3. SITE 379

The Shipboard Scientific Staff[1]

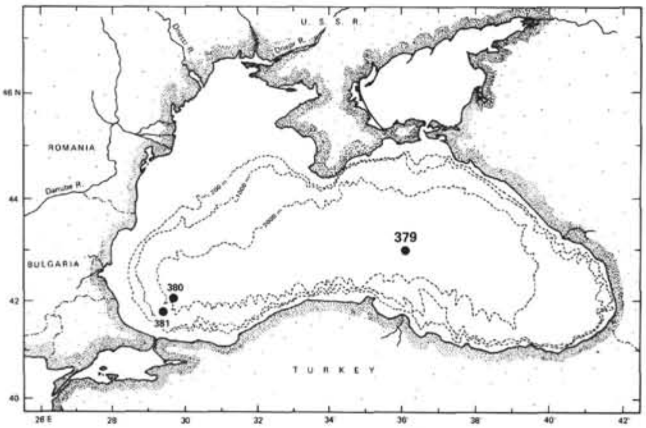

Figure 1. *Bathymetric chart showing the position of Site 379 and other Leg 42B sites in the Black Sea. Contour interval in meters.*

SITE DATA

Dates: 1114, 23 May to 0500, 28 May 1975

Time: 114 hours

Position (Figure 1): 43°00.29'N, 36°00.68'E

Holes Drilled: 3

Water Depth by Echo-Sounder: 2165 corr. meters

Maximum Penetration: 624.5 meters (379A)

Total Core Recovered: 412.3 meters from 78 cores

Age of Oldest Sediment: Pleistocene

Principal Results: Site 379 was drilled in the central portion of the Black Sea (Figure 1) (43°00.29'N; 36°00.68'E) to a maximum penetration of 624.5 meters. Hole 379 was to test a pressure core barrel; Site 379A was the principal hole, and was continuously cored. Site 379B was spot-cored mainly for geochemical samples. A total of 78 cores obtained 412.3 meters of sediment; heat flow was measured at 12 depths. Gas content was high in almost all cores, but the methane/ethane ratio stayed within safety limits. The principal objective of these sites was to obtain as complete as possible a Pleistocene section for strati-

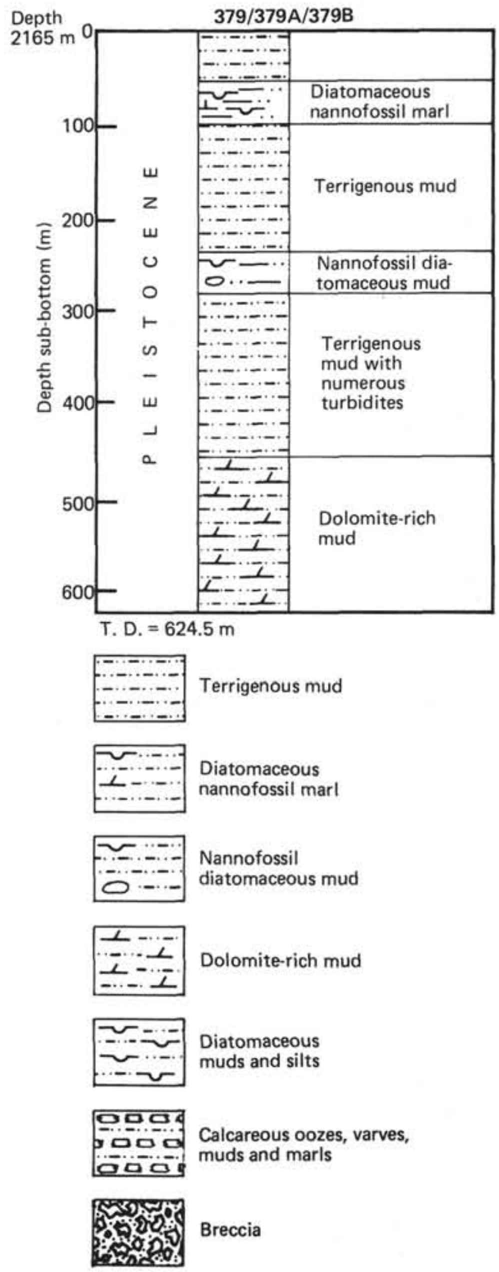

Figure 2. *Lithostratigraphic section recovered at Site 379.*

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graphic and biostratigraphic work. Based on micropaleontological, stratigraphic, and other studies, it seems clear that the entire section is Pleistocene in age.

The sediment section can be divided into nine subunits (Figure 2), but in general are of terrigenous origin. Sediments are mainly a dark greenish-gray to dark gray terrigenous mud, with occasional interbeds of silts, sandy silts, and sands. Some of the coarse beds are graded, suggesting that they were deposited from turbidity currents.

The fauna and flora from this site (and others in the Black Sea) were not very useful for dating purposes, but did occasionally indicate (when present) environmental changes. Periods of fresh or brackish water conditions were common in the past. Spores and pollen were especially useful, in particular using ratios of typical Steppe to Forest forms. These ratios indicate three cool or Steppe periods (called Alpha, Beta, and Gamma) and three warmer or Forest periods (called Celia, Betty, and Anna) which, besides being of environmental importance, permit some degree of correlation with Site 380.

Pore fluids were predominantly fresh to brackish in the upper 400 meters, but increased in salinity below that depth. The high gas content made the measurement of some physical properties such as porosity, sound velocity and wet bulk density difficult. Thermal conductivity was variable and showed no variation with depth. The average heat flow measured was $0.94 \pm 0.10 \times 10^{-6}$ cal/cm^2 sec, but two anomalously high temperatures were measured at 45 and 149.5 meters below the surface. Some subsurface seismic reflectors appeared to be correlative with lithologic changes.

BACKGROUND AND OBJECTIVES

The Black Sea is a large semi-enclosed marine basin having an area of 423,000 km^2 and a volume of 534,000 km^3. It is situated between two Alpine mountain ranges; the Pontic Mountains to the south, and the Caucasus Mountains to the east and north (Figure 3). The Black Sea is connected to the Mediterranean via the Bosporus, a narrow strait that has a sill depth of about 50 meters.

The Black Sea has been a sedimentary basin for probably as long as 200 million years, prior to that time it was a topographic high supplying sediments to the then forming and surrounding mountain ranges. Sediment thicknesses, in the Black Sea, are indicative of its long history and can be in excess of 16 km (Figure 4).

The Black Sea is of special interest to oceanographers because of its long history, because it is the largest body of anoxic water in the world, and because of its shallow connection to the Mediterranean. The latter has caused environmental conditions within the Black Sea to change considerably with Pleistocene sea-level variations. During the most recent drop in sea level, the Black Sea became disconnected from the Mediterranean and changed from a marine to a lacustrine environment (see Degens and Ross, 1974 and contained articles). When sea level rose starting about 15,000 years ago, it slowly returned to marine conditions reaching its present state about 3000 B.P. Possible past connections with the Caspian Sea also existed. These climatically controlled events and subsequent environmental changes have strongly influenced the characteristics of the Black Sea sediments. The study of the chemistry and paleontology of these sediments should aid in evaluating the climatic and geological history of the Black Sea as well as clarifying past worldwide sea level changes. The continuous and high sedimentation rate that has prevailed in the Black Sea should provide an extremely complete and useful Pleistocene section.

The main objectives of this site were:

1) to obtain as complete as possible a Pleistocene stratigraphic and biostratigraphic section.

2) to detail the interactions between the Black Sea and the Mediterranean, especially eustatic sea-level changes and stagnant cycles and establish a paleoclimatic and paleooceanographic record.

3) Select samples and perhaps drill a second hole for geochemical purposes. The main objectives of the geochemical program are:

a) to follow diagenetic changes, including the formation of hydrocarbons and the degradation of amino acids, carbohydrates, and porphyrins.

b) to observe the initiation of catagenesis (late diagenesis) which is believed to have started deeper than 500 meters.

