.7	Clay
11-4, 4	467.5	0.0	13.6	86.4	Clay
11-4, 91	468.4	0.0	13.1	86.8	Clay
11-6, 90	471.4	0.0	15.4	84.6	Clay
12-1, 144	521.4	0.5	13.3	86.2	Clay
13-1, 120	568.7	0.0	19.8	80.2	Clay
13-2, 90	569.9	0.0	16.2	83.8	Clay
14-2, 10	607.1	0.1	20.4	79.5	Clay
14-2, 119	608.2	0.2	17.7	82.1	Clay
15-2, 87	626.9	0.6	19.5	79.9	Clay
15-3, 121	628.7	0.2	14.7	85.1	Clay
15-4, 90	629.9	0.0	19.0	81.0	Clay
16-2, 90	636.4	0.0	25.7	74.3	Silty clay
16-3, 11	637.1	0.0	26.1	73.9	Silty clay
16-3, 88	637.9	1.3	66.5	32.2	Clayey silt
17-1, 80	644.3	0.6	15.0	84.4	Clay
17-2, 90	645.9	0.6	15.9	83.5	Clay
17-3, 90	647.4	0.7	15.0	84.3	Clay
18-1, 90	653.9	0.3	18.0	81.8	Clay
18-2, 90	655.4	0.1	17.7	82.2	Clay
19-2, 90	664.9	0.0	14.4	85.6	Clay
20-2, 90	674.4	0.0	15.9	84.1	Clay
21-2, 90	683.9	0.0	16.1	83.9	Clay
22-2, 90	693.4	0.3	29.1	70.5	Silty clay
22-4, 95	696.5	0.0	17.5	82.4	Clay
24-1, 120	711.2	0.0	5.6	94.4	Clay
24-2, 90	712.4	0.0	7.0	93.0	Clay
25-1, 13	719.6	0.0	7.5	92.5	Clay

APPENDIX B
Carbon-Carbonate Determinations for Site 250

Core, Section, Top of Interval (cm)	Sub bottom Depth (m)	Total Carbon (%)	Organic Carbon (%)	$CaCO_3$ (%)
Hole 250				
1-1, 135.0	1.35	3.2	0.5	22
1-3, 88.0	3.88	2.1	0.6	13
1-5, 88.0	6.88	3.1	0.5	21
2-2, 10.0	10.60	0.7	0.5	2
2-4, 130.0	14.80	1.2	0.5	5
2-6, 88.0	17.38	1.4	0.7	6
3-1, 28.0	55.78	1.2	0.7	5
3-1, 88.0	56.38	7.0	0.9	51
3-3, 22.0	58.72	2.9	0.5	20
3-3, 60.0	59.10	1.2	0.7	4
3-3, 132.0	59.82	6.9	0.8	51
Hole 250A				
1-2, 88.0	56.88	1.2	0.6	5
1-4, 88.0	59.88	1.7	0.4	11
1-5, 88.0	61.38	1.5	0.5	8
3-2, 88.0	75.88	2.6	0.5	18
3-5, 88.0	80.38	9.0	0.5	71
3-6, 121.0	82.21	3.9	0.7	26
4-2, 119.0	114.19	2.4	0.4	16
4-4, 88.0	116.88	1.3	0.6	5
4-6, 88.0	119.88	0.7	0.6	1
5-2, 88.0	151.88	0.8	0.4	3
5-4, 124.0	155.24	0.5	0.4	0
5-6, 88.0	157.88	0.8	0.4	4
6-2, 88.0	189.88	0.4	0.4	0
6-4, 88.0	192.88	0.4	0.4	0
7-1, 18.0	235.18	0.4	0.3	1
7-3, 88.0	238.88	0.5	0.4	1
7-5, 88.0	241.88	0.8	0.4	3
8-1, 88.0	292.88	0.5	0.4	0
8-3, 8.0	295.08	0.6	0.4	1
8-5, 90.0	298.90	0.4	0.4	0
9-2, 99.0	351.49	0.5	0.6	0
9-4, 88.0	354.38	0.3	0.4	0
10-2, 18.0	407.68	0.2	0.2	0
10-2, 98.0	408.48	0.2	0.3	0
10-5, 88.0	412.88	0.4	0.3	1
11-1, 88.8	463.88	0.2	0.3	0
11-3, 88.0	466.88	0.2	0.3	0
11-4, 2.0	467.52	0.2	0.3	0
11-4, 88.0	468.38	0.2	0.2	0
11-6, 88.0	471.38	0.9	0.3	5
12-1, 140.0	521.40	0.2	0.2	0
13-1, 74.0	568.24	0.2	0.2	0
13-1, 118.0	568.68	0.2	0.2	0
13-2, 88.0	569.88	0.2	0.2	0
14-2, 8.0	607.08	0.2	0.3	0
14-2, 117.0	608.17	0.2	0.2	0
15-2, 85.0	626.85	1.2	0.4	7
15-3, 119.0	628.69	0.1	0.2	0
15-4, 88.0	629.88	0.2	0.3	0
16-2, 88.0	636.38	5.1	0.2	41
16-3, 9.0	637.09	5.1	0.1	41
16-3, 86.0	637.86	6.2	1.8	37
17-1, 80.0	644.30	0.1	0.2	0
17-2, 88.0	645.88	0.1	0.2	0
17-3, 88.0	647.38	0.1	0.2	0
18-1, 88.0	653.88	0.2	0.2	0
18-2, 88.0	655.38	0.1	0.2	0
19-2, 88.0	664.88	0.1	0.2	0
20-2, 88.0	674.38	0.1	0.2	0

APPENDIX B – *Continued*

Core, Section, Top of Interval (cm)	Sub bottom Depth (m)	Total Carbon (%)	Organic Carbon (%)	$CaCO_3$ (%)
21-2, 88.0	683.88	0.1	0.2	0
22-2, 89.0	693.39	0.2	0.2	0
22-4, 93.0	696.43	0.1	0.2	0
23-1, 84.0	701.34	0.1	0.1	0
24-1, 118.0	711.18	0.3	0.3	0
24-2, 88.0	712.38	0.3	0.4	0
25-1, 11.0	719.61	0.1	0.2	0

APPENDIX C
X-Ray Analyses for Hole 250

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amor.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Gibb.
Bulk Samples													
1	0.0-9.0	0.9	84.6	75.9	–	16.0	7.5	5.8	7.8	19.1		43.8	–
		5.5	80.7	69.8	48.3	12.8	4.1	5.7	7.2	9.8		12.2	–
		7.0	85.8	77.7	–	25.0	7.0	8.0	13.9	20.1		25.2	0.8
2	9.0-18.5	17.9	85.5	77.3	15.6	22.0	6.5	8.1	9.9	18.4		18.4	1.1
2-20μ Fraction													
1	0.0-9.0	0.9	75.9	62.3		22.5	15.3	13.6	6.9	29.6	–	12.2	–
		5.5	72.5	57.0		33.1	10.9	18.8	10.2	24.2	1.5	–	1.3
		7.0	70.6	54.1		29.1	11.1	14.4	8.4	28.2	1.7	5.8	1.3
2	9.0-18.5	17.9	72.1	56.3		36.6	13.5	18.7	6.2	22.6	1.3	–	1.1
$<2\mu$ Fraction													
1	0.0-9.0	0.9	83.4	74.0		5.2	–	–	8.2	13.2		73.4	–
		5.5	85.6	77.5		14.6	–	6.6	15.3	19.1		43.3	1.0
		7.0	86.6	79.0		13.2	5.7	6.6	14.8	13.6		45.2	1.0
2	9.0-18.5	17.9	87.5	80.5		16.3	4.8	5.9	11.8	16.8		43.6	0.7

APPENDIX D
X-Ray Analyses for Hole 250A

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amor.	Calc.	Dolo.	Side.	Quar.	Cris.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Trid.	Clin.	Pyri.	Gibb.	Hali.
Bulk Samples																					
1	54.5-64.0	56.3	84.5	75.9	22.2	–	–	17.1	–	4.1	7.5	10.5	18.9	–	19.0	–	–	–	–	0.6	–
		57.8	85.3	77.0	–	–	–	23.4	–	3.3	6.5	6.5	24.4	2.3	24.5	8.4	–	–	–	0.7	–
3	73.5-83.0	82.2	78.2	66.0	42.0	–	–	10.2	–	4.0	4.4	10.4	11.6	–	17.5	–	–	–	–		–
4	111.5-121.0	117.4	85.6	77.5	10.2	0.8	–	19.5	–	4.2	6.7	12.7	21.9	–	24.0	–	–	–	–	–	–
6	187.5-197.0	191.4	85.6	77.5	–	–	–	23.4	–	–	11.8	10.5	31.5	–	22.6	–	–	–	–	–	–
7	235.0-243.5	235.1	86.4	78.7	–	–	–	21.0	–	10.7	7.9	11.1	24.7	–	24.7	–	–	–	–	–	–
		242.0	83.7	74.5	6.0	–	4.4	19.5	–	7.8	6.4	10.5	24.5	–	20.9	–	–	–	–	–	–
8	292.0-301.5	292.3	83.9	74.8	–	–	–	20.6	–	6.6	9.1	11.0	26.5	–	26.2	–	–	–	–	–	–
9	349.0-358.5	351.9	84.4	75.7	–	–	–	23.6	–	7.5	7.1	11.9	23.3	–	26.6	–	–	–	–	–	–
10	406.0-415.5	407.6	86.8	79.3	–	–	–	26.7	–	7.8	8.5	10.0	30.2	–	16.9	–	–	–	–	–	–
11	463.0-472.5	463.3	84.0	75.0	–	–	–	33.0	–	5.7	8.1	1.7	26.0	3.2	22.3	–	–	–	–	–	–
		470.2	83.8	74.6	–	–	–	33.4	–	7.6	10.0	2.1	26.5	3.9	16.5	–	–	–	–	–	–
13	567.5-577.0	568.3	84.1	75.2	–	–	–	29.1	–	6.1	10.9	2.7	25.8	2.1	23.3	–	–	–	–	–	–
		568.8	84.7	76.2	–	–	–	32.2	–	6.9	11.4	1.7	31.8	2.6	13.4	–	–	–	–	–	–
14	605.5-615.0	607.2	83.8	74.7	–	–	–	22.6	–	8.0	3.1	7.1	22.5	3.1	33.6	–	–	–	–	–	–
15	624.5-634.0	626.9	84.1	75.2	–	–	–	22.3	–	16.2	10.8	8.1	21.2	–	21.5	–	–	–	–	–	–
17	643.5-653.0	646.1	87.1	79.8	–	–	–	24.4	–	6.8	8.9	6.2	18.4	–	18.4	17.0	–	–	–	–	–
19	662.5-672.0	664.3	87.3	80.2	–	–	–	19.0	–	6.5	6.2	2.2	23.0	1.2	13.6	28.3	–	–	–	–	–
21	681.5-691.0	684.0	83.0	73.5	–	–	–	18.9	–	3.5	3.7	–	9.3	–	29.3	35.3	–	–	–	–	–
23	700.5-710.0	701.5	90.6	85.3	–	–	–	5.1	69.6	–	–	–	–	–	4.2	7.3	13.8	–	–	–	–
24	710.0-719.5	712.8	86.0	78.1	–	–	–	14.9	–	5.9	3.8	–	11.4	–	30.3	30.8	–	3.0	–	–	–
25	719.5-729.0	719.7	89.9	84.2	–	–	–	19.0	–	6.6	3.8	–	5.2	–	21.3	44.1	–	–	–	–	–
2-20μ Fraction																					
1	54.5-64.0	56.3	71.7	55.7	–	–	–	37.0	–	12.2	17.7	9.9	22.6	–	–	–	–	–	–	0.6	–
		57.8	69.3	52.0	–	–	–	32.8	–	12.9	16.5	9.1	26.1	1.3	–	–	–	–	–	1.3	–
3	73.5-83.0	82.2	72.2	56.5	–	–	–	29.7	–	15.5	14.7	16.7	21.0	–	–	–	–	–	1.6	0.7	–
4	111.5-121.0	117.4	70.7	54.3	–	–	–	34.2	–	14.0	15.6	11.4	22.6	0.7	–	–	–	–	0.9	0.6	–
6	187.5-197.0	191.4	64.8	45.1	–	–	–	34.8	–	12.7	22.3	2.8	25.9	1.4	–	–	–	–	–	–	–
7	235.0-243.5	235.1	66.5	47.7	–	–	–	34.2	–	13.0	18.4	4.6	27.3	1.2	–	–	–	–	1.3	–	–
		242.0	68.8	51.3	–	–	–	34.1	–	14.7	17.2	6.9	26.4	0.7	–	–	–	–	–	–	–
8	292.0-301.5	292.3	66.7	47.9	–	–	–	37.7	–	13.4	18.3	4.8	24.4	1.4	–	–	–	–	–	–	–
9	349.0-358.5	351.9	66.8	48.1	–	–	–	38.2	–	13.4	18.1	4.0	25.1	1.2	–	–	–	–	–	–	–
10	406.0-415.5	407.6	64.1	44.0	–	–	–	42.7	–	12.6	18.3	1.5	23.8	1.1	–	–	–	–	–	–	–

APPENDIX D – *Continued*

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amor.	Calc.	Dolo.	Side.	Quar.	Cris.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Trid.	Clin.	Pyri.	Gibb.	Hali.
11	463.0-472.5	463.3	61.2	39.4	–	–	–	45.8	–	10.8	19.2	–	22.8	1.3	–	–	–	–	–	–	–
		470.2	63.5	42.9	–	–	–	49.1	–	11.0	20.5	1.0	17.5	0.8	–	–	–	–	–	–	–
13	567.5-577.0	568.3	61.8	40.3	–	–	–	48.3	–	13.7	21.2	0.6	15.6	0.6	–	–	–	–	–	–	–
		568.8	57.8	34.1	–	–	–	50.5	–	11.3	23.5	–	13.4	1.2	–	–	–	–	–	–	–
14	605.5-615.0	607.2	59.0	35.9	–	–	–	52.1	–	14.6	16.7	0.8	14.9	0.9	–	–	–	–	–	–	–
15	624.5-634.0	626.9	63.9	43.6	–	–	–	35.2	–	22.7	17.2	2.5	22.5	–	–	–	–	–	–	–	–
17	643.5-653.0	646.1	64.9	45.2	–	–	–	42.1	–	13.9	19.7	2.8	20.4	1.0	–	–	–	–	–	–	–
19	662.5-672.0	664.3	67.4	49.1	–	–	–	37.6	–	19.9	20.8	–	19.3	2.4	–	–	–	–	–	–	–
21	681.5-691.0	684.0	62.1	40.8	–	–	–	45.6	–	13.1	17.8	–	15.1	1.8	–	6.6	–	–	–	–	–
23	700.5-710.0	701.5	87.4	80.4	–	–	–	4.7	72.2	1.7	2.3	–	1.3	–	–	4.5	13.3	–	–	–	–
24	710.0-719.5	712.8	75.0	60.9	–	–	–	31.4	–	9.2	14.6	–	24.8	–	9.8	–	–	10.3	–	–	–
25	719.5-729.0	719.7	76.5	63.2	–	–	–	33.2	–	20.1	15.8	–	28.0	3.0	–	–	–	–	–	–	–
<2μ Fraction																					
1	54.5-64.0	56.3	85.8	77.9	–	–	–	16.2	–	5.0	3.5	13.5	15.1	–	45.7	–	–	–	–	0.8	–
		57.8	85.1	76.7	–	–	–	17.7	–	6.0	4.7	13.1	14.4	–	36.7	7.4	–	–	–	–	–
3	73.5-83.0	82.2	86.0	78.2	–	–	–	12.5	–	3.3	3.8	13.2	11.5	–	55.7	–	–	–	–	–	–
4	111.5-121.0	117.4	86.5	78.8	–	–	–	14.6	–	3.7	5.4	13.0	12.2	–	48.0	–	–	–	–	–	3.1
6	187.5-197.0	191.4	87.8	81.0	–	–	–	15.7	–	6.6	7.2	8.2	17.6	–	38.8	–	–	–	–	–	5.9
7	235.0-243.5	235.1	83.2	73.8	–	–	–	15.2	–	7.1	4.7	10.9	29.5	–	25.4	–	–	–	–	–	7.3
		242.0	89.0	82.8	–	–	–	15.3	–	4.3	2.8	13.2	18.7	–	45.7	–	–	–	–	–	–
8	292.0-301.5	292.3	85.5	77.4	–	–	–	15.1	–	6.2	2.7	10.7	20.0	–	43.6	–	–	–	–	–	1.7
9	349.0-358.5	351.9	83.5	74.3	–	–	–	17.5	–	7.9	7.4	10.1	23.9	–	29.3	–	–	–	–	–	3.9
10	406.0-415.5	407.6	85.5	77.4	–	–	–	16.5	–	7.4	4.1	7.1	37.0	–	24.4	–	–	–	–	–	3.5
11	463.0-472.5	463.3	84.3	75.4	–	–	–	20.4	–	5.9	5.3	7.6	24.6	–	34.1	–	–	–	–	–	2.1
		470.2	86.0	78.1	–	–	–	20.9	–	5.8	4.2	7.3	24.9	–	31.7	–	–	–	–	–	5.2
13	567.5-577.0	568.3	85.7	77.6	–	–	–	19.1	–	5.8	4.7	2.6	25.2	–	31.2	–	–	–	–	–	9.2
		568.8	86.6	79.0	–	–	–	27.8	–	5.1	6.4	6.4	27.2	–	19.2	–	–	–	–	–	7.8
14	605.5-615.0	607.2	88.0	81.3	–	–	–	22.6	–	8.0	3.1	7.1	22.5	3.1	33.6	–	–	–	–	–	–
15	624.5-634.0	626.9	87.4	80.3	–	–	–	11.5	–	6.5	–	8.4	22.5	–	41.7	–	–	–	–	–	9.4
17	643.5-653.0	646.1	87.9	81.1	–	–	–	16.9	–	5.5	4.3	7.7	20.0	–	28.5	17.1	–	–	–	–	–
19	662.5-672.0	664.3	88.9	82.6	–	–	–	9.5	–	5.7	2.4	2.3	23.5	0.8	33.2	22.7	–	–	–	–	–
21	681.5-691.0	684.0	85.8	77.8	–	–	–	18.0	–	–	–	–	12.8	–	36.2	33.0	–	–	–	–	–
23	700.5-710.0	701.5	94.0	90.7	–	–	–	1.5	73.4	–	–	–	–	–	5.7	5.1	12.6	–	–	–	1.7
24	710.0-719.5	712.8	86.7	79.2	–	–	–	9.4	–	–	–	–	8.0	–	52.9	29.8	–	–	–	–	–
25	719.5-729.0	719.7	88.1	81.3	–	–	–	8.5	–	2.5	–	–	9.5	–	50.6	29.0	–	–	–	–	–

Site 250 Hole Core 1 Cored Interval: 0-9 m

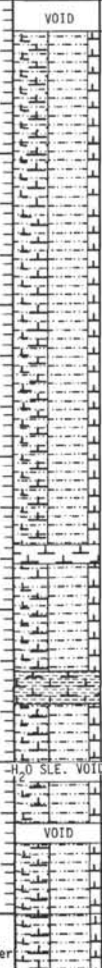
AGE: QUATERNARY

ZONE: FORAMS: *Globorotalia truncatulinoides*; N22-N23 — NANNOS: NN20

FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS. ETC.
RM	2		FM
FG	3	APE	
AM	3		
RG	3	CME	
RM	3		
CG	3	AME	FM
FM	3		
FG	3	AME	
CG	3		
	4	B	
RG	2		FM
FG	3	CME	
FG	3	B	FM

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher — METERS: 0.5, 1.0

LITHOLOGY:



LITHO. SAMPLE: *, *, XM, *, GZ, CC, *, CC, GZ, *, KE, *, XM, *, CC,GZ, XM, *, *

Colors: 5Y 5/2, 5Y 4/1, 5Y 5/2, 5Y 5/2, 5Y 4/1, 5Y 5/1, 5Y 4/1, 5Y 5/1 to 5Y 6/1, 5Y 4/1, 5Y 5/1, 5Y 5/1 to 5Y 6/1, 5Y 4/1, 5Y 5/1, 5Y 4/1

LITHOLOGIC DESCRIPTION

Predominantly medium olive green COCCOLITH DETRITAL SILTY CLAY with lesser olive gray DETRITAL SILTY CLAY and minor streaks and patches of light olive gray CLAYEY COCCOLITH OOZE. Stratification very badly obscured by intense coring deformation.