OPERATIONS

Glomar Challenger approached the site area on a course of 072°G at about 9 knots. This path closely followed a previous Woods Hole Oceanographic Institution seismic profile (Cruise A-II 49 profile no. 25, see Ross, et al., 1974). Two satellite fixes were obtained near the site and a minor course adjustment was made. The final approach was made at about 5 knots at 075°G. The final position coincided with that of a recent detailed Soviet Survey (see Neprochnov, this volume). A 16-kHz beacon was dropped while passing over the site at 1030 local time (0730 GMT, 23 May 1975). The ship continued on course 0.75°G for 10 minutes during which time additional seismic profiling data were collected. By 1058 LCT the seismic arrays were aboard and the airguns secured and the ship made a Williamson turn to return to the site. By 1105 LCT we were maneuvering over the beacon and lowering of pipe was started at 1114 LCT. The site location, as determined by satellite fix was 43°00.29′N and 36°00.68′E. Water depth was 1166 uncorrected fathoms or 2165 corrected meters. Water depth from the drill floor was 2175 corrected meters (based on echo sounder), and bottom was encountered by the drill pipe at 2171 meters (Table 1).

As the drill string was being lowered a test was made, with about 1000 meters of pipe out, of a pressure core barrel to ascertain if it sat properly within the drill pipe. The pressure core barrel, designed to collect and maintain sediments and fluids at their ambient pressure, was also used to cut Core 1 at this site. A total of 7 meters was cut and 4 were recovered (see separate report by Burt Adams for evaluation of this device). This core ended Hole 379, and we then started Hole 379A at 2050 LCT 23 May with a 7-meter punch-in

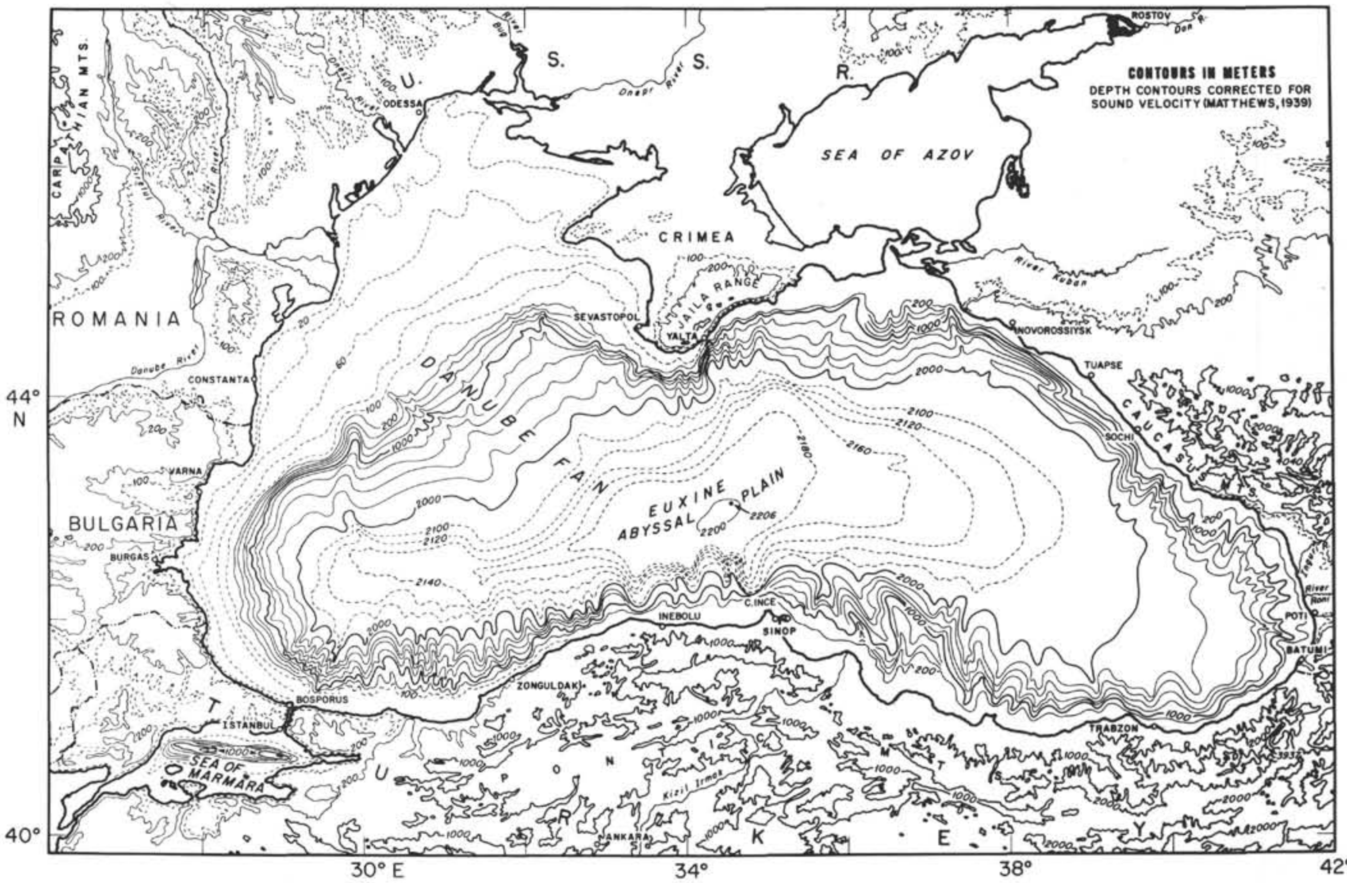


Figure 3. *General bathymetry and main physiographic features of the Black Sea (from Ross et al., 1974).*

core. The Safety Panel had recommended for this site, as well as all others in the Black Sea, that continuous coring be done. A total of 68 cores was continuously cut at this site and only 2.5 meters was washed (Core 33).

Essentially all the cores collected were gassy, some to such a degree that core material was forcibly extruded by the gas pressure when the core reached deck. In some instances the material was almost explosive in nature when leaving the core nose. In addition, almost all recovered cores had extensive void areas due to the expanding gas. Nevertheless, because of the general softness of the sediment and the care of the drilling crew, we were able to achieve a 61% recovery ratio. In some instances increasing or maintaining a high pump pressure appeared to result in less gas in the cores. Gas content was monitored on all cores, and butylane and propane were detected in gas voids from Cores 31 and 32; however, the methane/ethane ratio clearly stayed within safety limits for these two cores as well as for all the other cores cut at this site.

The pressure core barrel was used a total of six times at Site 379. It was used twice on Hole 379, three times on Hole 379A at 301 meters [to cut 7 meters of core; the remaining 2.5 meters were washed (Core 33)], 377.5 meters and 558 meters, and once on Hole 379B at 7 meters.

Heat flow measurements were made at 10 depths during Site 379, Hole A: 45 meters, 92.5 meters, 149.5 meters, 197 meters, 244.5 meters, 292 meters, 339.5 meters, 396.5 meters, 425 meters, and 624.5 meters. Besides providing extremely valuable information, this large number of measurements was the most ever made on a DSDP hole. An additional two more measurements were made on Hole 379B at 35.5 meters and 159 meters.

The original plan for this site was to obtain a complete Pleistocene stratigraphic and biostratigraphic section. However, after drilling the first 200 meters it became clear that the sedimentation rate at 379A had been too high to allow us to even get near this objective. It appeared that over a kilometer of drilling would be necessary to reach even the end of the Pleistocene. In addition, about half the time allotted for this site (total of 6 days) was to be used in drilling a hole for geochemical sampling. Clearly if two continuously cored holes were to be drilled our penetration would be limited. A meeting of the scientific staff was held on 25 May and we unanimously agreed to combine the stratigraphy and geochemical objectives and divide the subsequent core material, and to only core for spot samples at 379B for the geochemists. By about 450 meters subdepth, it became evident that even with this combined approach we would not get through even a major portion of the Pleistocene. Following two more scientific meetings, it was decided on 27 May to end Hole 379A, collect some shallower cores on Hole 379B, and continue to Site 380 where, based on seismic profiles, a thinner Pleistocene and Pliocene section was possible.