TEXTURE: Sand 0-0.1%
Silt 15-21%
Clay 79-85%
Occasional smear slides show 5% silt, 95% clay.

MINOR CONSTITUENTS: Quartz and mica are ubiquitous in at least trace amounts, the siltier intervals containing as much as 10% quartz and 2% mica. Traces of heavy minerals are common. Rare traces of authigenic zeolites and carbonates were observed. Diatoms are present throughout, from trace amounts to as much as 5%. Traces of sponge spicules are common, particularly in the lower half of the core. One occurrence of traces of collophanous fish debris was noted.

Total Carbon: 2.1-3.2%
Organic Carbon: 0.54-0.57%
Calcium Carbonate: 13.1-22.2%

CONSOLIDATION: Soft.

Explanatory notes in chapter 2

Site 250 Hole Core 2 Cored Interval: 9-18 m

AGE: QUATERNARY

ZONE: FORAMS: *Globorotalia truncatulinoides*; N22-N23 — NANNOS: NN20; NN19

FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS. ETC.
AG	3		
CG	3	AME	
CG	3		FG
RG	3		
CG	3-4		FG
RG	3-4	B	
CG	3-4		
RG	3	AME	
FG	3		
FG	3-4	FPE	
AG	3		FM
RG	3-4	FPE	
FG	3-4	AME	RM

SECTION: 1, 2, 3, 4, 5, 6, Core Catcher — METERS: 0.5, 1.0

LITHOLOGY:

LITHO. SAMPLE: *, CC,GZ, *, *, *, *, CC,GZ, *, *, KE, *, CC,GZ, XM, *

Colors: 5Y 5/1, 5Y 5/1, 5Y 5/1, minor 5Y 6/1, 5Y 5/1, 5Y 5/1

LITHOLOGIC DESCRIPTION

Medium olive gray COCCOLITH BEARING DETRITAL CLAY and lesser DETRITAL SILTY CLAY with minor streaks and patches of lighter colored CLAYEY COCCOLITH OOZE. Very minor specks of sediment several millimeters in diameter scattered throughout the core owe their color to finely disseminated ferruginous opaque material. Stratification is very badly obscured by intense coring deformation.

TEXTURE: Silt 16-17%
Clay 83-84%
Except for one smear slide from Section 1 which showed 40% silt, 60% clay.

MINOR CONSTITUENTS: Quartz and mica are ubiquitous in amounts varying from traces to 1%. Rare traces of authigenic zeolite were observed. Diatoms were present throughout the core in trace amounts, with one 2% occurrence. Traces of sponge spicules and collophanous fish debris were less common.

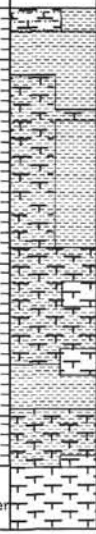
Total Carbon: 0.7-1.4%
Organic Carbon: 0.5-0.7%
Calcium Carbonate: 2.0-6.0%

CONSOLIDATION: Soft.

Explanatory notes in chapter 2

Site 250 Hole Core 3 Cored Interval: 55.5-65 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS., ETC.	SECTION
QUATERNARY	Globorotalia truncatulinoides; N22-N23	NN19	RG	1-2		RM	1
			RG	3	AGE		1
			FG	2			2
			CG	2	AGE		2
			AG	3		RM	3
			FG	2	AME		3
			AG	2	AME	RM	Core Catcher



LITHO. SAMPLE and colors: XM, CC,GZ, * — 5Y 4/1, lesser 5Y 5/1; 5Y 4/1; CC,GZ, * — 5Y 5/1; 5Y 4/1, 5Y 5/1; 5Y 6/1; * — 5Y 6.5/1; KE, CC,GZ, *, * — 5Y 6.5/1; CC — 5Y 4/1; CC — 5Y 5/1; 5Y 5/1 to 5Y 6/1

LITHOLOGIC DESCRIPTION

Olive gray DETRITAL CLAY and medium olive gray CLAYEY COCCOLITH OOZE, with smaller patches of light olive gray COCCOLITH OOZE.

TEXTURE: Silt 15-22%
Clay 78-85%

MINOR CONSTITUENTS: Quartz and mica are ubiquitous in trace amounts; one smear slide showed 1% mica, and a trace of feldspar. Trace amounts of zeolite are less common. Trace amounts of diatoms occur throughout the core. Sponge spicules and foraminifers are less common. One trace of discoasters and one of collophanous fish debris were noted.

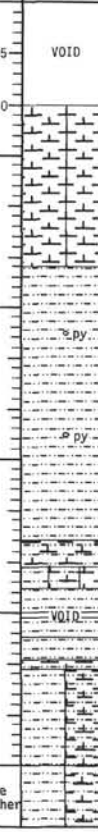
Total Carbon: 1.2-7.0%
Organic Carbon: 0.5-0.9%
Calcium Carbonate: 4% in detrital clay; 51% in oozes

CONSOLIDATION: Soft, but distinctly more consolidated than Cores 1 and 2.

Explanatory notes in chapter 2

Site 250 Hole A Core 1 Cored Interval: 54.5-64.0 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS., ETC.	SECTION
QUATERNARY	Globorotalia truncatulinoides; N22-N23	NN19	CG	3	APE		1
			FG	3			1
			CG	3		RM	2
					FME		2
			B				3
					B		3
			B			RM	4
			FG	3	CME		4
			FG	2-3			5
			FG	3	B		5
			RM	2	AME	RM	Core Catcher



LITHO. SAMPLE and colors: *, * — 5GY 3/2; XM; CC,GZ, * — 2.5Y 3/0, 5GY 3/2; *; KE, XM; *; * — 5Y 4.5/1; CC,GZ, *, *, * — 5Y 3/1; *, KE — 5GY 3/2; CC,GZ, *, *, XM — 5GY 4/2, 5GY 3/2; minor 5Y 3/1, 5Y 4/1, 5Y 5/1

LITHOLOGIC DESCRIPTION

Olive green and gray DETRITAL CLAY, lesser light gray CLAYEY COCCOLITH OOZE interbeds; also, interbeds gradational between these two lithologies. Minor dark patches several millimeters in diameter containing microcrystalline pyrite; two 0.5 x 2 cm pyrite nodules as indicated.

TEXTURE: Average sand 0-0.1%
Average silt 15%
Average clay 84-85%
Locally, silt as high as 50%. Total detrital content averages 75%.

MINOR CONSTITUENTS: Quartz and mica are generally present in traces, although quartz contents are as high as 10% and mica contents as high as 5% where silt contents are high. Heavy minerals are less common in trace quantities; feldspar is uncommon. Diatoms and sponge spicules and fish debris are present throughout in trace quantities.

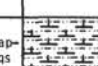
Total Carbon: 1.2-1.5%
Organic Carbon: 0.4-0.6%
Calcium Carbonate: 5.0-11.0%

CONSOLIDATION: Soft.

Explanatory notes in chapter 2

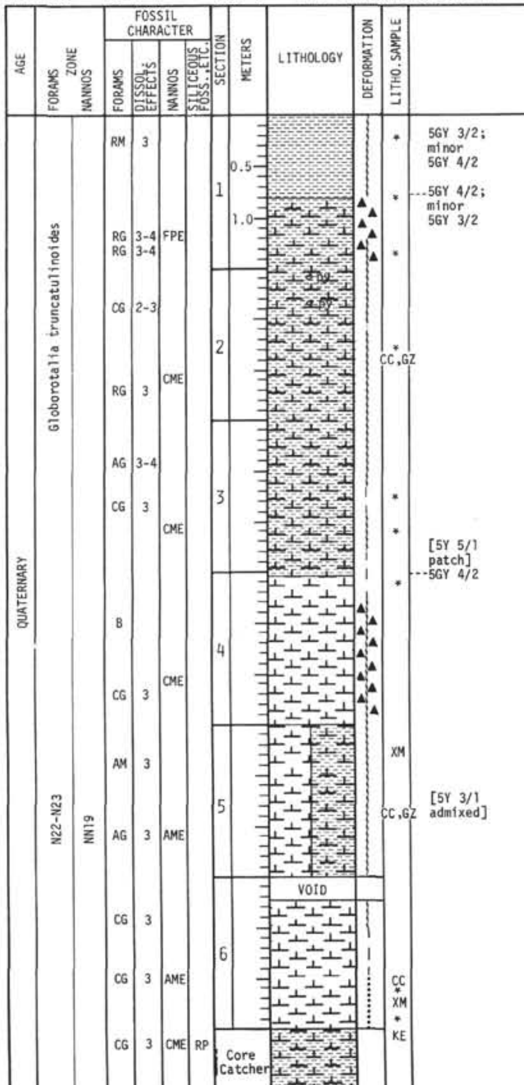
Site 250 Hole A Core 2 Cored Interval: 64.0-73.5 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS., ETC.	SECTION	LITHO. SAMPLE		LITHOLOGIC DESCRIPTION
QUATERNARY	G truncatulinoides; N22-N23	NN19	RM	3	CME		Scrapings	*	5Y 5/1	Gray DETRITAL SILTY CLAYEY COCCOLITH OOZE.



Explanatory notes in chapter 2

Site 250 Hole A Core 3 Cored Interval: 73.5-83.0 m



LITHOLOGIC DESCRIPTION

Top half of core is predominantly olive green and gray CLAYEY COCCOLITH OOZE; but top 80 cm of core is SILT-RICH DETRITAL CLAY.

Lower half of core is predominantly light gray and gray COCCOLITH OOZE with some admixed CLAYEY COCCOLITH OOZE as indicated.

TEXTURE: Average sand 0.0-0.1%
Average silt 13%
Average clay 87%

Total detrital content ranges between 5 and 100% and averages 30%.

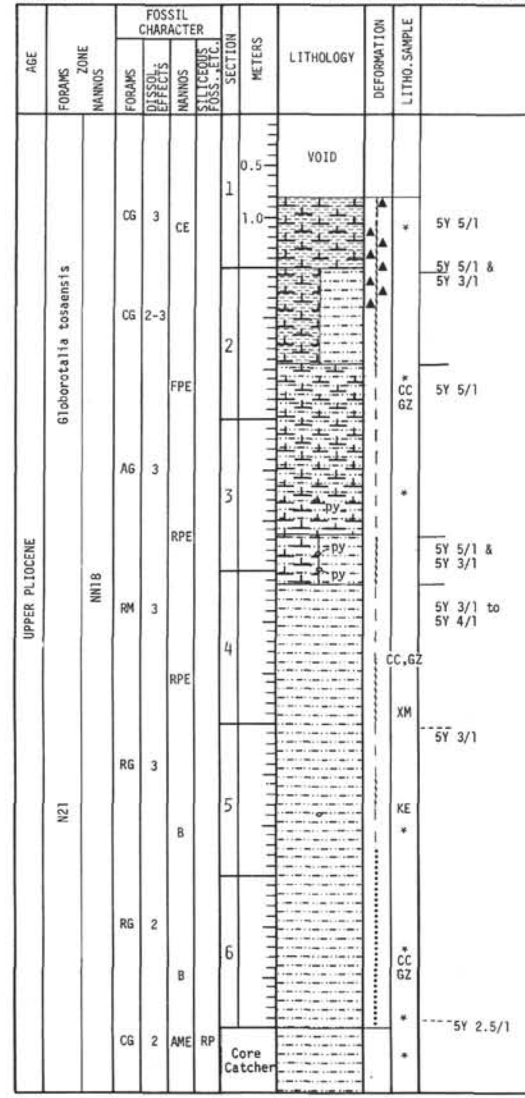
MINOR CONSTITUENTS: Traces of quartz and mica are present throughout the core, particularly in the siltier intervals. Traces of heavy minerals were observed in two smear slides toward the base of the core. Flecks of sediment several millimeters in diameter and rare laminae are colored dark gray by small quantities of micro-crystalline pyrite. Pyrite nodules, generally elongate and up to 3 cm long, are rare.

Traces of sponge spicules occur throughout. Diatoms and collophanous fish debris are somewhat less ubiquitous.

Total Carbon: 2.6-9.0%
Organic Carbon: 0.5-0.7%
Calcium Carbonate: 18.0-71.0%

Explanatory notes in chapter 2

Site 250 Hole A Core 4 Cored Interval: 111.5-121.0 m



LITHOLOGIC DESCRIPTION

Top half of the core is predominantly gray CLAY BEARING COCCOLITH OOZE and SILTY CLAYEY COCCOLITH OOZE, with subordinate admixtures of dark gray DETRITAL SILTY CLAY, which makes up the entire bottom half of the core, and becomes coccolith-bearing to coccolith-rich toward the base of Section 6.

Smear slides from the lowermost section reveal a change in clay character, the individual detrital grains gaining authigenic growth or replacement rims that become extinct under crossed nichols at angles which differ from extinction of the particle cores.

TEXTURE: Sand 0.0-0.1%
Silt 14-18%
Clay 82-86%
Total detrital content ranges between 10 and 98% and averages about 45%.

MINOR CONSTITUENTS: Traces of quartz and mica are present throughout, and are as high as 3% quartz and 2% mica in siltier intervals. Traces of feldspar are rarer. Flecks of sediment several millimeters in diameter and rare laminae are colored dark gray by small quantities of microcrystalline pyrite. Pyrite nodules, generally elongate and one or two centimeters long, are rare.

Traces of diatoms, sponge spicules and collophanous fish debris are present but not as common as in Cores 1 and 3.

Total Carbon: 0.7-2.4%
Organic Carbon: 0.4-0.6%
Calcium Carbonate: 1.0-16.0%

Explanatory notes in chapter 2

Site 250 Hole A Core 5 Cored Interval: 149.5-159.0 m

AGE: UPPER PLIOCENE

ZONE: FORAMS: *Globorotalia tosaensis* N21; NANNOS: *Discoaster brouweri* s.l. NN16-18

Section	Forams	Dissol. Effects	Nannos	Siliceous Foss. etc.	Litho. Sample	Color
1					*	5GY 4/2
2	RM	2			* ; CC,GZ	5Y 5/1
3	RG	2	CME		*	5Y 5/1
4	RM	2	RPE		** ; CC,GZ	5Y 3.5/1; 5Y 3/1; minor 5Y 5.5/1
5	RM	2-3	CMO		* * *	
6	RM	3	FPE		KE ; * ; CC	5Y 3.5/1; minor 2.5Y 3/0
Core Catcher	CG	2-3	FPO	RP	*	5Y 3/1

Lithology column: VOID (Section 1, 0-1.0 m); VOID (Section 2, lower part); VOID (Section 3, upper part); VOID (base of Section 4); N (Section 5); PY (Section 6, three levels); VOID (base of Section 6).

LITHOLOGIC DESCRIPTION

Predominantly olive green, olive gray and dark gray CLAY (86%) with minor gray SILTY CLAYEY COCCOLITH OOZE, CLAY-RICH COCCOLITH OOZE (Sections 3-5), and very dark gray COCCOLITH BEARING SILT-RICH CLAY.

TEXTURE: Silt 17-24%
Clay 76-84%

MINOR CONSTITUENTS: Quartz and mica are ubiquitous in trace amounts. Throughout the core, trace amounts of microscopic ferruginous material colors small flecks and laminae dark gray. A 0.25 cm nodule occurs in Section 5, and 3 pyrite nodules, one as large as 0.5 x 4 cm, were noted. Collophanous fish debris is widespread in trace amounts. Foraminifera, diatoms and sponge spicules are rare.

Total Carbon: 0.5-0.8%
Organic Carbon: 0.4%
Calcium Carbonate: 0-4%

Explanatory notes in chapter 2

Site 250 Hole A Core 6 Cored Interval: 187.5-197.0 m

AGE: ? ZONE: FORAMS ?, NANNOS ?

Section	Forams	Dissol. Effects	Nannos	Litho. Sample	Color
1				*	5GY 3/2
2	RM	3	B	* CC	
3	B		B	* XM ; XM	
4	B		B, B	KE ; * ; CC,GZ	5GY 3/2

Lithology column: VOID (Section 1, 0-1.0+ m); N (Section 3); N (Section 4).

LITHOLOGIC DESCRIPTION

Grayish olive green CLAY, individual particles under the microscope exhibiting authigenic growth or replacement rims.

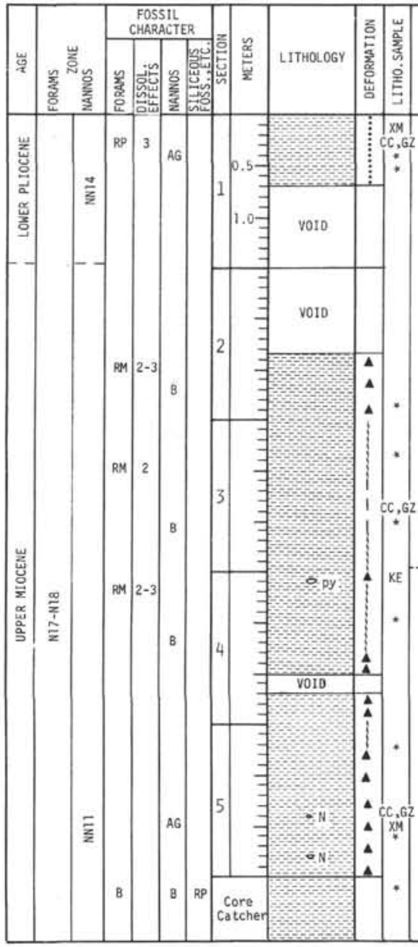
TEXTURE: Sand 0.0-0.1%
Silt 19-20%
Clay 80-81%

MINOR CONSTITUENTS: Trace quantities of quartz and mica ubiquitous. Microscopic grains of authigenic carbonate are as abundant as 1 percent. Two 0.5 to 1 cm diameter nodules as indicated. Trace quantities of collophanous fish remains observed in every smear slide. No other fossil remains.