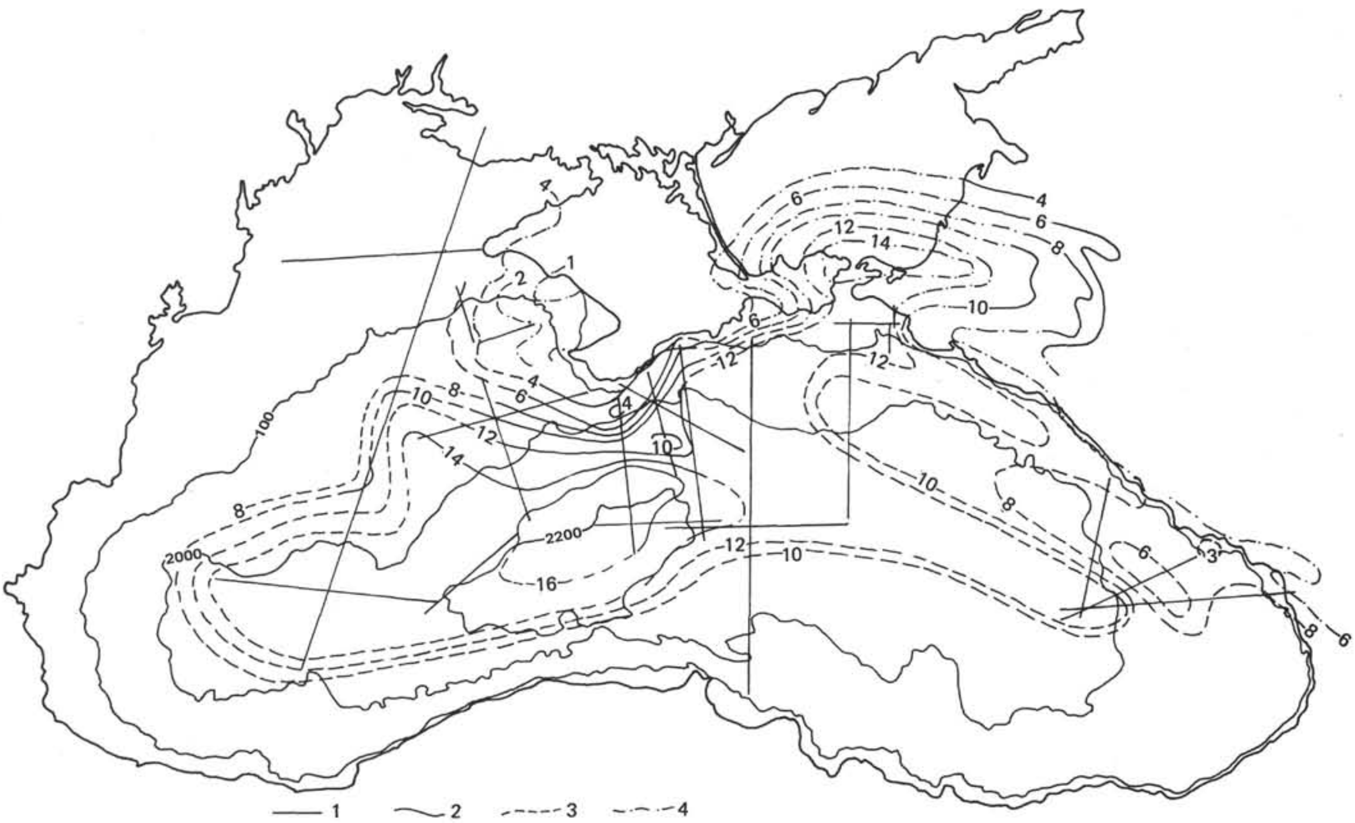


Figure 4. *Depth of basement in the Black Sea from Neprochnov, 1975. Solid lines (1) indicate deep seismic sounding profiles; wavy lines (2) indicate depth contours to basement in km; dashed lines (3) indicate interpreted depth contours to basement; dot and dashed lines (4) indicate land data.*

Hole 379A was ended at about 0800 LCT on 27 May after Core 68 and a heat flow station, and the pipe was pulled up above the sea floor. The next hole was offset 50 feet to the south and 190 feet to the east or 200 feet at 105°T from Hole 379A. Drilling was delayed until about 1830 LCT on 27 May due to damage to core-line fair lead sheaves.

A total of 7 cores and 2 heat flow measurements was attempted at Hole 379B. Since we were so close to the original site and we saw no safety problems, it was felt that spot coring would pose no danger, nevertheless gas content was still monitored. The recovery ratio was less on this site than 379A, probably because of washing down to selected depths. At 0500 LCT on 28 May the drilling was terminated and the drill string was secured by 1000 LCT. By 1020 LCT on 28 May, we were heading towards Site 380.

LITHOLOGY

Hole 379A was continuously cored to a depth of 624.5 meters (Table 2). In general, the whole sequence can be considered as one large unit composed of dark greenish gray to dark gray terrigenous mud. The muds are silty clays to clayey silts with intercalations of thin sandy silt to sand laminae. Locally, the sands occur as beds up to 8 cm thick. The graded bedding observed in some of the coarser layers suggest that they may have been deposited as turbidity currents. In the lower part of the hole, cross lamination and burrowing could be observed. The sediments consist of quartz, feldspars, clay minerals, detrital carbonates and smaller amounts of pyrite, heavy minerals, diatoms, nannofossils, and organic matter. The clays are dominated by smectite and illite with only little chlorite and kaolinite. The detrital carbonates are calcite and traces of dolomite. The carbonate content is in general low with an average of about 15%. Locally, small grayish white carbonate-rich bands occur having a carbonate content as high as 60%, which indicates that in the lower part of the hole chemical sedimentation becomes more significant. Indigenous fossils, like diatoms, nannofossils, and foraminifers are generally rare and restricted to certain intervals.

Based on shipboard examinations and shore-laboratory results, the sedimentary section at 379A can be divided into nine subunits.

Subunit 1—Nannofossil Ooze (0-0.30 m) PC 1474[2]

Subunit 1 is a nannofossil ooze principally composed of the coccolith *Emiliania huxleyi*. This top unit was encountered in previous piston cores taken in the Black Sea and was not directly found as a layer in the DSDP cores. However, the occurrence of coccolith patches in the first DSDP core suggests the presence of this marine unit. The unit has an average thickness of about 30 cm in the A-II cores and was deposited during the present marine conditions in the Black Sea.

[2]Piston Core 1474 A-II Cruise 49 (see Ross and Degens, 1974, for location of cores).

TABLE 1
Coring Summary, Site 379

Core	Date (May 1975)	Time	Depth From Drill Floor (m)	Depth Below Sea Floor (m)	Length Cored (m)	Length Recovery (m)	Recovery (%)
Hole 379							
1	23	1905	2171.0-2178.0	0.0-7.0	7.0	4.0	57[a]
Total					7.0	4.0	57
Hole 379A							
1	23	2050	2171.0-2178.0	0.0-7.0	7.0	7.0	100[b]
2	23	2150	2178.0-2187.5	7.0-16.5	9.5	0.0	0[b]
3	23	2245	2187.5-2197.0	16.5-26.0	9.5	0.0	0
4	23	2323	2197.0-2206.5	26.0-35.5	9.5	6.3	66[c]
5	24	0020	2206.5-2216.0	35.5-45.0	9.5	0.0	0[d]
6	24	0220	2216.0-2225.5	45.0-54.5	9.5	9.5	100[b,d]
7	24	0328	2225.5-2235.0	54.5-64.0	9.5	6.6	69[c,d]
8	24	0440	2235.0-2244.5	64.0-73.5	9.5	6.5	68[c,d]
9	24	0538	2244.5-2254.0	73.5-83.0	9.5	5.0	53[c,d]
10	24	0636	2254.0-2263.5	83.0-92.5	9.5	5.8	61[c,d]
11	24	0837	2263.5-2273.0	92.5-102.0	9.5	5.8	61[c,d]
12	24	0935	2273.0-2282.5	102.0-111.5	9.5	3.4	36[c]
13	24	1040	2282.5-2292.0	111.5-121.0	9.5	8.5	89[c,d]
14	24	1139	2292.0-2301.5	121.0-130.5	9.5	9.0	95[c,d]
15	24	1235	2301.5-2311.0	130.5-140.0	9.5	9.3	56[c]
16	24	1350	2311.0-2320.5	140.0-149.5	9.5	1.4	46[c,d]
17	24	1520	2320.5-2330.0	149.5-159.0	9.5	1.4	15[c]
18	24	1627	2330.0-2339.5	159.0-168.5	9.5	1.9	20[c]
19	24	1737	2339.5-2349.0	168.5-178.0	9.5	7.8	82[c]
20	24	1835	2349.0-2358.5	178.0-187.5	9.5	3.15	33[c]
21	24	1947	2358.5-2368.0	187.5-197.0	9.5	9.5	100[c]
22	24	2145	2368.0-2377.5	197.0-206.5	9.5	7.6	80[c]
23	24	2240	2377.5-2387.0	206.5-216.0	9.5	9.5	100[e]
24	24	2340	2387.0-2396.5	216.0-225.5	9.5	9.0	95[c]
25	25	0035	2396.5-2406.0	225.5-235.0	9.5	9.1	96[c]
26	25	0130	2406.0-2415.5	235.0-244.5	9.5	5.6	59[c]
27	25	0340	2415.5-2425.0	244.5-254.0	9.5	5.0	53[c]
28	25	0445	2425.0-2434.5	254.0-263.5	9.5	6.2	65[c]
29	25	0605	2434.5-2444.0	263.5-273.0	9.5	8.5	89[c]
30	25	0655	2444.0-2453.5	273.0-282.5	9.5	2.75	29[c]
31	25	0758	2453.5-2463.0	282.5-292.0	9.5	5.25	55[c]
32	25	1020	2463.0-2472.5	292.0-301.5	9.5	2.25	24[c]
33	25	1123	2472.5-2482.0	301.5-311.0	7.0	0.5	7[a,f]
34	25	1230	2482.0-2491.5	311.0-320.5	9.5	7.9	83[c]
35	25	1330	2491.5-2501.0	320.5-330.0	9.5	7.9	79[c]
36	25	1430	2501.0-2510.5	330.0-339.5	9.5	6.6	69[c]
37	25	1640	2510.5-2520.0	339.5-349.0	9.5	8.0	84[c]
38	25	1745	2520.0-2529.5	349.0-358.5	9.5	9.05	95[c]
39	25	1855	2529.5-2539.0	358.5-368.0	9.5	6.1	64[c]
40	25	2002	2539.0-2548.5	368.0-377.5	9.5	6.6	69[c]
41	25	2106	2548.5-2550.5	377.5-379.5	2.0	0.5	25[a]
42	25	2210	2550.5-2558.0	379.5-387.0	7.5	6.6	88[c]
43	25	2315	2558.0-2567.5	387.0-396.5	9.5	8.0	84[c]
44	26	0135	2567.5-2577.0	396.5-406.0	9.5	0.0	0
45	26	0245	2577.0-2586.5	406.0-415.5	9.5	6.2	65[c]
46	26	0410	2586.5-2596.0	415.5-425.0	9.5	7.6	80[c]
47	26	0625	2596.0-2605.5	425.0-434.5	9.5	5.8	61[c]
48	26	0735	2605.5-2615.0	434.5-444.0	9.5	7.6	80[c]
49	26	0845	2615.0-2624.5	444.0-453.5	9.5	7.9	83[c]
50	26	0950	2624.5-2634.0	453.5-463.0	9.5	7.6	80[c]
51	26	1105	2634.0-2643.5	463.0-472.5	9.5	6.6	69[c]
52	26	1205	2643.5-2653.0	472.5-482.0	9.5	5.2	55[c]
53	26	1310	2653.0-2662.5	482.0-491.5	9.5	2.7	28[c]
54	26	1420	2662.5-2672.0	491.5-501.0	9.5	7.5	79[c]
55	26	1545	2672.0-2681.5	501.0-510.5	9.5	3.45	36[c]
56	26	1645	2681.5-2691.0	510.5-520.0	9.5	6.2	65
57	26	1750	2691.0-2700.5	520.0-529.5	9.5	6.9	73[c]
58	26	1850	2700.5-2710.0	529.5-539.0	9.5	6.6	69
59	26	2010	2710.0-2719.5	539.0-548.5	9.5	9.1	96[c]
60	26	2116	2719.5-2729.0	548.5-558.0	9.5	7.5	79[c]

TABLE 1 – *Continued*

Core	Date (May 1975)	Time	Depth From Drill Floor (m)	Depth Below Sea Floor (m)	Length Cored (m)	Length Recovery (m)	Recovery (%)
61	26	2225	2729.0-2733.0	558.0-562.0	4.0	0.15	4[a]
62	26	2327	2733.0-2738.5	562.0-567.5	5.5	2.9	53[c]
63	27	0045	2738.5-2748.0	567.5-577.0	9.5	0.0	0
64	27	0150	2748.0-2757.5	577.0-586.5	9.5	3.5	37[c]
65	27	0310	2757.5-2767.0	586.5-596.0	9.5	8.75	92[c]
66	27	0415	2767.0-2776.5	596.0-605.5	9.5	2.6	27[c]
67	27	0630	2776.5-2786.0	605.5-615.0	9.5	5.6	59[c]
68	27	0710	2786.0-2795.5	615.0-624.5	9.5	6.8	72[c]
Total					622.0	379.1	61
Hole 379B							
1	27	1905	2171.0-2178.0	0.0-7.0	7.0	6.6	94[b]
2	27	1955	2178.0-2185.0	7.0-14.0	7.0	0.0	0[a]
3	27	2045	2187.5-2197.0	16.5-26.0	9.5	1.3	14[c]
4	27	2255	2216.0-2225.5	45.0-54.5	9.5	3.9	41[c]
5	27	2359	2244.5-2254.0	73.5-83.0	9.5	3.4	36
6	28	0108	2263.5-2273.0	92.5-102.0	9.5	5.35	56[c]
7	28	0210	2292.0-2301.5	121.0-130.5	9.5	0.2	2
8	28	0330	2301.5-2311.0	130.5-140.0	9.5	5.0	52[c]
9	28	0445	2320.5-2330.0	149.5-159.0	9.5	3.45	36
Total					80.5	29.2	36

[a]Pressure core barrel.
[b]Punch-in cores.
[c]Gassy core.
[d]Broke circulation.
[e]H_2S observed.
[f]Washed 2.5 meters.

TABLE 2
Lithologic Summary, Site 379

Subunit		Thickness (m)	Interval (m)	Core
1	Nanno ooze	0.30	0–0.30	1474[a]
2	Sapropel	0.40	0.30–0.70	1474
3	Terrigenous mud	65	0.70–65	1–7
4	Diatomaceous nannofossil mud	35	65–100	8–11
5	Sapropel	0.30	100–225	11
6	Terrigenous mud	125.5	100–225	12–24
7	Diatomaceous nannofossil mud	~47	~225–~273	25–29
8	Terrigenous mud	~180	~273–453	30–49
9	Terrigenous mud with carbonate varves	170	453–624.5	50–69

[a]Piston Core 1474 A-II Cruise 49.

Subunit 2—Sapropel (0.30-0.70 m) PC 1474[2]

This subunit is also mainly known from A-II piston cores, where the nannofossil ooze (Subunit 1) is underlain by a sapropel that consists of about 40% to 50% organic matter by dry weight. Within the sapropel the water content is of the order of 90%, and occasionally thin nannofossil beds and fine layers of inorganically precipitated aragonite ("wheat grains") are found. The principal fossil species is *Braarudosphaera bigelowi*. No distinct sapropel layer was observed in the badly disturbed first DSDP core, but its presence was suggested by fragments. This subunit is related to the development of the H_2S zone in the Black Sea that started about 7000 years ago.

Subunit 3—Terrigenous Mud (0.70-65 m) Cores 1-7

This subunit is dark greenish gray detrital silty clay to clayey silt, and the upper part of this subunit corresponds to the detrital sediments obtained from previous piston cores (Unit III of Ross et al., 1974). Although many of the upper cores were badly disturbed by the drilling operation, some alteration of medium gray silty mud and greenish black clay intervals were found. Silt and fine sand occur as streaks and patches and occasionally as layers. The graded bedding of these suggest turbidites. The sediment is mainly composed of clay minerals, quartz, feldspar, heavy minerals, and detrital carbonates (calcite and traces of dolomite). On an average the carbonate content is 15%. The quartz and feldspar content is high (>30% on average), and plagioclase are often more abundant than quartz. Besides the abundant plagioclase, K-feldspar is present in quantities up to 8%. The clays are illite, smectite, with subordinate chlorite and kaolinite. The dominant heavy minerals are pyroxene, epidote, and green hornblende which are thought to reflect a southern or southeastern source area. Only reworked nannofossils of the Cretaceous and Tertiary were encountered. The varying amounts of diatoms (traces up to 20%) that are found in Core 4 to 9 are all fresh-water diatoms. Obviously, Subunit 3 was deposited in a fresh-water environment when no Mediterranean water could enter the Black Sea. The pollen data suggest a cold climate, probably corresponding to the Würm/Weichsel glacial stage. As there is some controversy concerning the correlation of Hole 379A and Holes 380/380A, no attempt of correlation is made in the lithology report. The reader is referred to the individual synthesis chapters. Also, see palynology report for this site and for Site 380.