Total Carbon: 0.4%
Organic Carbon: 0.4%
Calcium Carbonate: 0.0%

Explanatory notes in chapter 2

Site 250 Hole A Core 7 Cored Interval: 235.0-243.5 m



5Y 3/1; minor 5Y 4/1

5Y 3/1 to 5Y 4/1

[minor 5Y 5/1 admixture]

--5Y 4/1

5Y 3/2

LITHOLOGIC DESCRIPTION

Very dark gray to gray CLAY, with very minor bands and streaky patches of lighter CLAYEY COCCOLITH OOZE. Stiff where less disturbed. Clay particles rimmed as in preceeding cores.

TEXTURE: Sand 0.0-0.3%
Silt 13.0-19.0%
Clay 81.0-87.0%

MINOR CONSTITUENTS: Quartz and mica are ubiquitous in trace amounts and are each 1% in one smear slide. Only one slide showed a trace of heavy minerals.

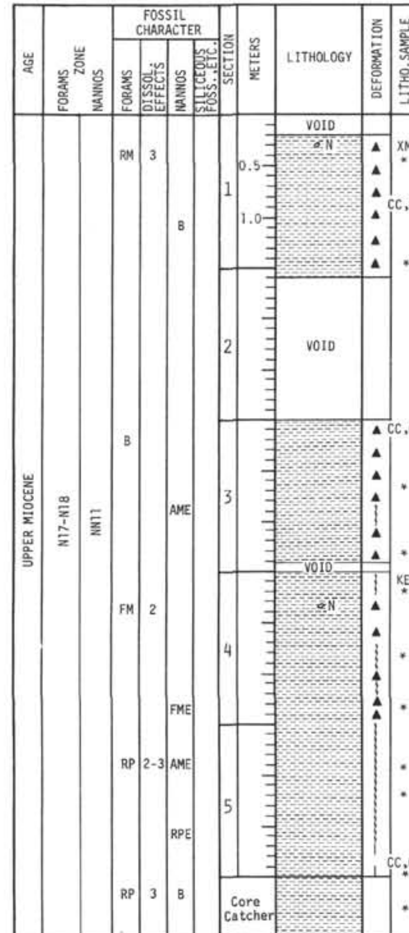
Authigenic carbonate is common in trace amounts, and two nodules, 0.5 to 2 cm in size were observed in Section 5.

Trace quantities of collophanous fish debris are common in the lower half of the core. Aside from one occurrence of diatom traces, no other fossils were observed in the clays.

Total Carbon: 0.4-0.8%
Organic Carbon: 0.3-0.4%
Calcium Carbonate: 1.0-3.0%

Explanatory notes in chapter 2

Site 250 Hole A Core 8 Cored Interval: 292.0-301.5 m



5Y 3.5/1; minor (10%) 5GY 6/2

--5GY 3/2
5Y 3.5/1

5GY 3.5/1; minor 5GY 6/2

5Y 4/1

--5G 2/1

5Y 3/1

LITHOLOGIC DESCRIPTION

Dark gray to very dark gray CLAY, with very minor patches of lighter gray COCCOLITH OOZE and SIDERITE-RICH COCCOLITH OOZE. The clay particles are rimmed, as in preceeding cores.

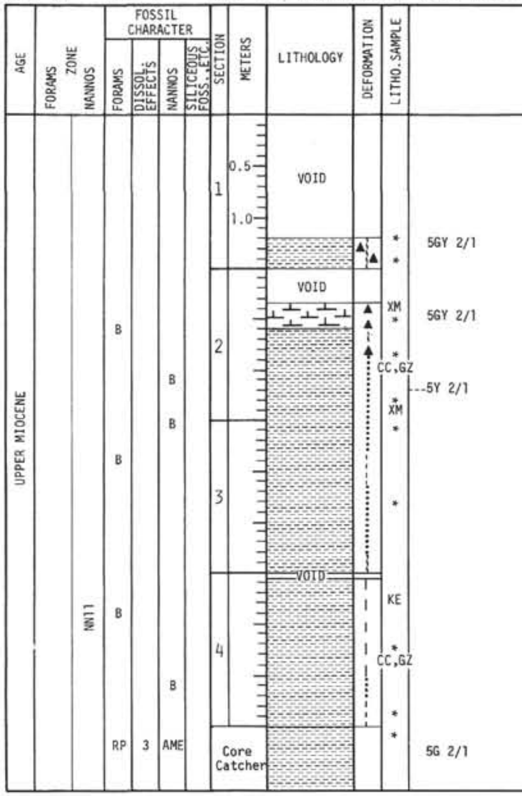
TEXTURE: Sand 0.1-0.2%
Silt 17.0-21.0%
Clay 79.0-83%

MINOR CONSTITUENTS: Quartz and mica are ubiquitous in trace amounts; quartz content was 2% in one smear slide. Traces of authigenic carbonate are common, and attain 20% in some of the coccolith ooze patches. Two nodules 0.5 to 1.5 cm in diameter were noted.

Total Carbon: 0.4-0.5%
Organic Carbon: 0.4%
Calcium Carbonate: 0.0-1.0%

Explanatory notes in chapter 2

Site 250 Hole A Core 9 Cored Interval: 349.0-358.5 m



LITHOLOGIC DESCRIPTION

Olive or greenish black CLAYS throughout, except for approximately 5% to 10% of Section 1 and the 35-60 cm interval of Section 2, which are olive greenish gray COCCOLITH OOZE and COCCOLITH-RICH CLAY. Rare (less than 5%) very dark grayish black CLAY, colored by microscopic opaque ferruginous material in Section 2.

TEXTURE: Sand 0.0-0.1%
Silt 10-14%
Clay 86-90%

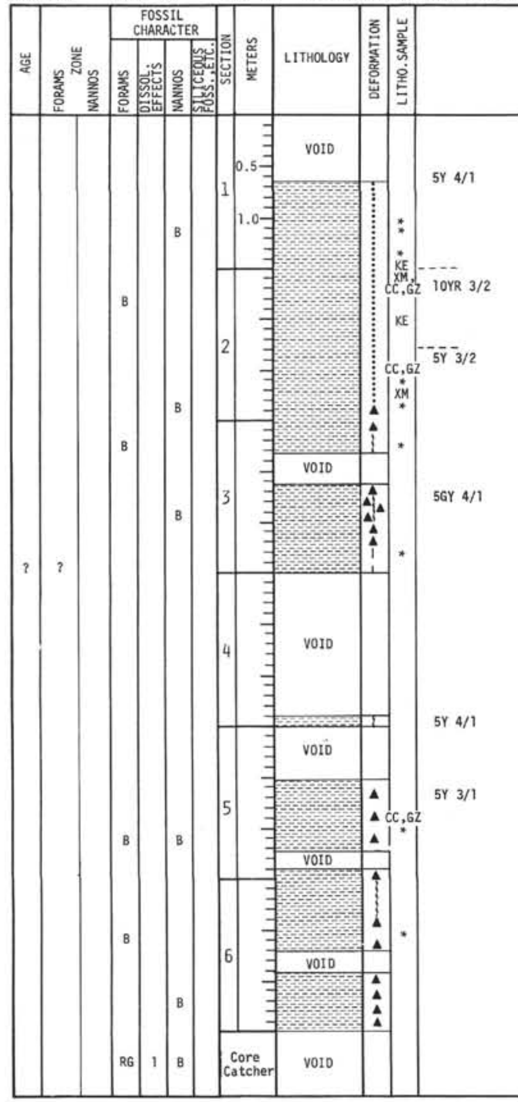
MINOR CONSTITUENTS: Quartz and mica present in trace amounts. Authigenic carbonate comprises approximately 8% of the coccolith-rich clay in Section 2. Patches of authigenic carbonate as large as 1.5 x 4 cm but generally smaller than 0.5 cm are widespread in Sections 1, 3, and 4. Scattered zeolitic patches were noted in Section 4.

Total Carbon: 0.3-0.5%
Organic Carbon: 0.4-0.6%
Calcium Carbonate: 0.0%

CONSOLIDATION: Stiff where not intensely disturbed.

Explanatory notes in chapter 2

Site 250 Hole A Core 10 Cored Interval: 406.0-415.5 m



LITHOLOGIC DESCRIPTION

The entire core consists of CLAY. Sections 1, 2 and 3 exhibit numerous color changes, both gradational and sharp, between greenish gray, yellowish brown, and olive brown. Possible slight mottling occurs in these sections. The remainder of the core consists of olive gray CLAY. Individual clay particles are authigenically or replacement rimmed as in previous cores.

TEXTURE: Sand 0.0-0.2%
Silt 12-14%
Clay 86-88%

MINOR CONSTITUENTS: Quartz and mica are ubiquitous in trace amounts. Fish debris are less common. Trace quantities of authigenic minerals include zeolite (?), carbonates and glauconite.

Total Carbon: 0.2-0.4%
Organic Carbon: 0.2-0.3%
Calcium Carbonate: 0.0-1.0%

CONSOLIDATION: Stiff, except for badly disturbed Section 3.

Explanatory notes in chapter 2

Site 250 Hole A Core 11 Cored Interval: 463.0-472.5 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS.,ETC.	SECTION	LITHO. SAMPLE		LITHOLOGIC DESCRIPTION
LOWER & MIDDLE MIOCENE	?	?	B B B B B B B		B B B B B B B B		1	MY * XM, * CC,GZ	5Y 2/1 to 5GY 4/1	CLAY, generally greenish black to dark olive gray, except for two 60 cm dark yellowish brown gradational intervals in Sections 4 and 5. Microscopically, the clay particles show authigenic or replacement rims. The top 10 cm of the core is semi-lithified and contains fine dolomitic laminae.
							2		5Y 2/1 to 5Y 2.5/1	TEXTURE: Silt 12-15%, Clay 85-88%
							3	* CC,GZ, * XM * CC,GZ	5Y 2/1 to 5GY 4.5/1 [thin 5YR 2/1 band]; [thin 5YR 2/1 band]	MINOR CONSTITUENTS: Quartz and mica are ubiquitous in trace amounts. The clay appears largely barren of fossils.
							4	XM CC,GZ * *	10YR 3/2; 5Y 3/1	Total Carbon: 0.2-0.9%; Organic Carbon: 0.2-0.3%; Calcium Carbonate: 0.0-5.0%
							5	** XM	10YR 3/2; 5Y 3/1	CONSOLIDATION: With the exception of the semi-lithified 10 cm top of the core, the clays are stiff where not intensely disturbed.
							6	* CC,GZ KE	5Y 4/1 to 5Y 3/1	MOTTLING: Slight mottling, either chemical or biogenic, was observed in Sections 1 and 2.

Explanatory notes in chapter 2

Site 250 Hole A Core 12 Cored Interval: 520.0-524.0 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS.,ETC.	SECTION	LITHOLOGY	LITHO. SAMPLE		LITHOLOGIC DESCRIPTION
?	?		B		B		1	VOID	KE CC,GZ	5Y 4/1; 5GY 6/1; 5Y 3/1	Semi-lithified olive gray CLAY with splintery fracture due to drilling deformation. Same clay as in previous cores. TEXTURE: Sand 0.5%, Silt 13%, Clay 86%. Between 108 and 115 cm, greenish gray laminated FINE SAND; possibly an altered tuff composed largely of a carbonate matrix containing scattered grains of quartz, plagioclase, biotite and opaque ferruginous granules.

Explanatory notes in chapter 2

Site 250 Hole A Core 13 Cored Interval: 567.5-577.0 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS.,ETC.	SECTION	LITHOLOGY	LITHO. SAMPLE		LITHOLOGIC DESCRIPTION
LOWER-MIDDLE MIOCENE	?	NN3-NN5	B B B B B		RPE B B B		1	VOID; VOID	MY CC XM * * CC,GZ XM *	5GY 6/1; 5GY 4/1; 5YR 3/4; 5YR 3/4; 5G 2/1 to 5Y 4/1	The core consists of CLAY throughout with the exception of 10 cm of lithified very fine CARBONATE SAND similar in aspect to the sand in Core 12 tentatively identified as an altered tuff. The clays vary in color from greenish black to olive gray, with a 90 cm interval of moderate brown near the top of the core. Fragments of similar brown clay make up less than 1% of the basal brecciated interval of Section 4. Slight mottling occurs in Section 3.
							2		* GZ *		TEXTURE: Sand 0%, Silt 16-20%, Clay 80-84%
							3	VOID	MY * * KE		MINOR CONSTITUENTS: Trace amounts of quartz and mica are ubiquitous, and collophanous fish debris is also common. Isolated patches and elongated tubes of sideritic carbonate, oriented parallel to bedding, occur in Section 3, particularly between 10-45 and 85-115 cm. Microscopic ferrous and ferric particles strongly influence the clay colors, being finely disseminated throughout the sediment. Total Carbon: 0.2%; Organic Carbon: 0.2%; Calcium Carbonate: 0.0%
							4		*	5G 2/1 to 5Y 4/1; same as above, with minor (1%) 5YR 3/4	CONSOLIDATION: Semi-lithified except at the bottom of the core which was brecciated by drilling.
							Core Catcher		*	5Y 3/2	

Explanatory notes in chapter 2

Site 250 Hole A Core 14 Cored Interval: 605.5-615.0 m

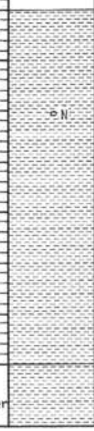
Columns: AGE | ZONE (FORAMS, NANNOS) | FOSSIL CHARACTER (FORAMS, DISSOL. EFFECTS, NANNOS, SILICEOUS FOSS., ETC.) | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION

Age: ? ; Zone: Forams ? , Nannos ?

Fossil character: Forams B, B, B, B; Nannos B, B, B, B

Sections: 1, 2, 3, Core Catcher (0.5, 1.0 m marks)

LITHOLOGY: VOID (upper part of Section 1)



Litho. sample / color annotations:

- * 5GY 3/1
- 10YR 3/2
- 5GY 2/1
- 5GY 2/1
- * 5YR3/4
- CC,GZ 5GY 3/1
- XM 10YR 3/2
- CC,GZ
- * 5Y 4/1 & 5G 4/1
- 5YR 3/4
- * KE [thin bands, 10YR 3/2]
- XM
- 5GY 4/1
- 5YR 3/4 (20%) admixed with 5GY 3/1 (80%)
- *
- * 5Y 2/1

The entire core is CLAY, approximately half is dark olive green to olive black, and the other half is moderate brown to dark yellow brown, the individual color intervals varying in thickness from 2 to 50 cm. The clay particles are authigenically or replacement rimmed as in previous cores.

TEXTURE: Sand 0.1-0.2%
Silt 18-20%
Clay 80-82%

MINOR CONSTITUENTS: With the exception of rare collophanous fish debris, the clay is barren of fossils. Quartz is ubiquitous in amounts up to 5%, and traces of mica and heavy minerals are found throughout the core. In the olive clays, small patches of authigenic carbonate are found, and one small nodule was noted.

Total Carbon: 0.2%
Organic Carbon: 0.2-0.3%
Calcium Carbonate: 0.0%

CONSOLIDATION: Semi-lithified where undisturbed or slightly disturbed; stiff to soft where deformed by drilling.

Explanatory notes in chapter 2

Site 250 Hole A Core 15 Cored Interval: 624.5-634.0 m

Columns: AGE | ZONE (FORAMS, NANNOS) | FOSSIL CHARACTER (FORAMS, DISSOL. EFFECTS, NANNOS, SILICEOUS FOSS., ETC.) | SECTION | METERS | LITHOLOGY | DEFORMATION | LITHO. SAMPLE | LITHOLOGIC DESCRIPTION

Zone: ?

Fossil character: Forams B, B, B, B, B; Nannos B, B, B, B, B, FPE, B

Sections: 1, 2, 3, 4, Core Catcher (0.5, 1.0 m marks)

LITHOLOGY: VOID (upper part of Section 1)

Litho. sample / color annotations:

- * 5GY 2/1 to 5G 2/1
- *
- CC,GZ 5G 4/1
- XM 10YR 3/2
- * 5G 4/1
- XM * [5G 4/1 band]
- 10YR 3/2
- KE 5YR 3/4
- *
- [5GY 2/1 band]
- CC,GZ XM *
- XM 10Y 4/2
- * 5GY 2/1 & 10Y 4/2
- CC,GZ 5GY 2/1
- 5GY 2/1 & 5Y 6/1 interlaminated
- * 5GY 2/1
- * 5GY 2/1 & 5Y 6/1 interlaminated
- 5Y 3/2

With the exception of the uppermost 3 cm of the core which appears to be a lithified DOLOMITE with the texture of very fine sand, the entire core is CLAY, the top 170 cm and bottom 110 cm, or 55% of the core is olive green to olive black; the central 234 cm is moderate brown to dark yellow brown. The olives and browns grade into each other over narrow intervals. The clay particles are authigenically or replacement rimmed.

TEXTURE: Sand 0-0.6%
Silt 15-20%
Clay 80-85%

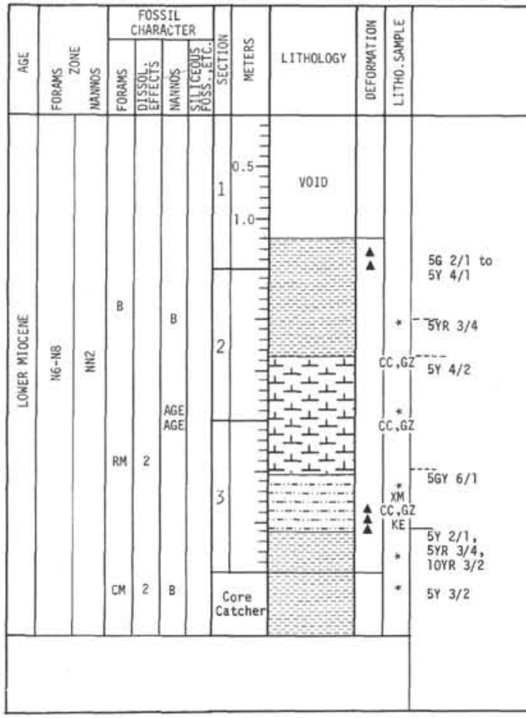
MINOR CONSTITUENTS: Quartz is present throughout the core, from trace amounts to as much as 10%. Mica is also ubiquitous, from trace quantities to as much as 6%. Half of the smear slides showed 1-3% feldspar. Heavy minerals, notably zircon, were less common, in trace amounts. Microcrystalline authigenic carbonate (dolomite or siderite) shows on some slides in traces. One occurrence of a glauconite grain was noted. With the exception of uncommon collophanous fish debris, the core is barren of fossils.

Total Carbon: 0.2-1.2%
Organic Carbon: 0.2-0.4%
Calcium Carbonate: 0.0-7.0%

CONSOLIDATION: The core is semi-lithified except where softened by drilling deformation.