Subunit 4—Diatomaceous Nannofossil Mud (~65-100 m) Cores 8-11

This subunit consists of a dark greenish gray to medium gray mud characterized by the first appearance of marine diatoms, foraminifers, and nannofossils beneath the Holocene Black Sea deposits. Diatoms were found in Cores 10 and 11, and a brief fresh-water interval during this marine period in indicated by the intercalation of a thin layer of fresh-water diatoms. The marine influence is also shown by abundant *Emiliania huxleyi* and *Ammonia breccarii* found in Core 11, Section 5 and in the increase in pore-water salinity. In Core 11, Section 5, a distinct layering of fossil material could be recognized (Figure 5). The remainder of this subunit is composed of a mixture of nannofossils, diatoms, and terrigenous material. This subunit was cored again at Hole 379B at exactly the same depth interval, a point significant for cross correlation between Holes 379A and 379B. The pollen data suggest deposition of this subunit during a warm interglacial period that may correspond to the Eemian.

Subunit 5—Sapropel, Core 11

Subunit 5 is a black sapropel layer (Figure 5) that has a thickness of about 0.3 meter and is intensely compacted. Its organic carbon content can be as high as 15%. It has thin white layers composed of nannofossils or aragonite in typical "wheat grains" similar to the Holocene sapropel sequence. The nannofossils are *Braarudosphaera bigelowi* and *Syracosphaera pirus* which indicate brackish water conditions (18‰) in the Black Sea. Manganosiderite was detected by X-ray diffraction. This subunit is interpreted as a shift from a fresh-water to a marine environment.

Subunit 6—Terrigenous Mud (100-225 m) Cores 12-24

Subunit 6 is a dark greenish-gray terrigenous mud, that resembles Subunit 3 in that clay, quartz, feldspar and detrital carbonates are the most common sediment components. Most of the recovered cores are badly disturbed. In the lower part of the subunit (Cores 19 to 24), beds of silt and sand are found within the mud in general cycles of 10 to 15 cm. These beds are mostly silt but some are composed of sandy material (Cores 20-3; 21-2). Most of the coarser grained beds have sharp upper and lower contacts and many appear graded. Some stringers of pyrite are scattered throughout the subunit, and quartz and feldspar content are generally high (25% to 30%). The clays are similar to Subunit 3, except that smectite seems to be more abundant. Carbonate content is generally low (10%-15%) and detrital dolomite is found in trace quantities. A decrease in pyroxene content is observed within the heavy mineral suite that might be a result of the instability of this mineral rather than indicating a change in source area. The nannofossils found in this subunit are all reworked. Diatoms are present in Cores 16, 18 and 19 to 24. The diatoms are all fresh-water

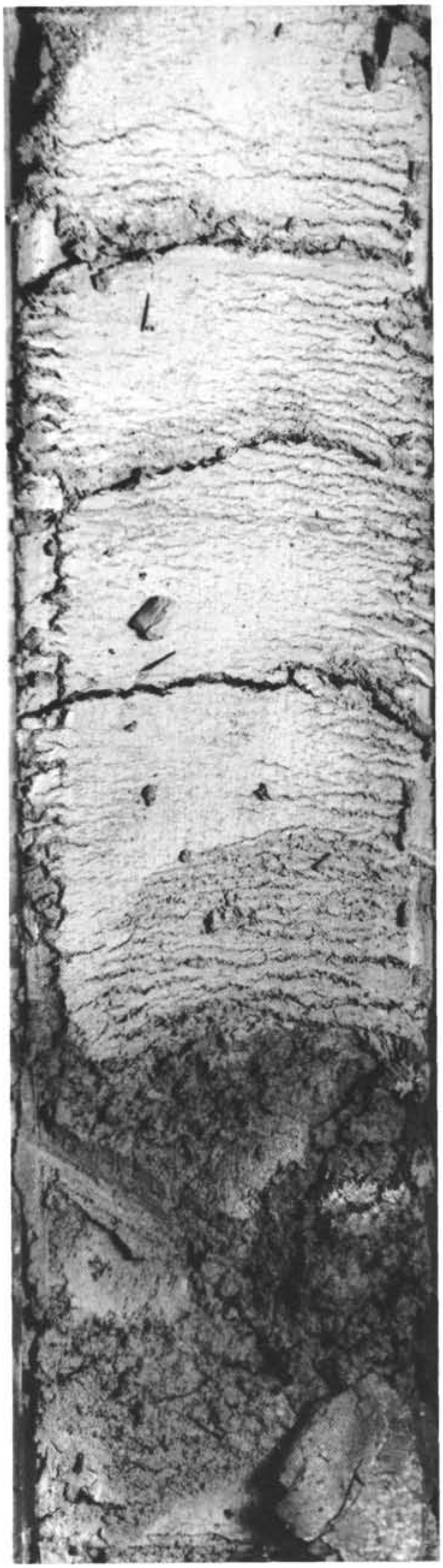


Figure 5. *A black sapropel layer topped by a nannofossil ooze.*

species with the exception of those in Core 18 which are characterized as marine. Basically, the subunit was deposited in a fresh-water environment with one brief marine invasion. The climate was cold (Weichselian), as indicated by pollen analyses, and the marine invasion is interpreted as a short interstadial period.

Subunit 7—Diatomaceous Nannofossil Mud (225-273 m) Cores 25-29

Subunit 7 is a diatomaceous nannofossil-rich terrigenous mud, that is distinguished by the presence of diatoms and nannofossils in various layers of the unit and by the first occurrence of authigenic carbonate. Several small sapropelic horizons also occur. One very distinct one (6% org C) was found in Core 29, Section 5 (Figure 6). Authigenic carbonate is present in 3 to 7 cm thick light gray massive beds (Sections 25-2 and 29-5). In Core 29, Section 5, a cyclic pattern of light gray micrite and medium bluish gray pyrite and carbonate-rich mud was observed (Figure 7). In the light gray structureless carbonate layers, carbonate contents ranged up to 74%, and consist principally of calcite. These carbonate layers are known for perialpine lakes under the name "Seekreide."

Braarudosphaera bigelowi was found in Sample 25-2, 3 cm and in Core 29 again indicating brackish-marine water conditions. Diatoms were reported in Core 25 and Cores 29-31 and are characterized as marine. The diatoms are often concentrated in olive-brown thin layers. A pale red sediment sequence suggesting more oxidizing conditions was found in Section 29-6. Layers of sandy silts are often present suggesting a turbidite origin. This subunit, as indicated by the pollen flora, was deposited under brackish-marine conditions in a warm climate. It may be correlative to the Holstein interglacial period.

Subunit 8—Terrigenous Mud (275-453 m) Cores 30-49

This subunit is a dark greenish gray terrigenous mud similar to Subunits 3 and 6. Turbidites are also common in this section, and they exhibit a kind of rhythmic pattern with thicknesses of 7 to 10 cm. The sands or sandy silts at the base of a turbidite measure between 0.2 and 3 cm. Besides the turbidites, thin light gray sandy silt to silt layers are found (e.g., Core 49) which sometimes show cross-bedding and ripples (Figure 8). These silt layers are characterized by abundant carbonate rock fragments and contain a different heavy mineral content (opaques, garnet) than the greenish gray coarse-grained turbidite layers (epidote, green hornblende, pyroxene, and often typical alkali hornblende). A windblown origin is suggested for the silt layers and they could be interpreted as a loess deposit.

No indigenous fossil material was encountered in this subunit. Pollen data indicate that the climate was cold from Core 30 to Core 43 (Windel/Elster?) (with a warm interglacial in Core 34) and warmer below Core 43.