Explanatory notes in chapter 2

Site 250 Hole A Core 16 Cored Interval: 634.0-643.5 m



LITHOLOGIC DESCRIPTION

The core consists of CLAY above and below a sequence of SILTY NANNOFOSSIL BEARING CLAY and COCCOLITH OOZE. Greenish black and olive gray CLAY in Section 1 and the upper part of Section 2 pass gradationally down to 30 cm of BROWN CLAY (Section 2, 55-85 cm). Underlying the brown clay with a gradational contact is 110 cm of light olive gray COCCOLITH OOZE containing discoasters. This lithology passes down with a narrow gradational contact into NANNOFOSSIL BEARING SILTY CLAY. The basal clays grade downward in color from olive black to brown and dark yellowish gray. At 130 cm in Section 4 an elongate burrow 0.75 x 5 cm is filled with very fine carbonate clayey silty sand. The clays are rimmed as in previous cores.

TEXTURE: Sand 0.0-1.3%
Silt 26-66%
Clay 32-74%
The core shows an appreciable increase in silty terrigenous components compared with preceeding cores.

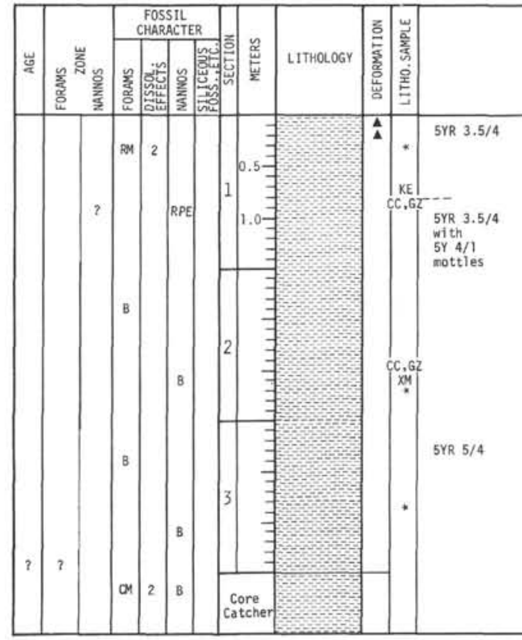
MINOR CONSTITUENTS: Quartz and mica are present in appreciable amounts (up to 10%). Trace quantities of heavy minerals include zircon, sphene, apatite and iron oxides. Authigenic minerals include glauconite traces and carbonate which in one smear slide approached 30%.

Total Carbon: 5.1-6.2%
Organic Carbon: 0.2-1.8%
Calcium Carbonate: 37-41%

CONSOLIDATION: Semi-lithified.

Explanatory notes in chapter 2

Site 250 Hole A Core 17 Cored Interval: 643.5-653.0 m



LITHOLOGIC DESCRIPTION

The entire core is MODERATE BROWN CLAY with slight (less than 1%) olive gray mottling throughout, with the exception of the uppermost 80 cm. The clay particles are authigenically or replacement rimmed.

TEXTURE: Sand 0.6-0.7%
Silt 15-16%
Clay 84%

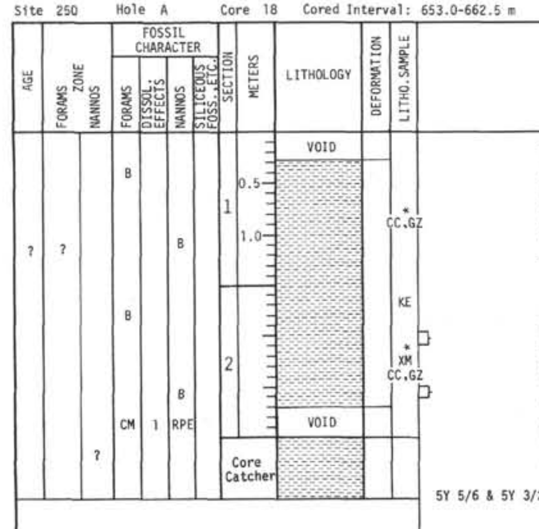
MINOR CONSTITUENTS: Traces to several percent of quartz, feldspar and mica are common; traces of heavy minerals are rare. The clays are barren of fossils. Traces of microscopic authigenic carbonate are uncommon. Finely divided amorphous ferric material is disseminated throughout.

Total Carbon: 0.1%
Organic Carbon: 0.2%
Calcium Carbonate: 0.0%

CONSOLIDATION: Semi-lithified.

Explanatory notes in chapter 2

Site 250 Hole A Core 18 Cored Interval: 653.0-662.5 m



LITHOLOGIC DESCRIPTION

The core is moderate brown CLAY with slight (less than 1 percent) olive gray mottling which is especially pronounced at the 50-60 cm and 100-110 cm intervals of Section 2. The core catcher sample is light olive brown and olive gray CLAY. The clay particles are authigenically or replacement rimmed.

TEXTURE: Sand 0.1-0.3%
Silt 18%
Clay 82%

MINOR CONSTITUENTS: Quartz comprises 1 to 5 percent of the core; mica is present in traces to 1 percent; traces of fish debris are present. The clay is otherwise barren of fossils.

Total Carbon: 0.1-0.2%
Organic Carbon: 0.2%
Calcium Carbonate: 0.0%

CONSOLIDATION: Semi-lithified.

Explanatory notes in chapter 2

Site 250 Hole A Core 19 Cored Interval: 662.5-672.0 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS. ETC.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
?	?	?	B				1	0.5, 1.0	VOID		*
			FM	2			2				XM *, XM CC,GZ *
					B						
					B		3				* KE *, KE, *
			FM	2	B		Core Catcher		VOID		*

5YR 3/4
10YR 4/2 & 5Y 5/2
5YR 3/4
5Y 5/2
10YR 4/2
5YR 3/4
5GY 4/1
10YR 3/2
10YR 5/2

LITHOLOGIC DESCRIPTION

Predominantly (85%) moderate brown and yellowish brown CLAYS, with subordinate (15%) gray and dark gray CLAY. Clay grains are microscopically rimmed as in previous cores.

TEXTURE: Sand 0%
Silt 14%
Clay 86%

MINOR CONSTITUENTS: Quartz is present everywhere in appreciable amounts (up to 5%), and trace quantities of mica are ubiquitous. Scattered specks of zeolite occur throughout the core. The clays are barren of fossils.

Total Carbon: 0.1%
Organic Carbon: 0.2%
Calcium Carbonate: 0.0%

CONSOLIDATION: Semi-lithified.

Explanatory notes in chapter 2

Site 250 Hole A Core 20 Cored Interval: 672.0-681.5 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS. ETC.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
?	?	?	B, FP		B		1	0.5, 1.0	VOID		*, *
			B				2				KE CC,GZ
			RG		B						
			RM		B		Core Catcher				*

5Y 2/1
[5Y 4/1 2 cm]
5YR 3/4
5GY 3/1
5YR 3/4
5GY 4/1
[5Y 4/1 band]
5YR 3/4
5GY 4/1
5YR 3/4
5GY 4/1
5YR 3/4
[5GY 4/1 2 cm]
5Y 3/1
5Y 3/2

LITHOLOGIC DESCRIPTION

CLAY, 52% of which is moderate brown, the remaining 48% being sharply defined interbeds varying in color from olive gray and greenish gray to olive black and containing olive black mottles and burrows. The clay grains show microscopic authigenic growth or replacement rims.

TEXTURE: Sand 0%
Silt 16%
Clay 84%

MINOR CONSTITUENTS: Detrital silt-sized quartz constitutes 1% of the sediment; feldspar occurs in amounts varying from traces to 1%. The clays are barren of fossils.

Total Carbon: 0.1%
Organic Carbon: 0.2%
Calcium Carbonate: 0.0%

CONSOLIDATION: Semi-lithified.

Explanatory notes in chapter 2

Site 250 Hole A Core 21 Cored Interval: 681.5-691.0 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS. ETC.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
?	?	?	RP				1	0.5, 1.0	VOID		*, KE CC,GZ
			B, FM				2				*
					B						XM *
			RM		B		Core Catcher				*

5Y 4/1
5YR 3/4
5Y 3/1
5YR 3/4
5GY 4/1
5YR 3/4
5YR 4/4

LITHOLOGIC DESCRIPTION

CLAY, predominantly (85%) moderate brown, with subordinate olive gray and greenish gray CLAYS. Most color boundaries are gradational. Burrowing is common, particularly at 83 cm in Section 1 and 140 cm in Section 2, and evidence of bioturbation is seen in Section 2.

TEXTURE: Sand 0%
Silt 16%
Clay 84%

MINOR CONSTITUENTS: Quartz, feldspar, mica and heavy minerals (notably zircon and opaques) are present in trace quantities. Authigenic minerals are represented by trace amounts of dolomite. Nannofossils may constitute up to 4%.

Total Carbon: 0.1%
Organic Carbon: 0.2%
Calcium Carbonate: 0.0%

CONSOLIDATION: Semi-lithified.

Explanatory notes in chapter 2

Site 250 Hole A Core 22 Cored Interval: 691.0-700.5 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS. ETC.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE		LITHOLOGIC DESCRIPTION
CONIACIAN	?	Coniacian	B, B, B, RM, RM, RM, RP		B, B, CPE, CPE, B, FPE		1, 2, 3, 4, Core Catcher	0.5, 1.0	VOID, VOID	▲▲	*, *, MY, CC,GZ, KE, XM, *, KE, CC,GZ, *, *	5YR 4/4; 5YR 3.5/4; Inoceramus fragment; 5YR 6/4	The entire core is composed of moderate brown ZEOLITE-BEARING CLAY and NANNOFOSSIL ZEOLITE BEARING CLAY. Black nodules of opaque iron and/or manganese oxides up to 1.5 cm in diameter are common throughout. Sections 2 and 4 also contain abundant dark laminae and diffuse zones of these oxides in a finely disseminated state. A 3 mm band of chert was noted in Section 4 at 35 cm. Organic burrows up to 3 mm in diameter oriented roughly parallel to bedding are common in Sections 3 and 4. The clays are microscopically rimmed as in previous cores. TEXTURE: Sand 0-0.3%, Silt 18-29%, Clay 71-82% MINOR CONSTITUENTS: Traces of quartz, feldspar, micas and opaque heavy minerals occur throughout. Within the dark laminae finely disseminated iron and/or manganese oxides form up to 50% of the sediment. Zeolites average about 7%; one specimen, at 120.5 cm in Section 1, contains about 20%. Dolomite rhombs occur in trace amounts. Calcareous nannofossils average about 4%. Total Carbon: 0.1-0.2% Organic Carbon: 0.2% Calcium Carbonate: 0.0% CONSOLIDATION: Semi-lithified throughout.

Explanatory notes in chapter 2

Site 250 Hole A Core 23 Cored Interval: 700.5-710.0 m

AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS. ETC.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE		LITHOLOGIC DESCRIPTION
CONIACIAN	?	Coniacian	B, RG, B		FPE, RPE, B		1, 2, Core Catcher	0.5, 1.0	VOID	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲	KE, *, *, CC,GZ, XM, MY, *, KE, *, KE, *	5YR 5/2; 5YR 4/4; 10YR 5/4; 5YR 4/4	The core consists predominantly of pale brown CLAY, pale brown ZEOLITE RICH CLAY, and moderate brown ZEOLITE CLAY. One smear slide, from 105 cm in Section 1, is a pure claystone. The entire core is characterized by grayish black laminae, dark gray intervals, and dark gray patches, all reflecting local high concentrations of iron and/or manganese oxides. Color boundaries tend to be fairly sharply defined. Subhorizontal burrows less than 0.5 cm in diameter occur in Section 2. TEXTURE: Silt 5%, Clay 95% (smear slide) MINOR CONSTITUENTS: Detrital silt-sized quartz contents range up to 5%, with one smear from 56 cm in Section 1 containing approximately 40%. Feldspar, mica, and collophanous fish debris are present in trace amounts. Authigenic zeolite is present in amounts of up to 25%. The finely disseminated iron and/or manganese oxides compose up to 50% of the darker colored intervals. Total Carbon: 0.1% Organic Carbon: 0.1% Calcium Carbonate: 0.0% CONSOLIDATION: Semi-lithified.

Explanatory notes in chapter 2

Site 250 Hole A Core 24 Cored Interval: 710.0-719.5 m

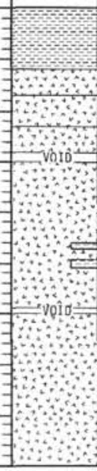
AGE	FORAMS ZONE	NANNOS ZONE	FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS. ETC.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE		LITHOLOGIC DESCRIPTION
?	?		B, RM		B, B, B, B, B, B, B		1, 2	0.5, 1.0	VOID	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲	*, CC,GZ, *, *, KE, *, *, CC,GZ, XM, *	5GY 4/1; 5Y 4/1; 5Y 5/2; 5YR 5/4; 5GY 2/1 to 5GY 4/1 [5G 4/1, 2 cm]; 5Y 4/2	CLAY predominantly olive gray and grayish olive, with minor light olive gray, dark greenish gray and olive black layers, particularly at the top of the core. One 5 cm thick zone (102-107 cm, Section 1) is light moderate brown. Small burrows, both lighter and darker in color than the host sediment, occur throughout Section 2. The sediment is massive and unlaminated. As in the previous cores, the clay particles are rimmed authigenically or by replacement. TEXTURE: Sand 0%, Silt 6-8%, Clay 92-94% MINOR CONSTITUENTS: Detrital silt-sized quartz is ubiquitous in amounts of 1-3%. Feldspar and mica traces are also present throughout. Heavy minerals including garnet, apatite and rutile or anatase are also common in trace amounts. Collophanous fish debris is rare; the core otherwise appears barren of fossils. Total Carbon: 0.3% Organic Carbon: 0.3-0.4% Calcium Carbonate: 0.0% CONSOLIDATION: Semi-lithified.

Explanatory notes in chapter 2

Site 250 Hole A Core 25 Cored Interval: 719.5-729.0 m

AGE	FORAMS ZONE	NANNOS ZONE	FOSSIL CHARACTER: FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS., ETC.	SECTION	METERS
?	?		RG		B B B		1 2 3	0.5 1.0

LITHOLOGY



DEFORMATION

LITHO. SAMPLE: CC,GZ XM * ; * TS, MY ; TS, MY * ; * * * ; *

LITHOLOGIC DESCRIPTION

10YR 4/2

5Y 2/1

10YR 5/4 to 10YR 4/2

5Y 2/1, weathered 5Y 5/2

5Y 2/1

[10YR 4/2]

[10YR 4/2]

5Y 2/1

Dark yellowish brown massive CLAY: 5% silt; 95% clay; quartz 1%; feldspar and mica trace to 1%; rare fish debris, otherwise barren of fossils.

COARSE SUBOPHITIC OLIVINE BASALT, weathered brownish.

DEVITRIFIED WEATHERED GLASSY OLIVINE BASALT.

COARSE SUBOPHITIC OLIVINE BASALT, olive black weathered brownish; weathering diminishing down the core.

At 80-85 cm and 95-102 cm in Section 2, semi-lithified brown CLAY identical to the clay at the top of the core occurs in the basalt. The boundary between the basalt and clay is a shared calcitic vein up to 5 mm thick. The clay shows no evidence of deuteric alteration.

Other calcitic randomly oriented veining occurs diminishingly down the core.

SEDIMENTARY TEXTURE: Sand 0%
Silt 8%
Clay 92%

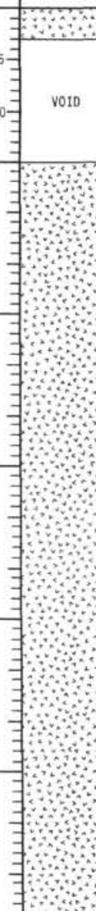
UPPERMOST UNIT:
Total Carbon: 0.1%
Organic Carbon: 0.2%
Calcium Carbonate: 0.0%

Explanatory notes in chapter 2

Site 250 Hole A Core 26 Cored Interval: 729.0-738.5 m TD

AGE	FORAMS ZONE	NANNOS ZONE	FOSSIL CHARACTER: FORAMS	DISSOL. EFFECTS	NANNOS	SILICEOUS FOSS., ETC.	SECTION	METERS
							1 2 3 4 5 6	0.5 1.0

LITHOLOGY



DEFORMATION

LITHO. SAMPLE: LD LD ; LD ; LD ; * TS,MY LD ; *

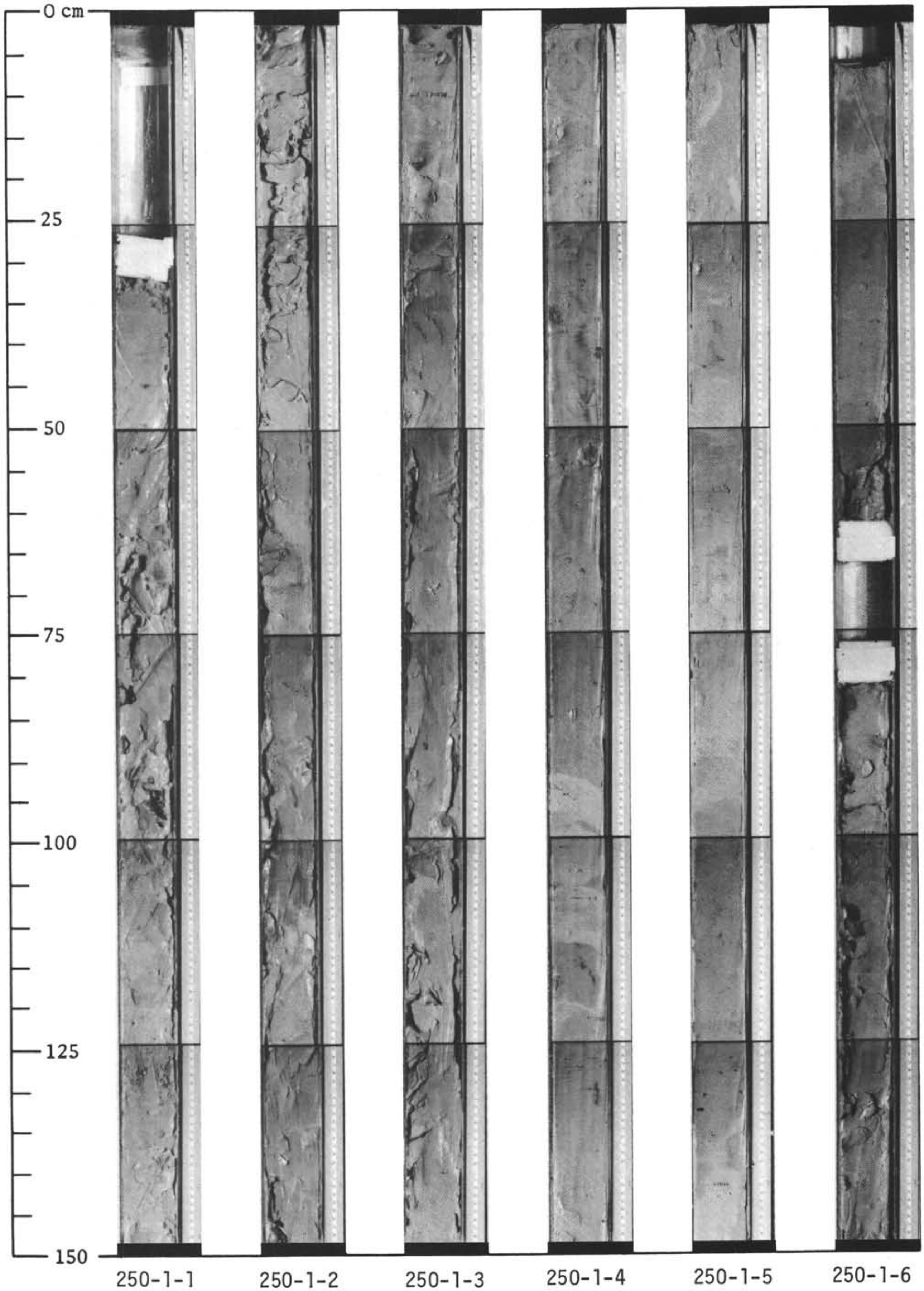
LITHOLOGIC DESCRIPTION

5Y 6/1

N4

Medium grained OLIVINE BASALTS, weathered olive gray down to approximately 90 cm, Section 4. Veining by calcite and dark green serpentine. Calcite-filled vesicles abundant between 90 cm and 150 cm, Section 3. Below 100 cm, Section 4, medium grained dark gray fresh OLIVINE BASALT.