Subunit 9—Terrigenous Mud With Carbonate Varves (453-624.5 m) Cores 50-68

Subunit 9 is basically also a terrigenous mud. It is distinguished from the previous units by the

Figure 6. *Black sapropel layers intercalated in marly sediments.*

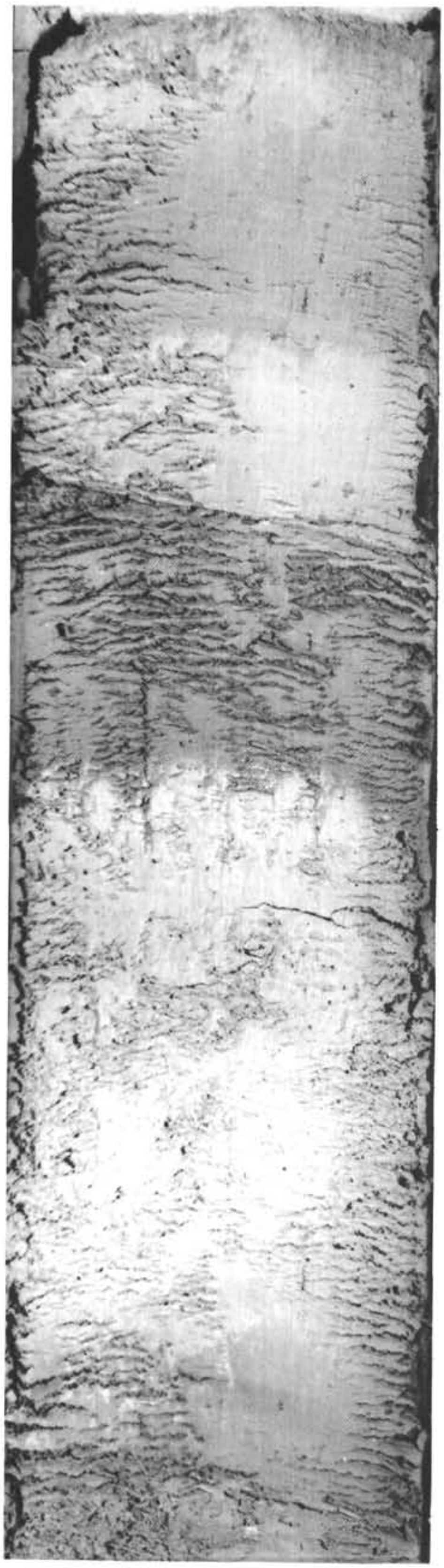


Figure 7. *Light gray structureless* seekreide *alternating with medium bluish gray marly sediments.*

intercalation of carbonate-rich layers. These layers are predominantly found in Cores 50, 58, 60 and 65 and reveal a typical rhythmic pattern. The pattern consists of an alternating sequence of pyrite, dark clay, and calcite (Figure 9). The average thickness of one sequence varies between 3 and 6 cm but is commonly about 4 cm. From the bottom up, the sequence starts with a thin layer of pyrite, on the average 1 to 2 mm thick. Next is a dark clay that grades into a gray clay; finely dispersed pyrite grains were found throughout the gray sediment. The carbonate content of the clays is less than 10%. The gray clay is often mottled and white calcite from the overlying carbonate mud is found in the burrows. The sequence ends with a white to yellowish colored fine-grained carbonate mud consisting of silt-sized calcite particles, the carbonate content is as high as 63%. Pyrite nodules (1 to 2 mm in diameter) frequently occur in this part of the sequence. The boundaries between calcite and pyrite and clay and pyrite are always sharp and distinct. In certain parts of the unit, sand layers of up to 8 cm are found (Figure 10). The dominant lithology of Subunit 9 is a terrigenous mud consisting of quartz and feldspar (about 20% to 25%), clay minerals, and detrital carbonates (calcite and traces of dolomite). Indigenous fossils are extremely rare. There is a questionable occurrence of *Braarudosphaera bigelowi* in Core 50A. No diatoms or foraminifers were found. Dinoflagellates are fairly common in Core 64. The pollen data indicate that most of the unit was deposited in a more or less interglacial sequence, with an age at the base of perhaps Waalian.

The mechanism of the rhythmic *seekreide* pattern found in some of the cores is not yet fully understood. The cycles are unlikely to be seasonal because this would imply a sedimentation rate in the order of 40 meters per 1000 years, and this high rate is not in line with geothermal consideration. The cycles are likely to be related to the presence of a thermocline. Under anoxic conditions within the sediments, the pyrite and the dark clays could be deposited. Carbonate content within the dark clays is very low (0-5%) which might indicate carbonate dissolution. The breakdown of the thermocline would lead to sufficiently oxygenated bottom conditions and the development of chondritic burrowers. But the rate of sedimentation or some other factor did not permit sufficient residence time for the burrowers to produce a completely reworked and mottled sediment texture.

BIOSTRATIGRAPHY

Calcareous Nannoplankton—Hole 379

Only one sample (379-1, CC) was examined for age dating, zoning, and paleoenvironmental assignment. The sample contains floods of *Emiliania huxleyi* (Lohmann) together with frequent reworked Cretaceous and Eocene to Oligocene calcareous nannoplankton (see Table 3). A late Quaternary age is assigned to the sample based on the occurrence of *E. huxleyi* which is the nominal species of the Martini (1971) NN-21 calcareous nannoplankton zone. The

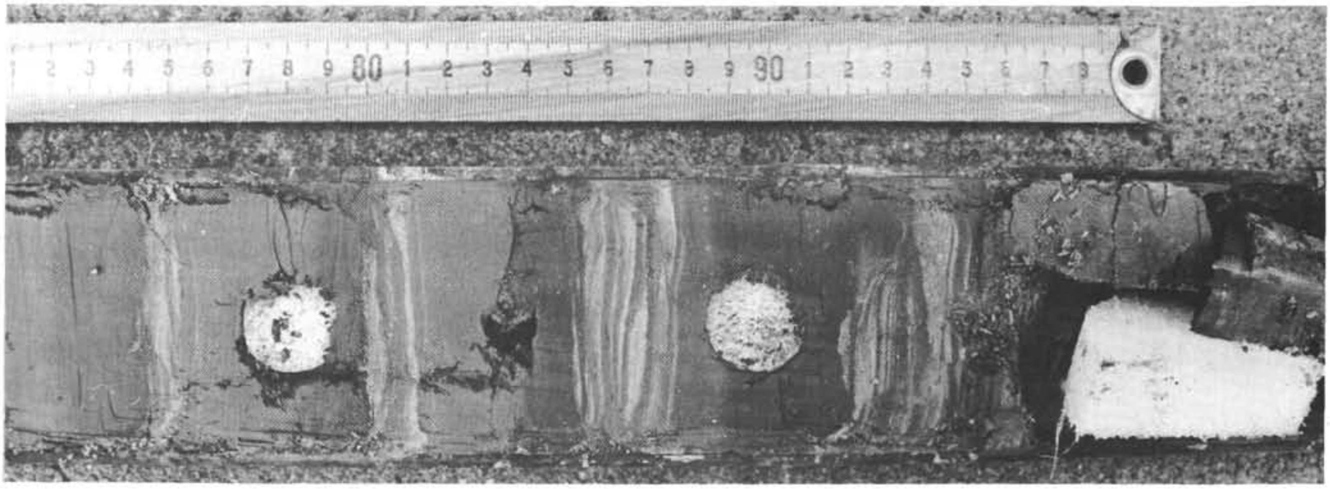


Figure 8. *Light gray carbonate-rich sandy silt to silty layers intercalated in dark greenish gray terrigenous muds. Cross bedding and ripples are present.*

paleoenvironment was probably brackish-water on the basis of Bukry's (1974) studies, and the absence of calcareous nannoplankton designated as normal marine by him.

Other Fossil Groups—Hole 379

No indigenous planktonic foraminifers for making age assignments, zonal assignments, and paleoenvironmental interpretations were found in Sample 379-1, CC nor were any reworked species encountered (see Table 3). Further, during the process of searching for planktonic foraminifers, estimates were made of other microfossils; however, no benthic foraminifers, ostracodes, diatoms, mollusc, siliceous spicules, or other microfossils were observed.

Calcareous Nannoplankton—Hole 379A

Two hundred thirty-five samples were examined for calcareous nannoplankton for purposes of age dating, zoning, and making paleoenvironmental interpretations. Indigenous species of calcareous nannoplankton are primarily restricted to the uppermost cores (Cores 1 through 11) and Core 25 (see Table 4). From Core 1 through Section 5 of Core 11, very rare to flood occurrences of *Gephyrocapsa caribbeanica* Boudreaux and Hay are found. Associated with these nannoflora are very rare to abundant reworked Cretaceous and Eocene to Oligocene calcareous nannoplankton. The absence of definite marine species of the genera *Cyclococcolithina, Ceratolithus, Helicopontosphaera*, and *Rhabdosphaera* suggests a brackish-water paleoenvironment according to the data of Bukry (1974).