Explanatory notes in chapter 2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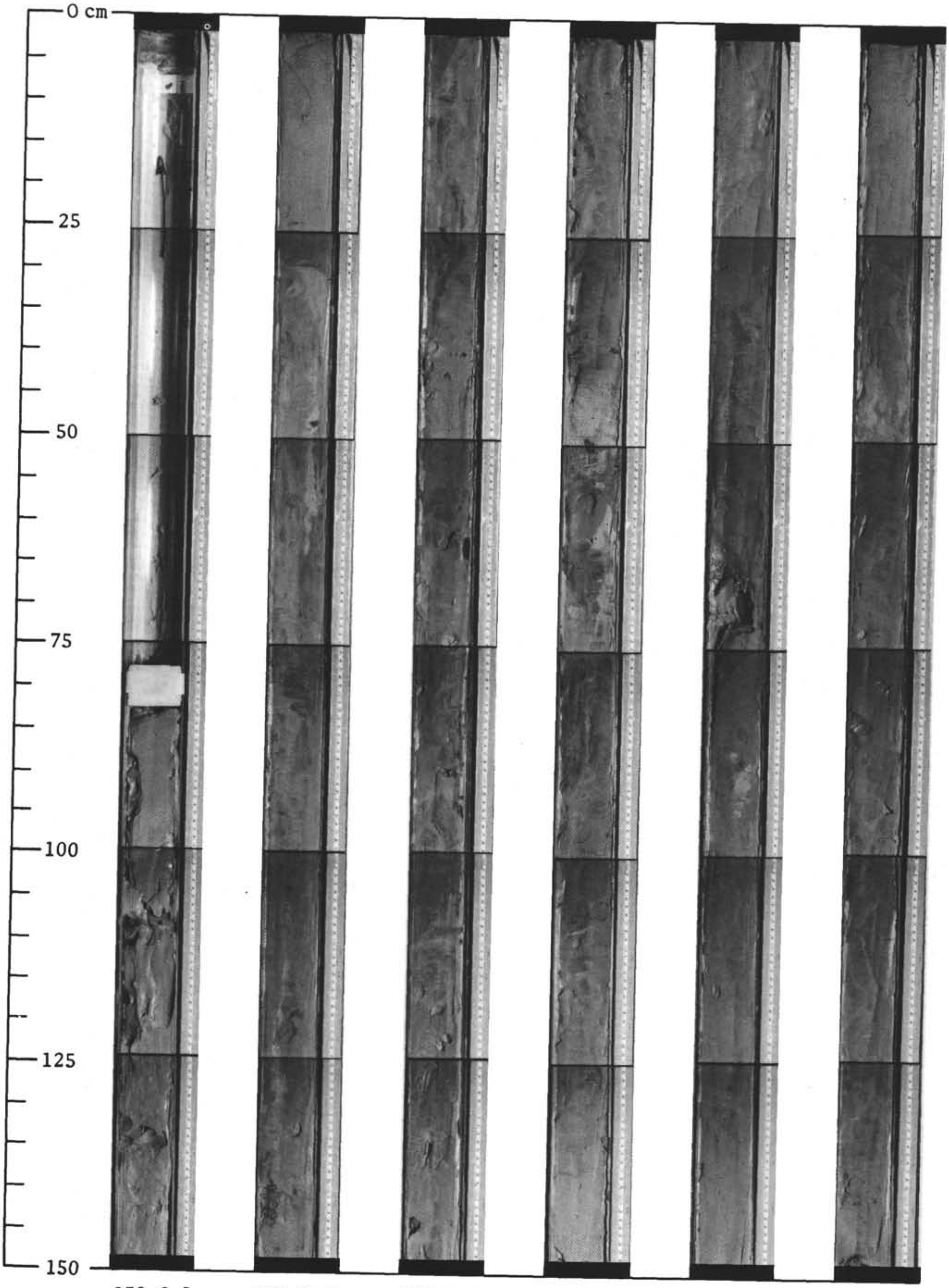
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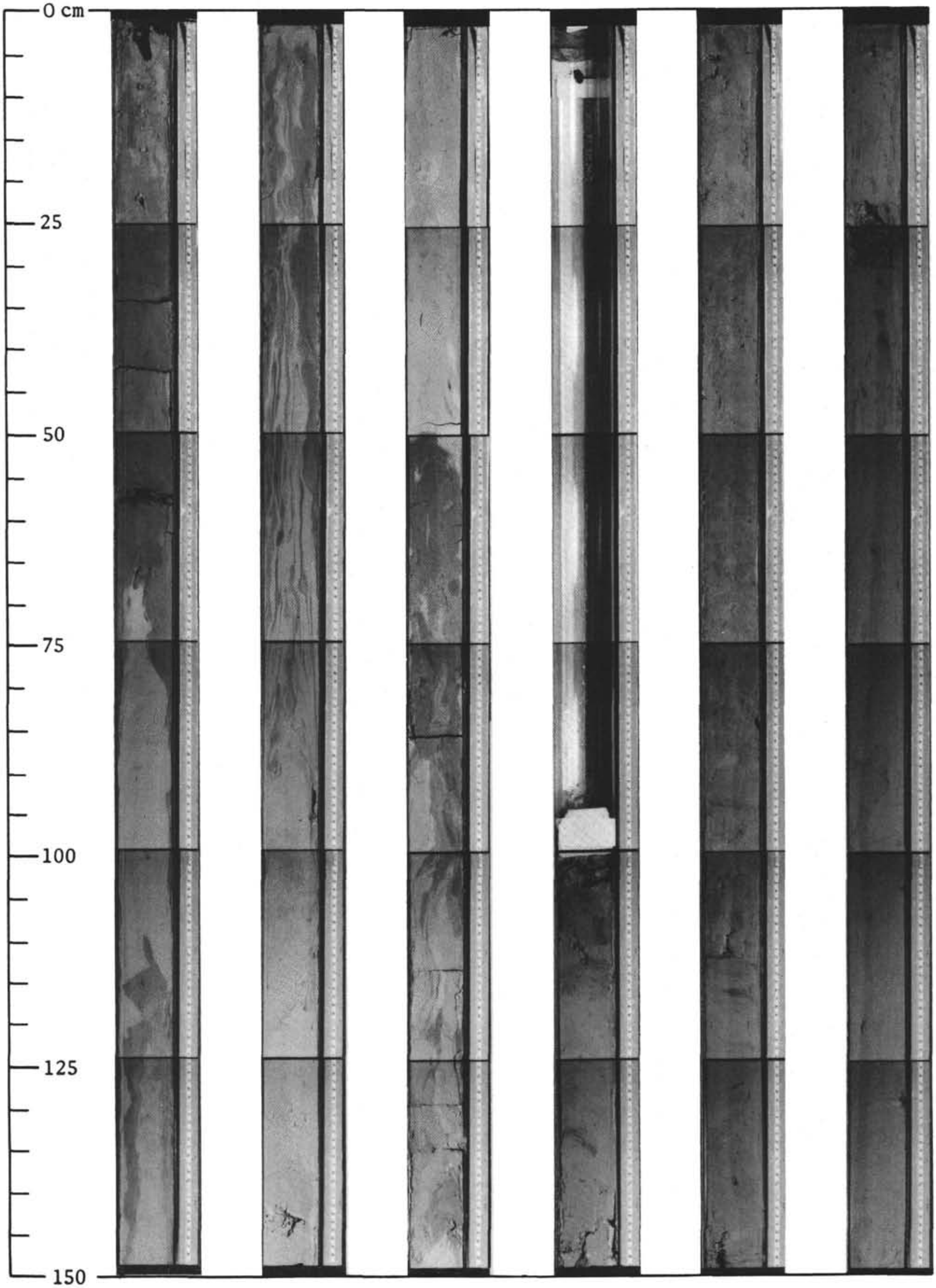
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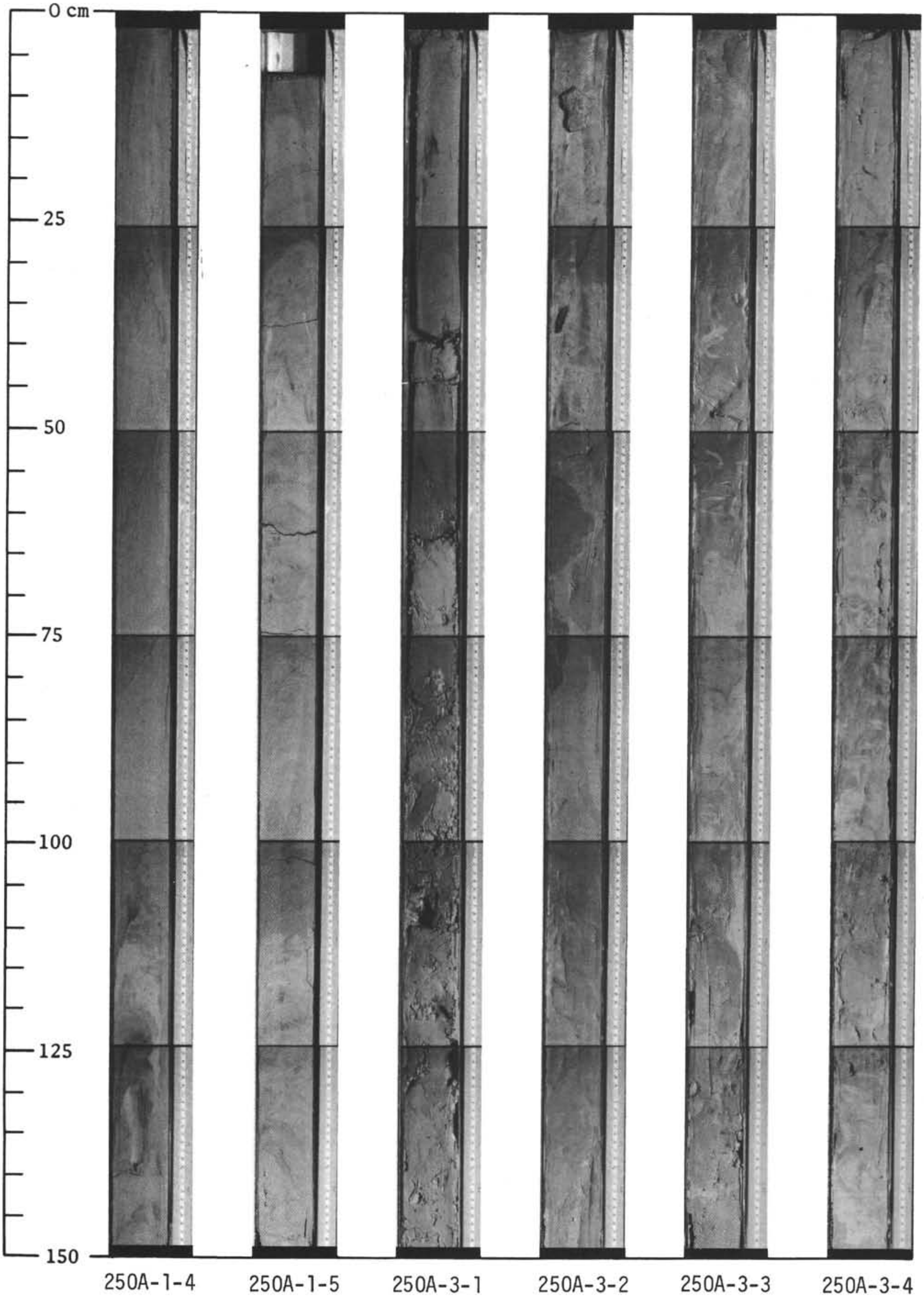
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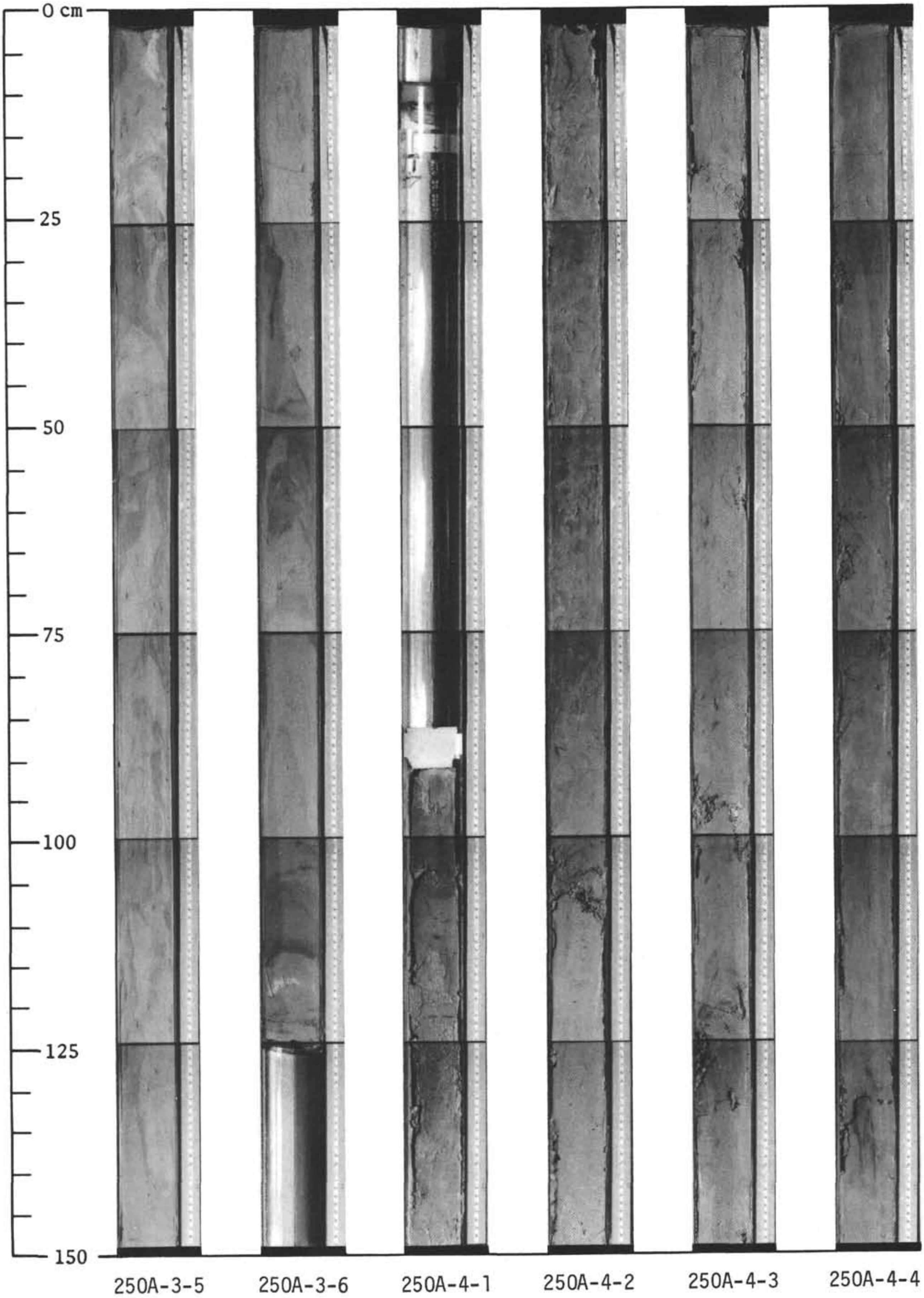
250A-3-4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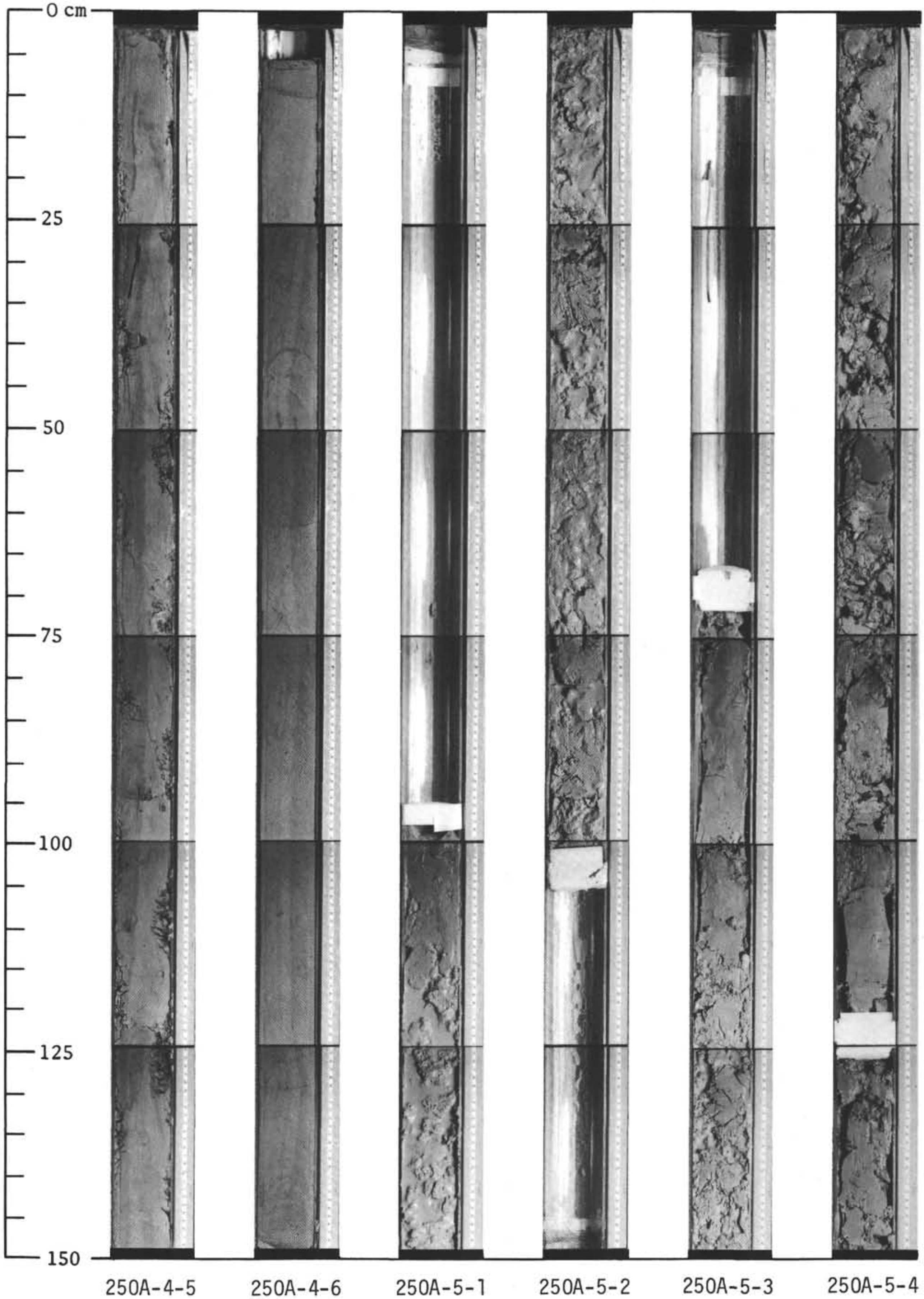