The abundance of indigenous species (see Table 4) disappears abruptly below Section 5 of Core 11. Most of the remaining samples studied from Hole 379A contain only reworked Cretaceous and Eocene to Oligocene species. The only other definite occurrence of indigenous forms is in Core 25, Sections 2 and 3. At this horizon only *Braarudosphaera bigelowi* (Gran and Braarud) is found with very rare reworked Cretaceous and Eocene to Oligocene calcareous nannoplankton. In Sample 379A-25-2, 50-52 cm it is very rare as whole specimens and fragments and in Sample 379A-25-3, 134-135 cm it is abundant as whole specimens and fragments. Several very questionable occurrences of *B. bigelowi* are found in Samples 379A-19-5, 99-101 cm, 379A-21, CC, 379A-29, CC, and 379A-51, CC. These samples are questioned because of the extreme rarity of specimens. Frequent to common reworked Cretaceous and Eocene to Oligocene forms are associated with the indigenous flora. Bukry (1974) indicates that a nannoflora containing only *B. bigelowi* is probably indicative of brackish-water deposition.

Only the fossiliferous interval above Section 6 of Core 11 can be dated. It is assigned to the Quaternary based on the occurrence of *Gephyrocapsa caribbeanica* Boudreaux and Hay. No other age assignments can be made for Hole 379A because the only other occurrences of an indigenous species are those of *Braarudosphaera bigelowi* (Gran and Braarud) which ranges from Jurassic to Recent.

Other Fossil Groups—Hole 379A

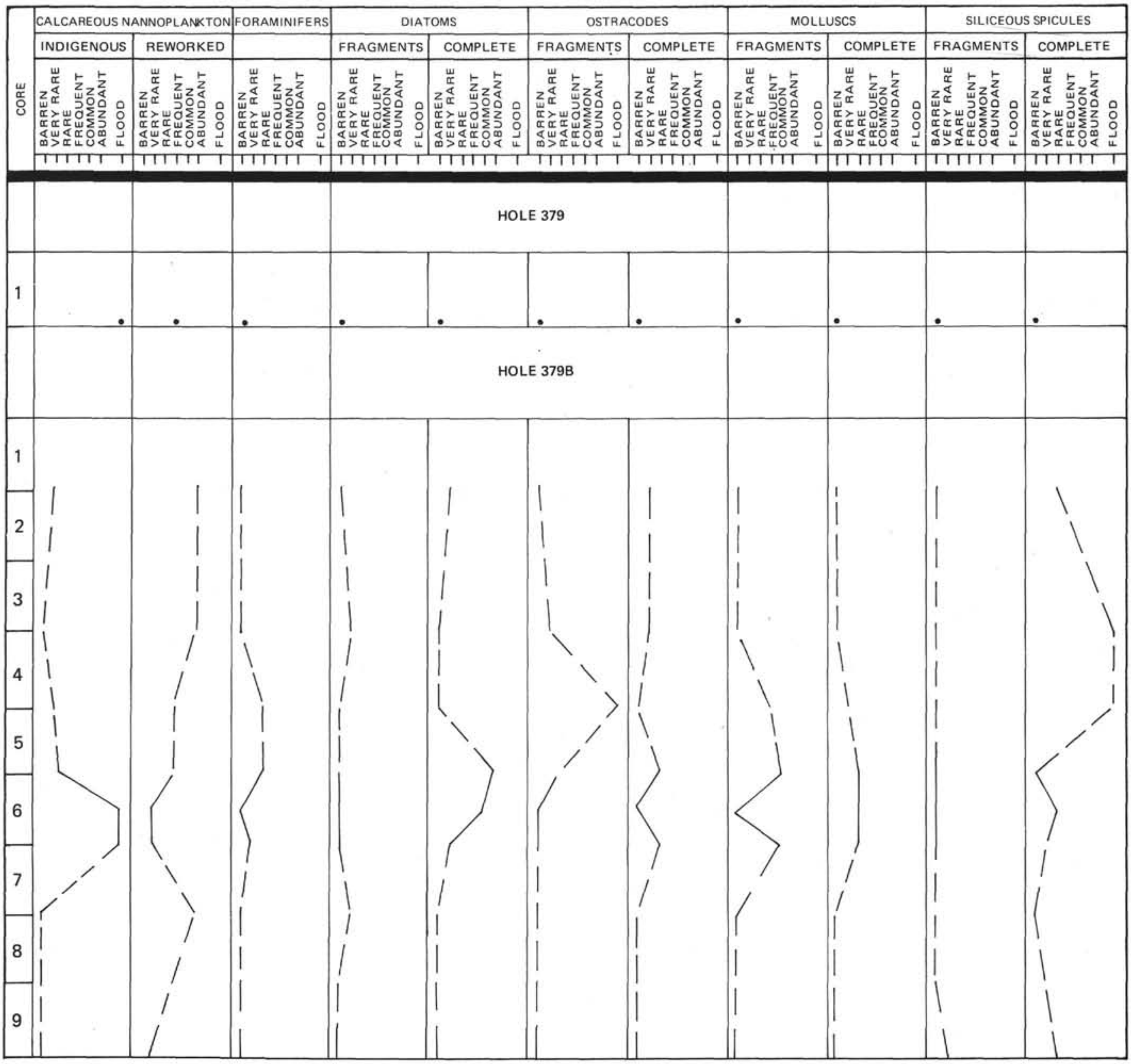
One hundred eighty-four samples were examined for planktonic foraminifers for age dating, zoning, and making paleoenvironmental interpretations. None of the samples contained indigenous specimens of planktonic foraminifers. Small (juvenile) reworked globigerinids were found in Samples 379A-4, CC, 379A-17-1, 89-91 cm, 379A-21-4, 20-22 cm, and 379A-34, CC. A small (juvenile) globorotalid was found in Sample 379A-51-2, 24-26 cm. A specimen of *Chiloguembelina* sp. was found in Sample 379A-38, CC and a specimen of *Pseudohastigerina* sp. was encountered in Sample 379A-6-1, 74-76 cm. See report by Gheorghian (this volume) for additional comments. While examininng the samples for planktonic foraminifers, the presence of all other groups of microfossils was noted and estimates were made of their abundance (see Table 4).

Benthic foraminifers are primarily restricted in their occurrence to samples from Cores 4 through 11 (see Table 4). Most of the occurrences reported from this

Figure 9. *Rhythmic patterns of carbonate cycles. The base is a medium gray mud grading upward into a zone of chondritic burrows where it is topped by light gray* seekreide *or mud.*

Figure 10. *Sand layer intercalated in a terrigenous mud sequence.*

TABLE 3
Distribution of Various Fossil Groups in Holes 379 and 379B at Site 379



interval are of *Ammonia beccarii* (Linne) together with rare occurrences of other benthic forms. Very rare to rare benthic faunas are encountered in the interval from Cores 13 through 7. In another chapter Gheorghian gives species determinations for indigenous and reworked benthics.

Diatoms are rare and sporadically distributed above Core 8. They are very rare in Core 1, rare in Cores 4 and 6, and very rare in Core 7 (see Table 4). From Cores 8 through 11 they constitute an important part of the flora. They occur sporadically between Cores 11 and 30 and are absent below Core 30. Diatoms are rare in Core 17, abundant in Core 18, very rare in Core 21, rare to floods in Core 24 through 25, abundant in Core 29, and very rare in Core 30. See reports by Jousé (this volume) and Schrader (this volume) for further discussions of diatoms.

Ostracodes are sporadically distributed throughout the cored interval (see Table 4). Further studies are those of selected samples by Olteanu (this volume), a more complete one by Schneider (this volume), and a preliminary one by Benson (this volume).

Molluscs are primarily restricted to Cores 1 through 11 where they are relatively abundant (see Table 4); however, they do occur rarely to frequently in Cores 16, 17, 23, 54, 57, and 64.

Siliceous spicules occur rarely and sporadically from Core 6 through Core 51 and are absent above and below this interval (see Table 4). No other microfossils or fish remains were observed in any of the samples.

Calcareous Nannoplankton—Hole 379B

Only nine samples were examined from Cores 1 and 3 through 9 from Hole 379B (see Table 3). All are core catcher samples except for 379B-6-4, 80-82 cm. Indigenous calcareous nannoplankton were restricted to samples from the upper six cores. These samples contained *Gephyrocapsa caribbeanica* Boudreaux and Hay. Frequencies varied from barren in the sample from Core 3, to very rare occurrences in samples from Cores 1 and 4, to rare in the sample from Core 5, and finally to floods in samples from Core 6. This fossiliferous interval is assigned to the Quaternary based on the occurrence of *G. caribbeanica*. According to the data of Bukry (1974) the paleoenvironment would be interpreted to be brackish-water based on the absence of normal marine species. Reworked Cretaceous and Eocene to Oligocene calcareous nannoplankton species were observed in all nine samples studied with very rare to abundant frequencies.