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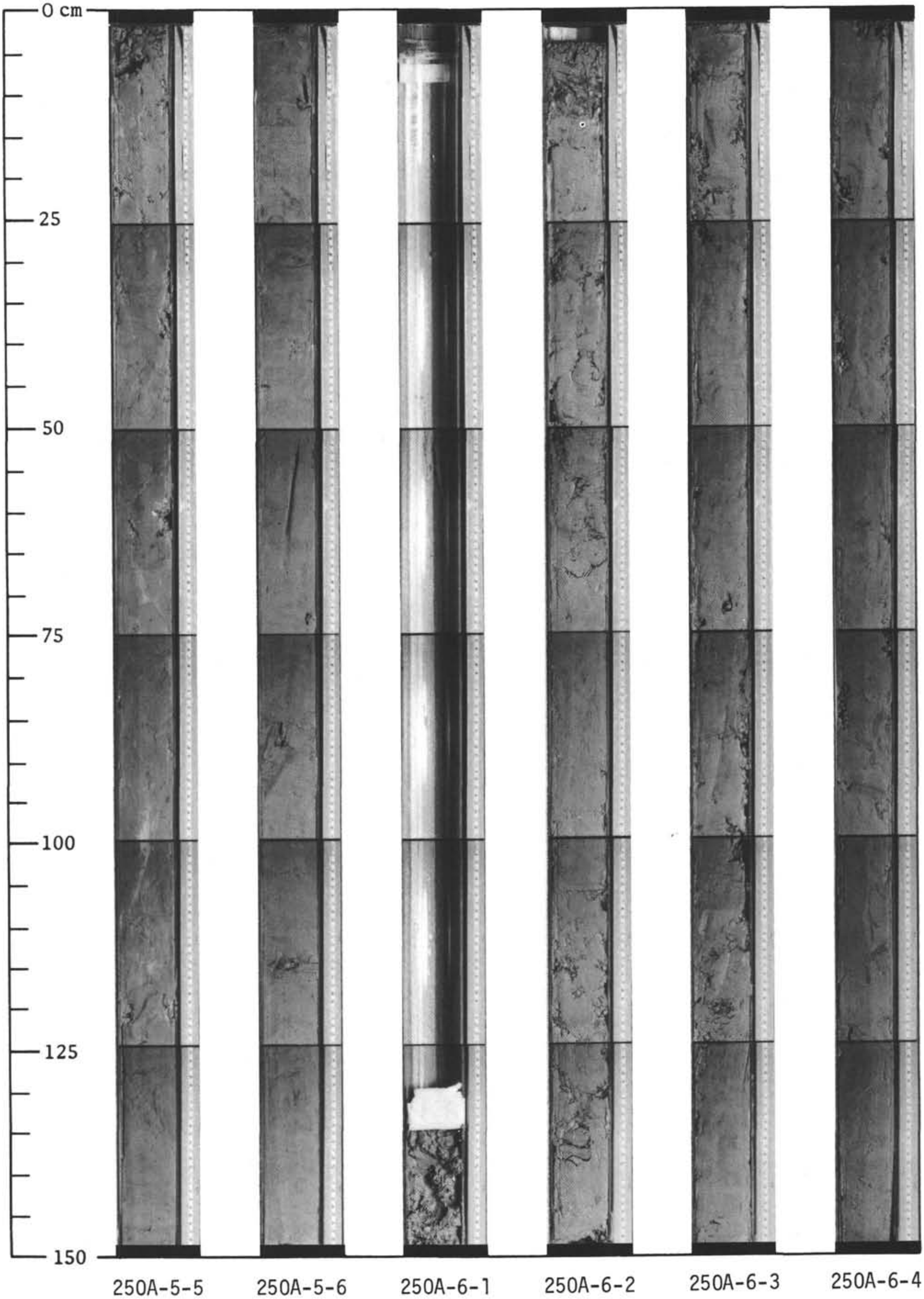
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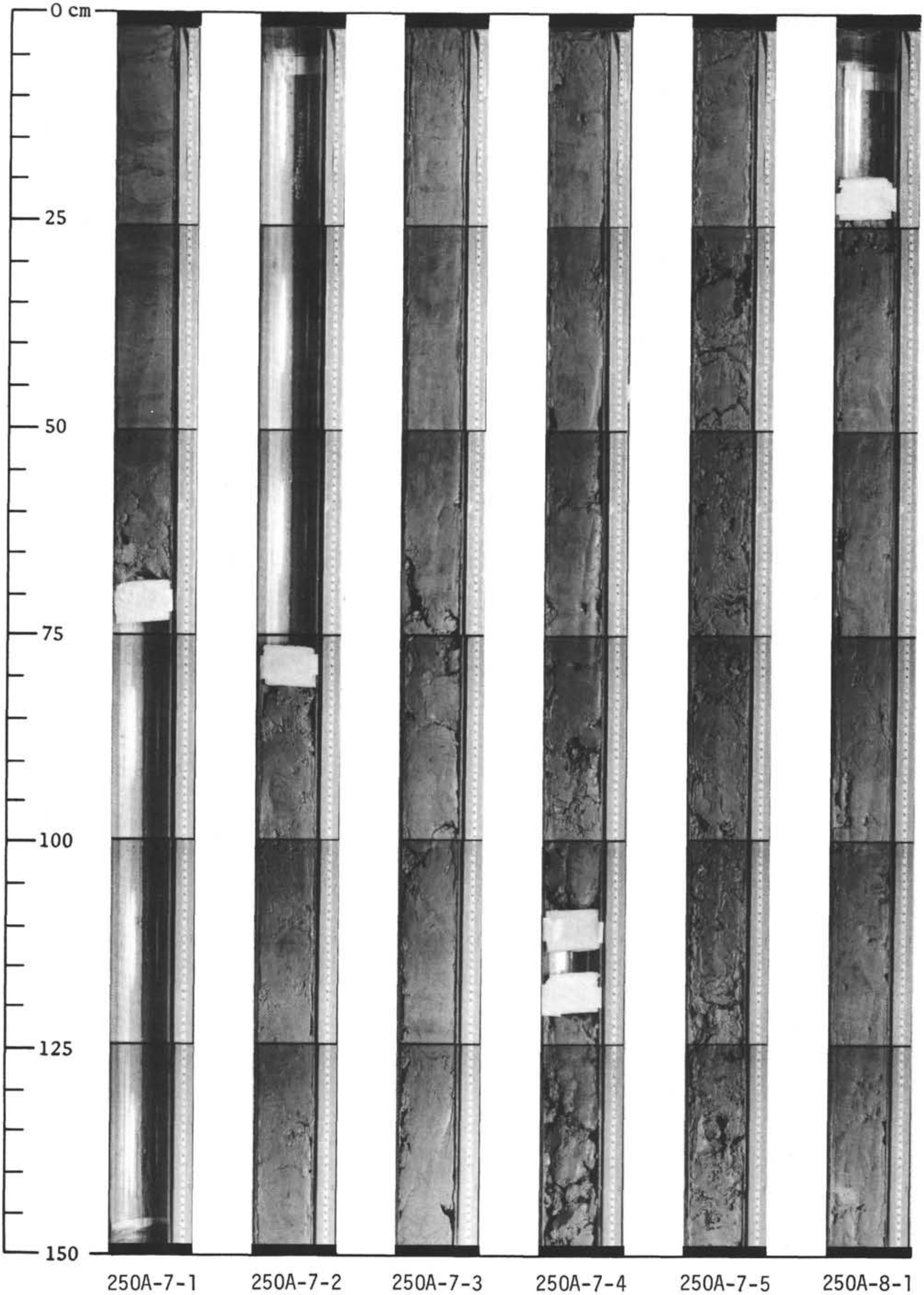
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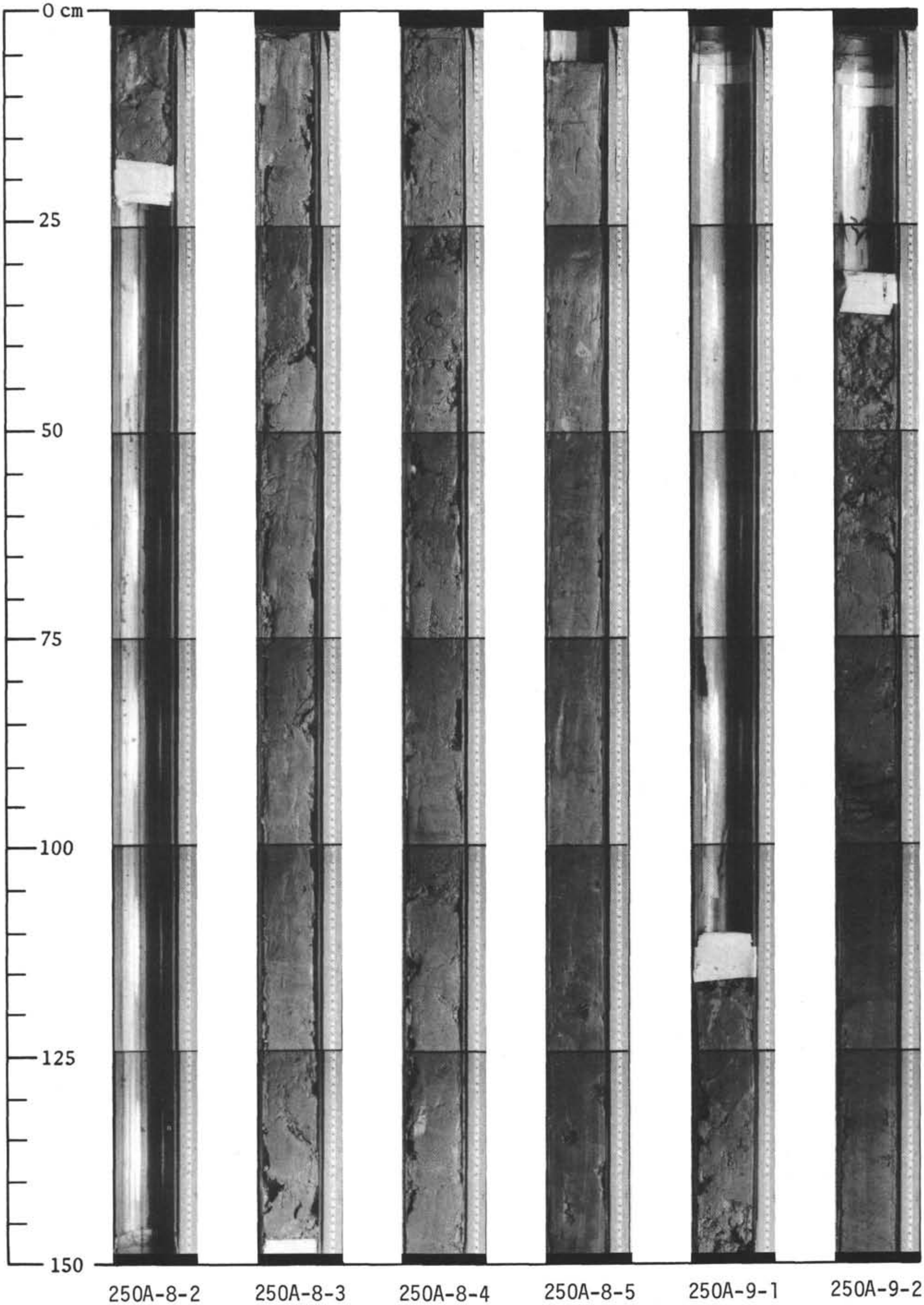
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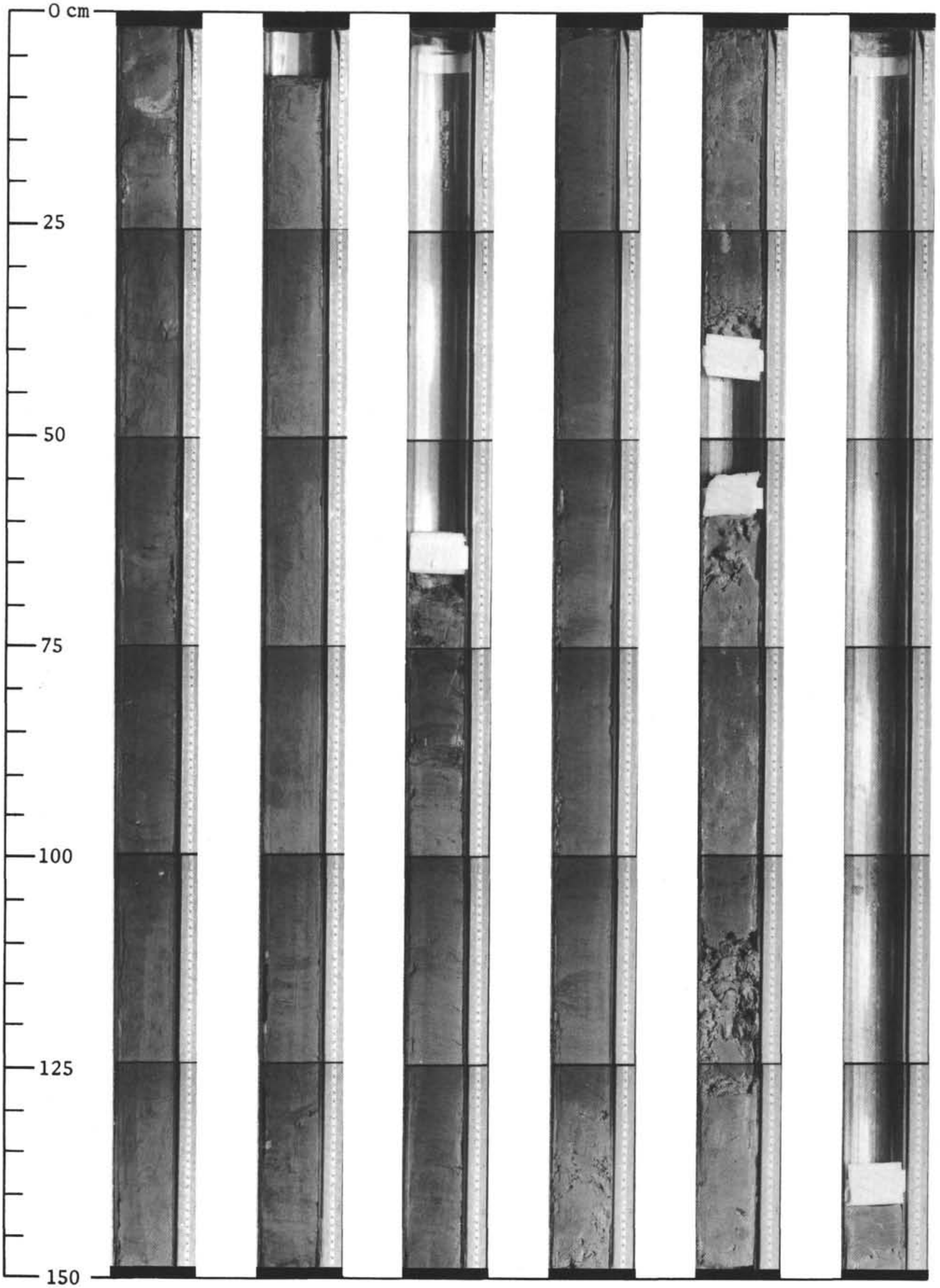
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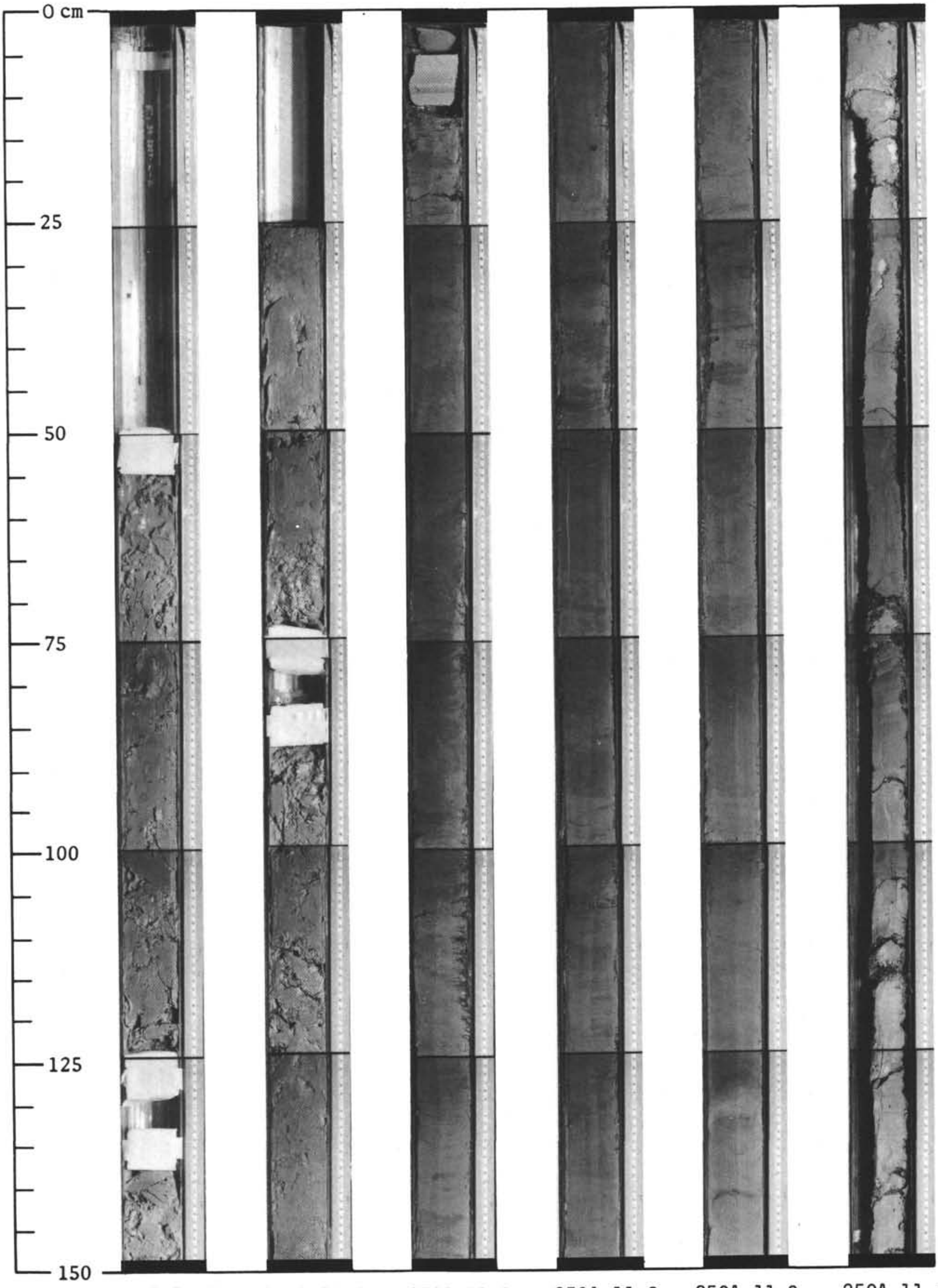

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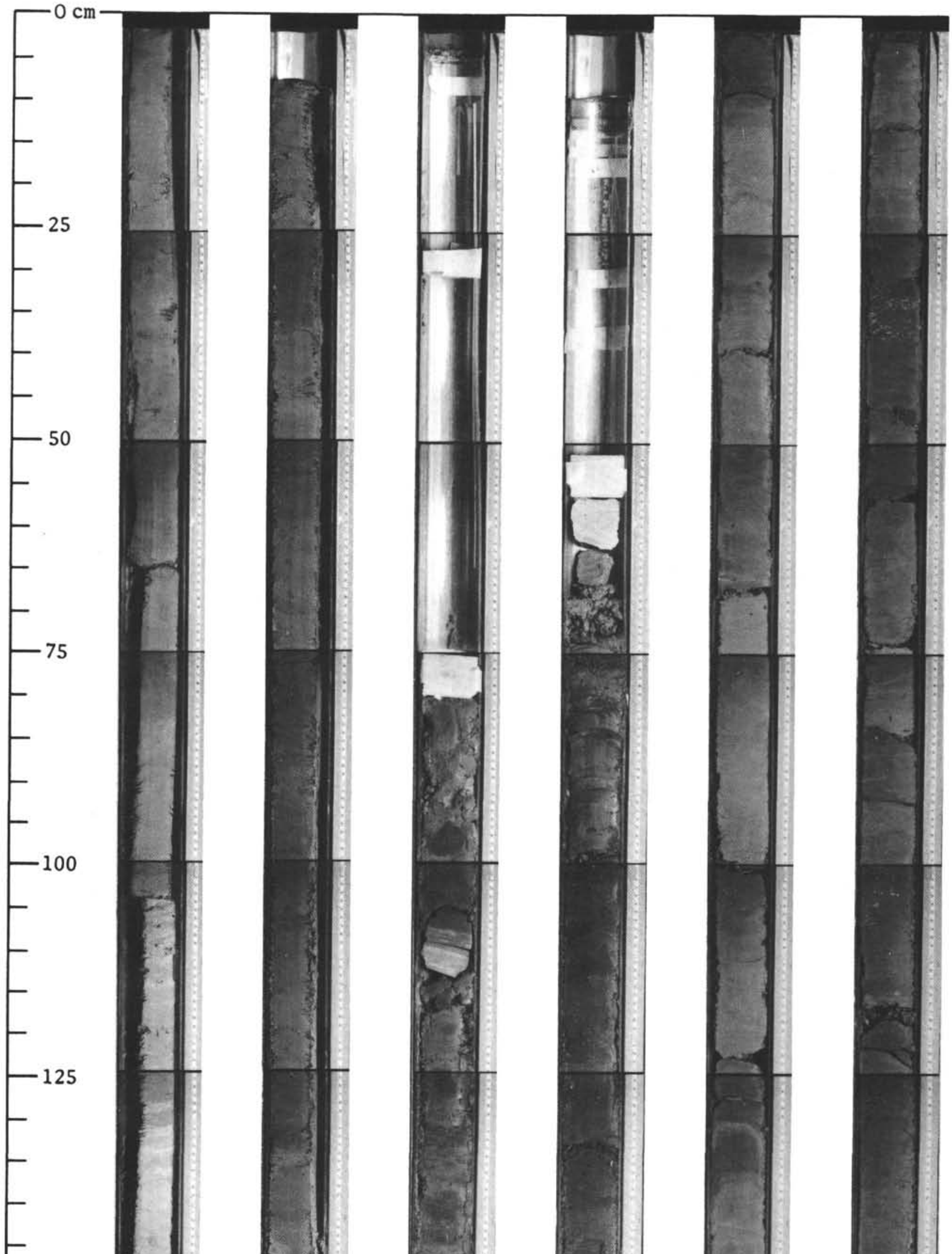
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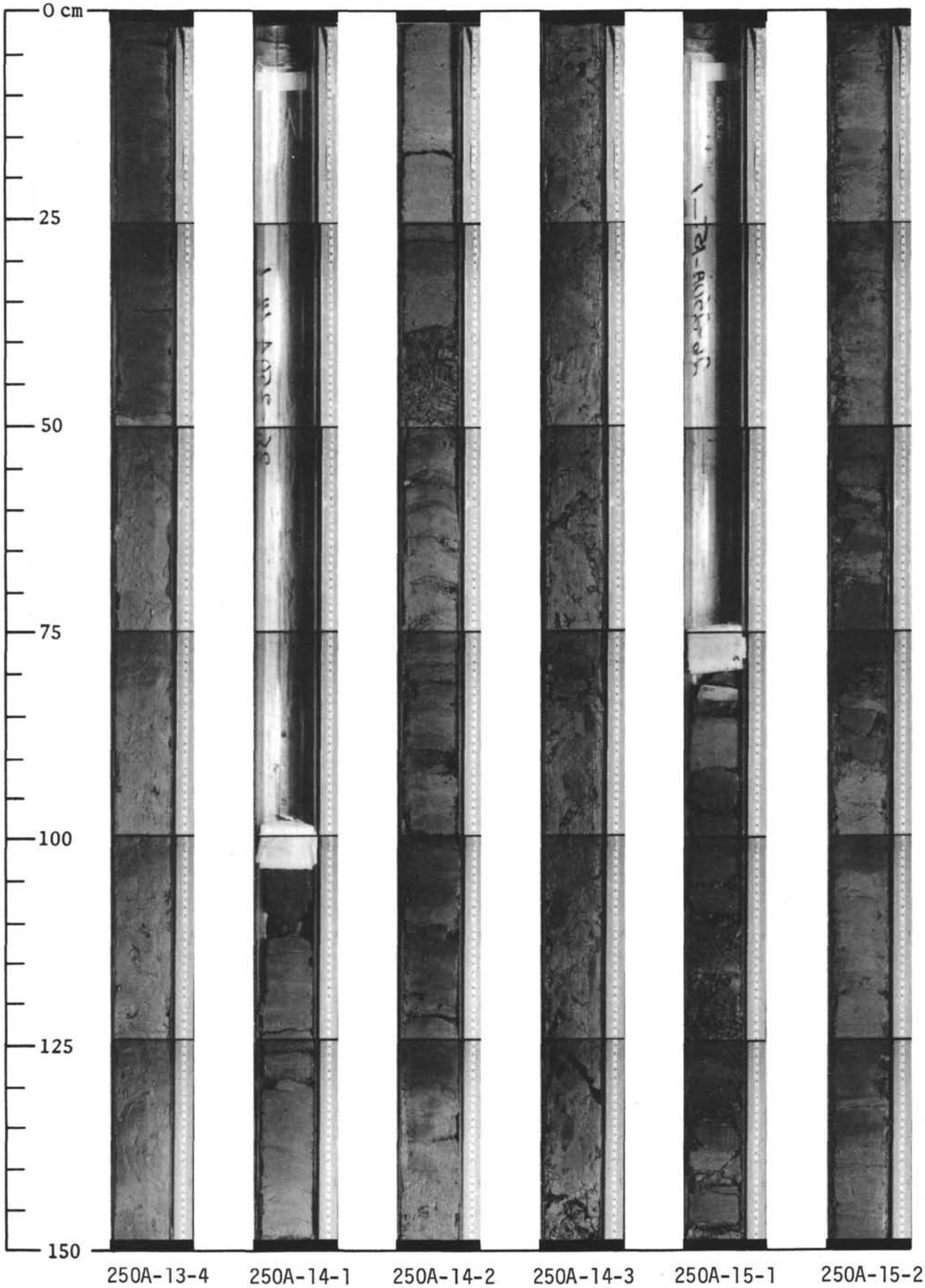
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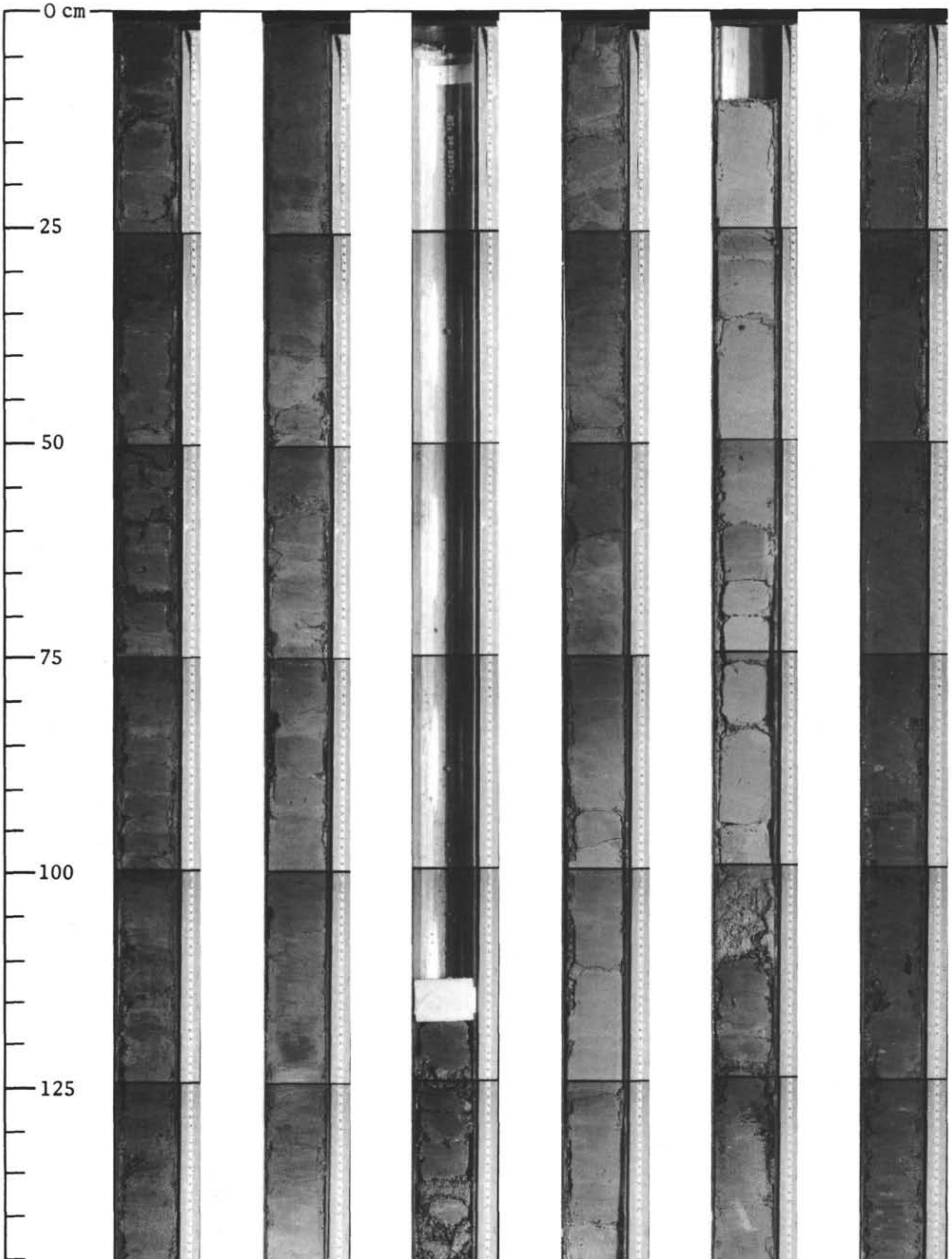
250A-15-2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250A-16-2
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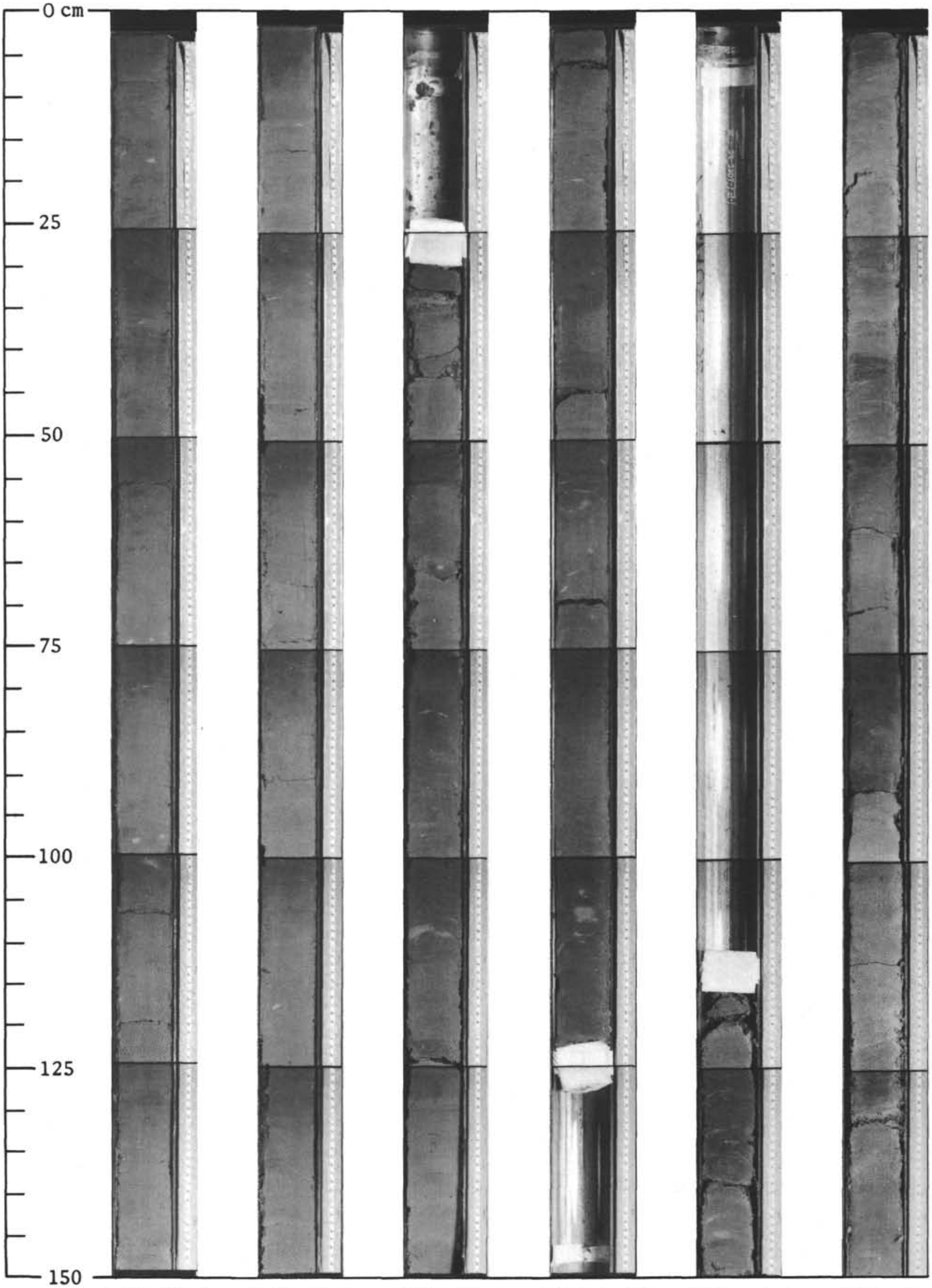
250A-17-1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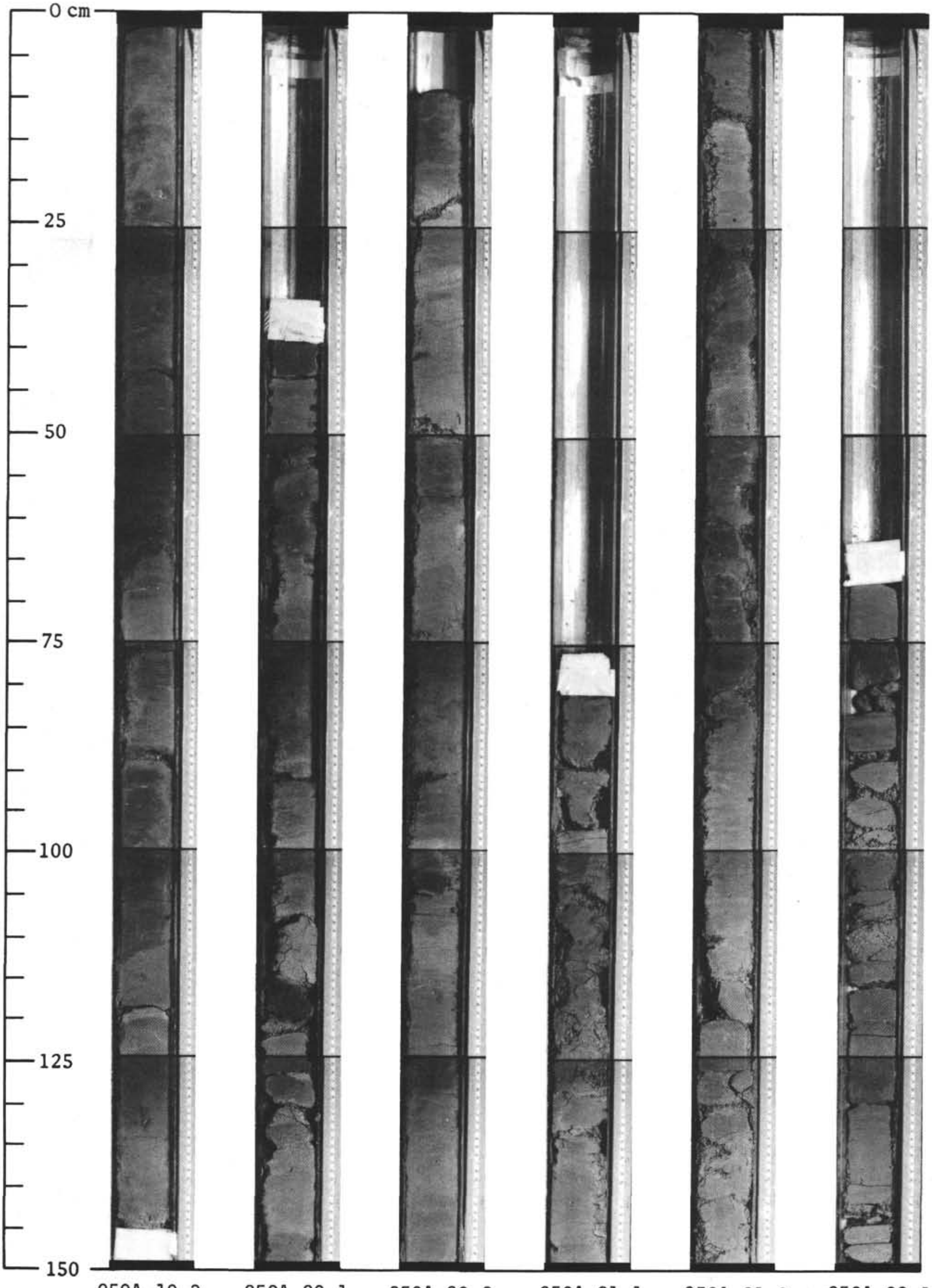
250A-18-2
250A-19-1
250A-19-2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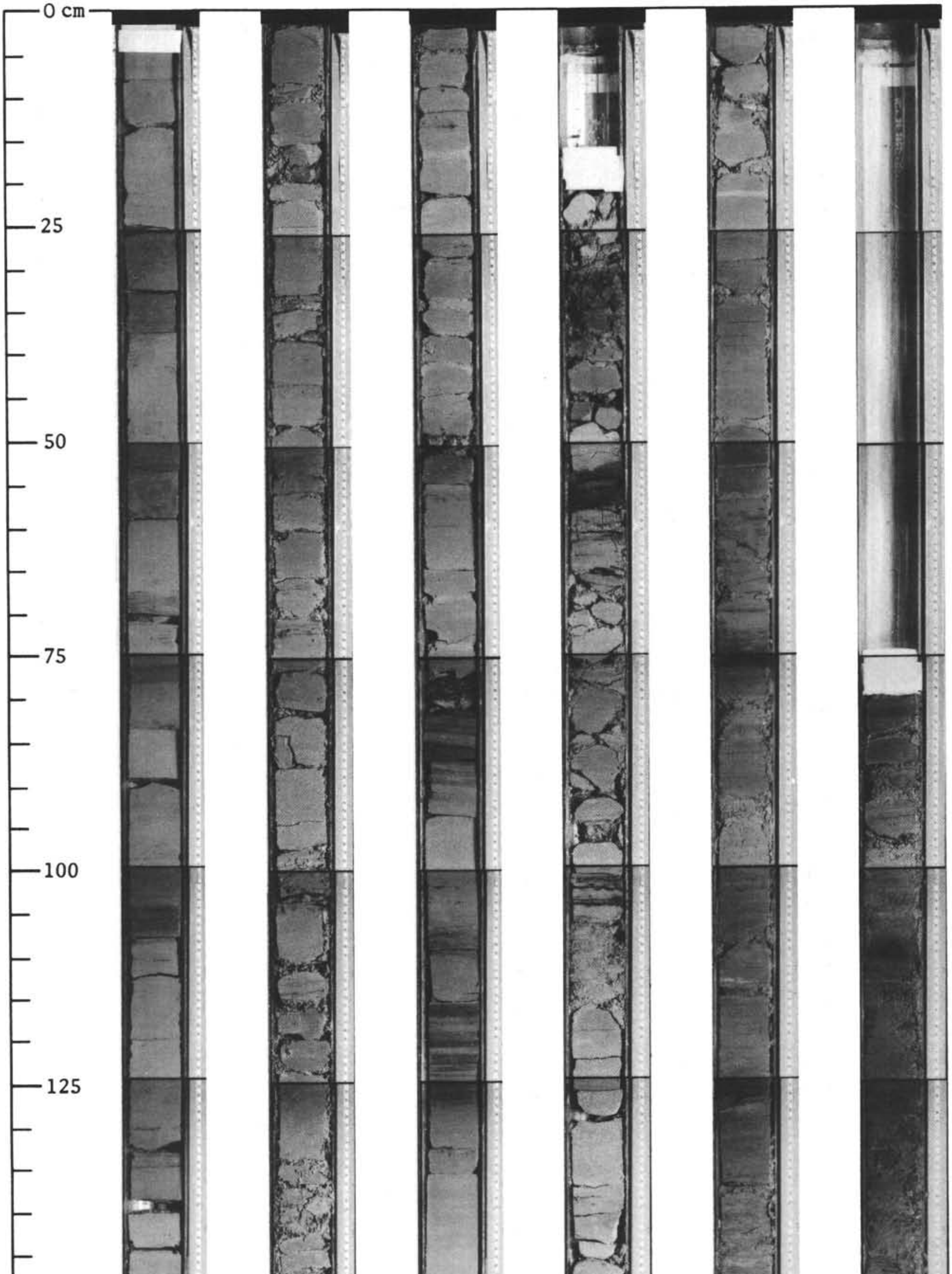
250A-22-1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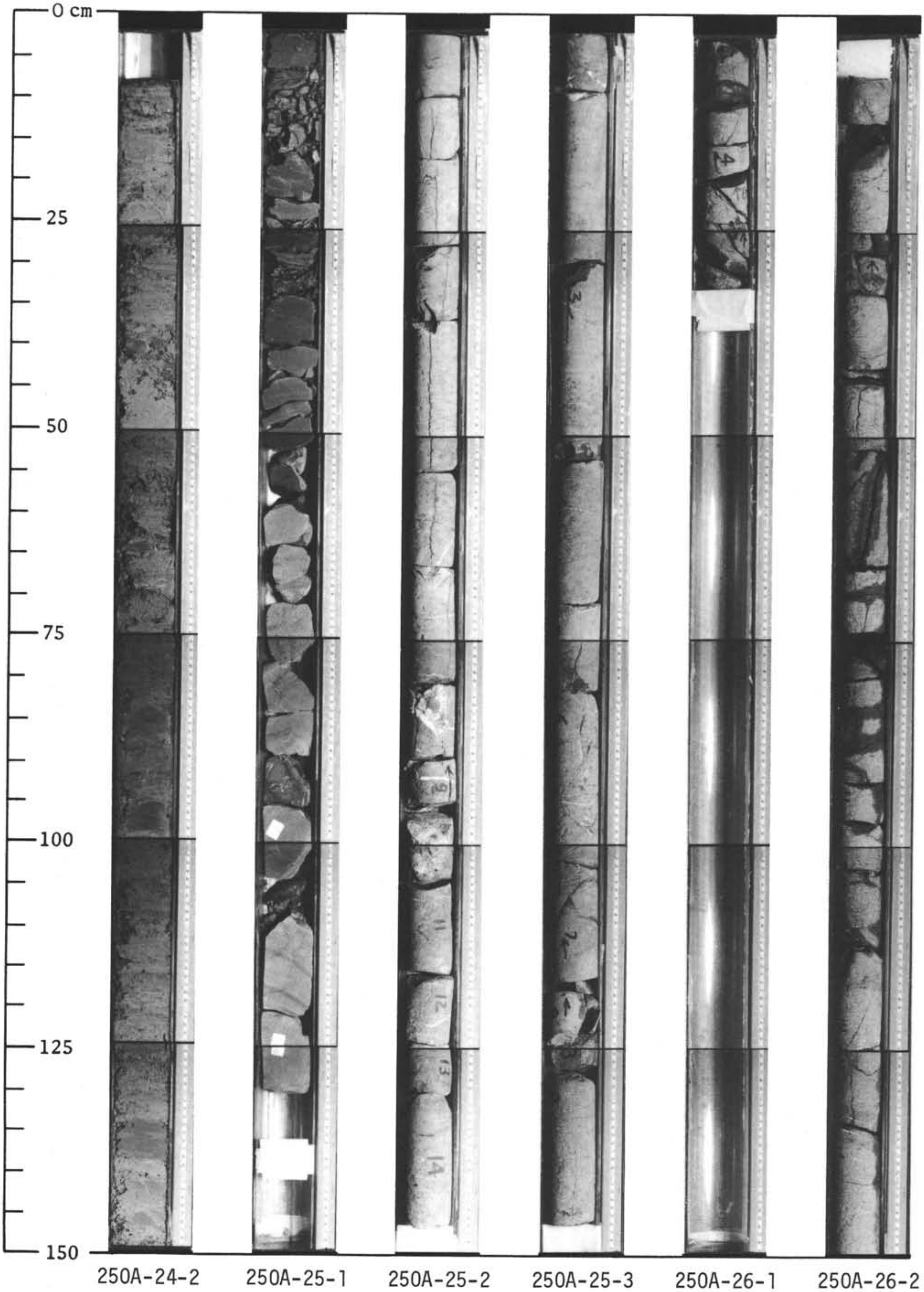
250A-24-1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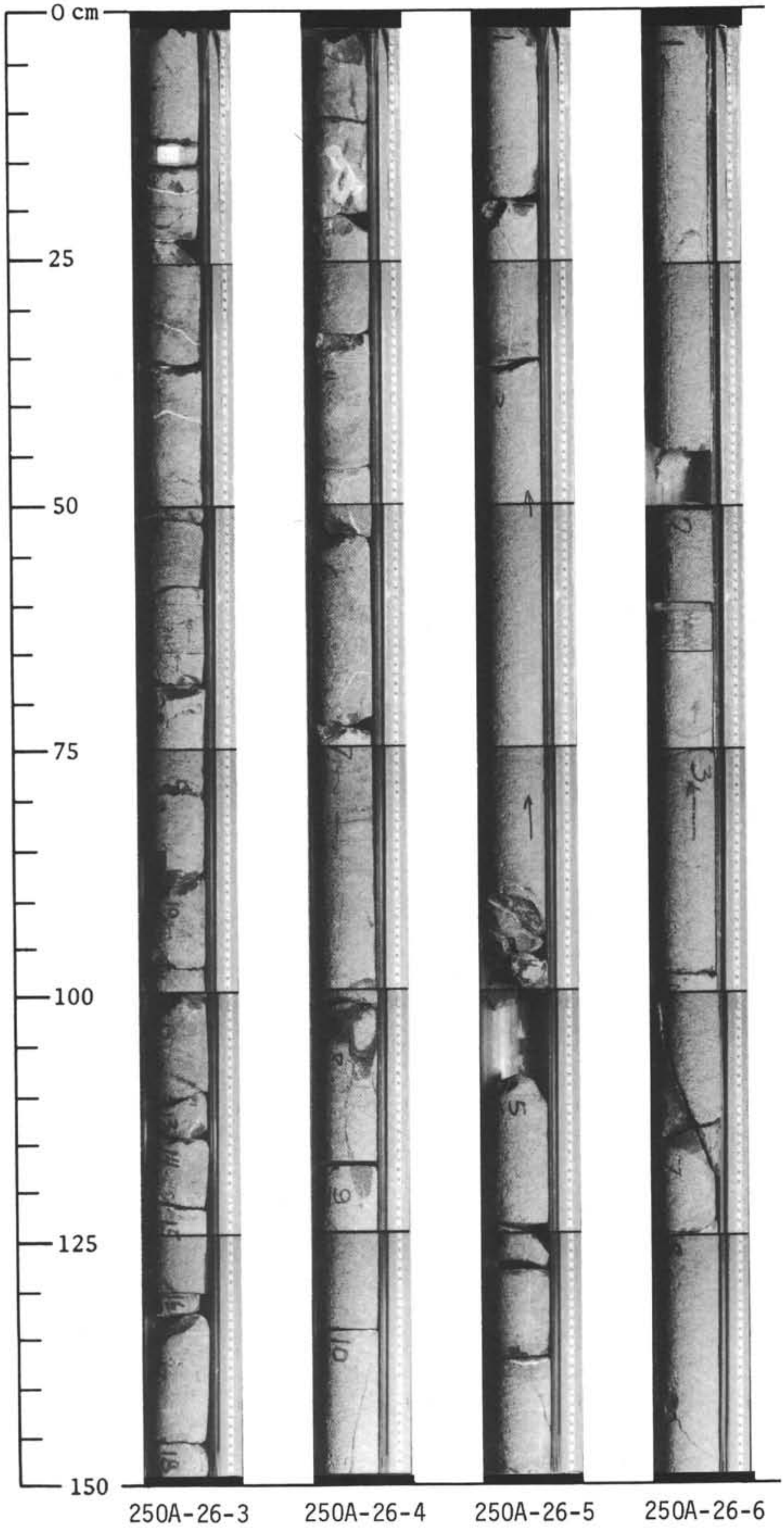
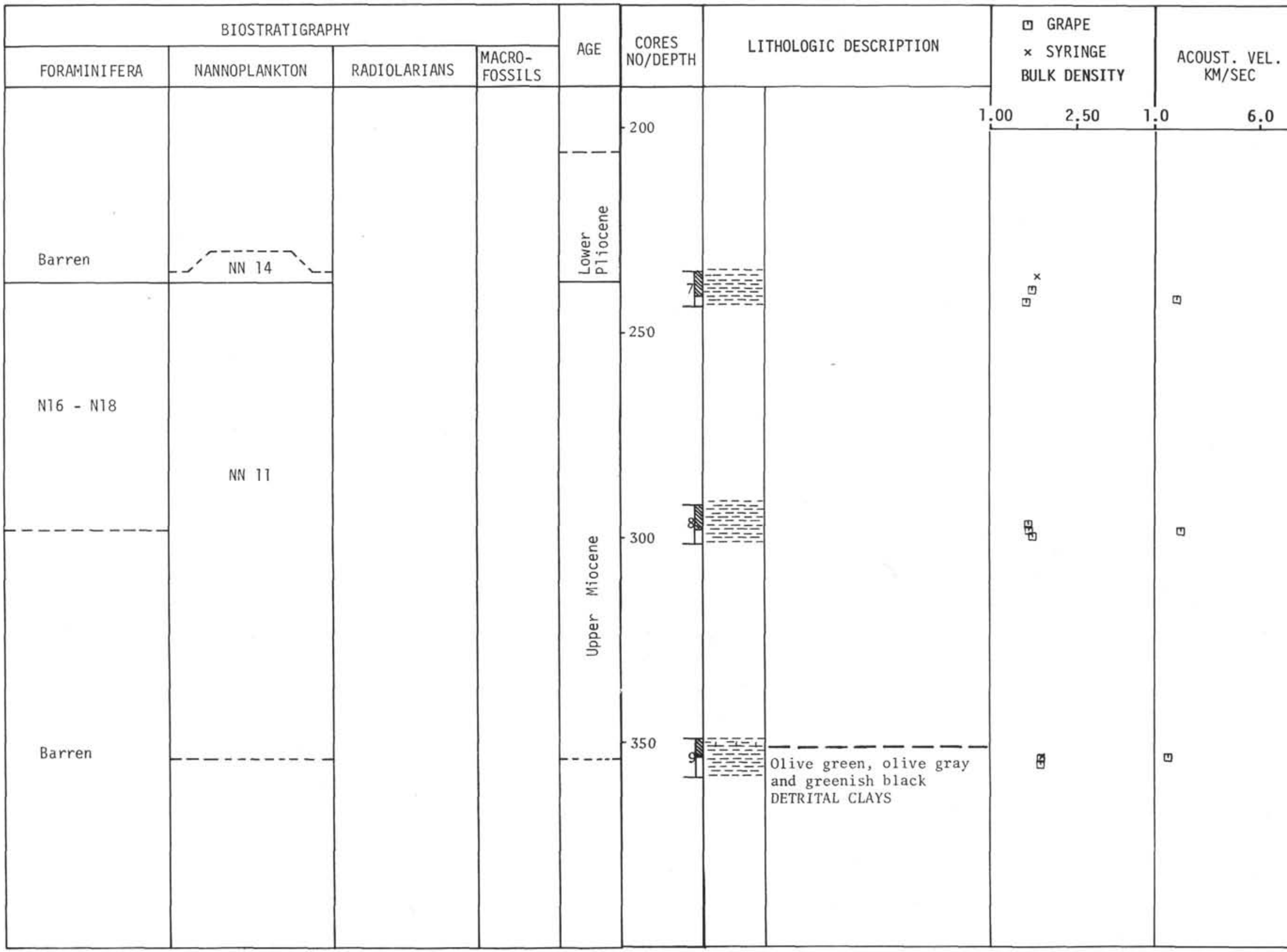
250A-26-1
250A-26-2


0 cm
25
50
75
100
125
150
250A-26-3
250A-26-4
250A-26-5
250A-26-6

SUMMARY OF DRILLING RESULTS: SITE 250/0 - 200 m

BIOSTRATIGRAPHY				AGE	CORES NO/DEPTH	LITHOLOGIC DESCRIPTION	⊡ GRAPE × SYRINGE BULK DENSITY	ACOUST. VEL. KM/SEC
FORAMINIFERA	NANNOPLANKTON	RADIOLARIANS	MACRO-FOSSILS				1.00 – 2.50	1.0 – 6.0
N22 - N23	NN 20			Quaternary	0; 250: 1, 2	Light gray clayey COCCOLITH OOZE (50 %), interbedded with olive green and gray COCCOLITH DETRITAL SILTY CLAY and DETRITAL SILTY CLAY		
	NN 19				50; 250: 3; 250A: 1, 2, 3			
	?			?	100			
N21	NN 18			Upper Pliocene	4; 150; 5	Olive green, olive gray, and greenish black DETRITAL CLAYS, with less than 5 % SILTY COCCOLITH OOZE, CLAY RICH COCCOLITH OOZE, and COCCOLITH RICH CLAY		
	NN16							
Barren	Barren			?	6			

SUMMARY OF DRILLING RESULTS: SITE 250/200 - 400 m



SUMMARY OF DRILLING RESULTS: SITE 250/400 - 600 m

BIOSTRATIGRAPHY				AGE	CORES NO/DEPTH	LITHOLOGIC DESCRIPTION	⊡ GRAPE × SYRINGE BULK DENSITY	ACOUST. VEL. KM/SEC
FORAMINIFERA	NANNOPLANKTON	RADIOLARIANS	MACRO-FOSSILS				1.00 2.50	1.0 6.0
					400			
Barren	Barren			Lower-Middle Miocene	10			
					450			
	NN3 - NN5				11			
					500			
Barren	Barren				12			
					550			
	NN3 - NN5			Lower-Middle Miocene	13	Interbedded greenish black, olive gray and moderate brown DETRITAL CLAY		

SUMMARY OF DRILLING RESULTS: SITE 250/600 - 800 m