Other Fossil Groups—Hole 379B

Nine samples were examined for planktonic foraminifers for purposes of age dating, zoning, and making paleoenvironmental interpretations. No indigenous planktonic foraminifers were observed. A discussion of reworked species is given by Gheorghian (this volume). While studying the samples for planktonic foraminifers, estimates were made of other fossil group occurrences (Table 3).

Benthic foraminifers are restricted to the samples from Cores 4 through 6 (see Table 3). As previously discussed for Hole 379A, the faunas consist of *Ammonia beccarii* (Linne) with very rare occurrences of other species. Species determinations for benthic foraminifers are discussed by Gheorghian (this volume).

All other groups of fossils—diatoms, ostracodes, molluscs, and siliceous spicules—are primarily restricted to the samples from Cores 3 through 6. The only exception is that the core-catcher sample from Core 7 contains very rare diatom fragments. No fish remains or other fossil groups were observed.

PALYNOLOGY

All core-catcher samples recovered, Cores 1-68, contained palynomorphs, extracted by conventional palynological methods. Shipboard, the procedure consisted of prolonged heating in 20% HCl, followed by heating in Calgon detergent, and a float-sink procedure with $ZnCl_2$ solution, specific gravity 2.0. Shore procedure was the same, except that 52% HF digestion was substituted for detergent-dispersion. This produced cleaner and more concentrated residues, but an interesting aspect of the shipboard work was that acceptable preparations were obtained from all samples without the use of HF.

The palynofloras obtained consisted of pollen, embryophytic spores, fungal spores, algal remains, acritarchs, and dinoflagellates. The gross palynological results for Hole 379A are displayed in Figure 11. "Steppe-Forest Index" (SFI) as a general climatic indicator, was calculated for each core-catcher sample, using the following ratio:

$$\frac{\text{Artemisia + Chenopodiaceae + Amaranthaceae}}{\text{(The above) + Pinus + Cedrus + Picea + Abies + Quercus + Alnus + Ulmaceae (and other tree genera)}}$$

The larger the number obtained, the more indication of comparatively cool/dry conditions in the Black Sea drainage. Modern surface sediments of the Black Sea yield a SFI of about 10%.

A "Marine-Influence Index" (MI) was calculated as the following ratio:

$$\frac{\text{Dinoflagellates + Acritarchs}}{\text{Dinoflagellates + Acritarchs + Total Pollen}}$$

Note, however, that some dinoflagellates are fresh-water forms, and "acritarchs," while presumably algal, are by definition a heterogeneous group of unknown exact relationship, and presumably include fresh-water forms. Even the modern Black Sea is far from full marine and yet surface sediments produce a high (ca. 40%) "Marine-Influence Index." A very low MI does indicate fully non-marine environment, however. One especially characteristic bag-like dinoflagellate, as yet unnamed ("dinoflagellates 19-20"), is plotted separately as a percent of dinoflagellates and acritarchs because its appearance in the record is characteristically sudden and dramatic. (This fossil was known on shipboard as "bag 51".)

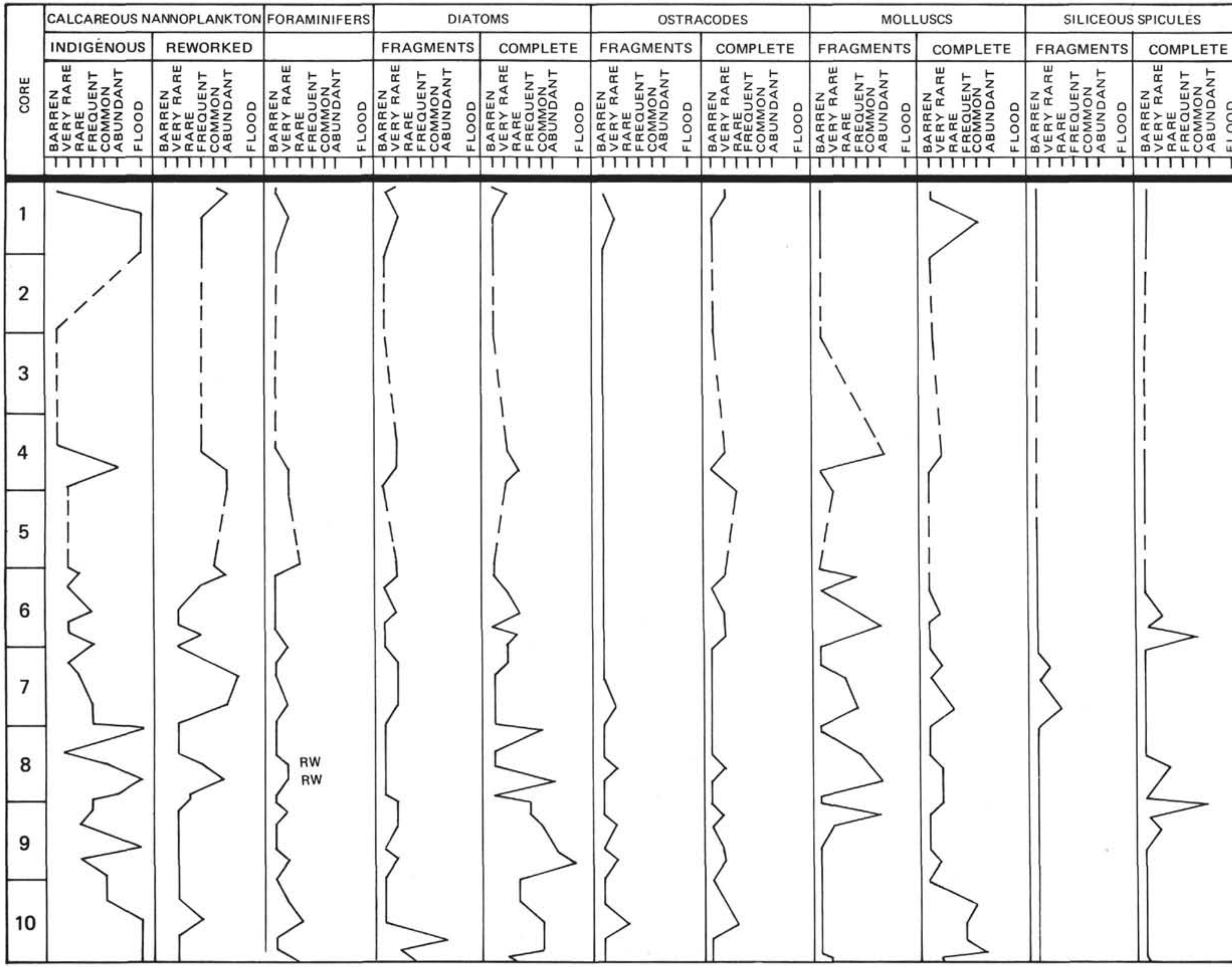
The significance of the palynological curves for Site 379 is best understood by comparison with those for Holes 380-380A, which represent a more complete record. The probably cool periods "Alpha," "Beta," and "Gamma" of Holes 380/380A would appear to be represented at Hole 379A by less clearly expressed steppe peaks culminating at Cores 59, 32, and 16, respectively. The low SFI below Core 62 seems clearly to represent the end of the "Pre-Alpha" of 380/380A, but the long Pliocene-late Miocene record of the lower part of Holes 380/380A and 381 was not penetrated at Site 379.

The MI curve for Site 379 agrees with that at 380/380A in general outline but not in detail, which may indicate the influence of local environment at the site of deposition—for example, locally abundant pollen/spore deposition would depress the MI value somewhat. However, the MI peaks associated with the "Alpha" period are shown also at Site 379 (although the numbers are lower) and, especially the peaks of "dinoflagellates 19-20" that characterize "Alpha" at Site 380, are seen also at Site 379, along with some earlier "dinoflagellates 19-20" peaks (Cores 27-28 and 36-37) that do not have equivalents at Hole 380.

Based on abundant pollen of Tsuga (hemlock), other conifer pollen, abundant Ulmaceae pollen (elm family), the MI, SFI, and dinoflagellate information, Cores 60-68 of Hole 379 ("Pre-Alpha") seem to correlate with Cores 36-41 of Hole 380A. These levels in the two holes both belong to about the Waalian, or are ±1,000,000 yr B.C.

TABLE 4
Distribution of Various Fossil Groups in Hole 379A at Site 379. (RW = Reworked)

HOLE 379A



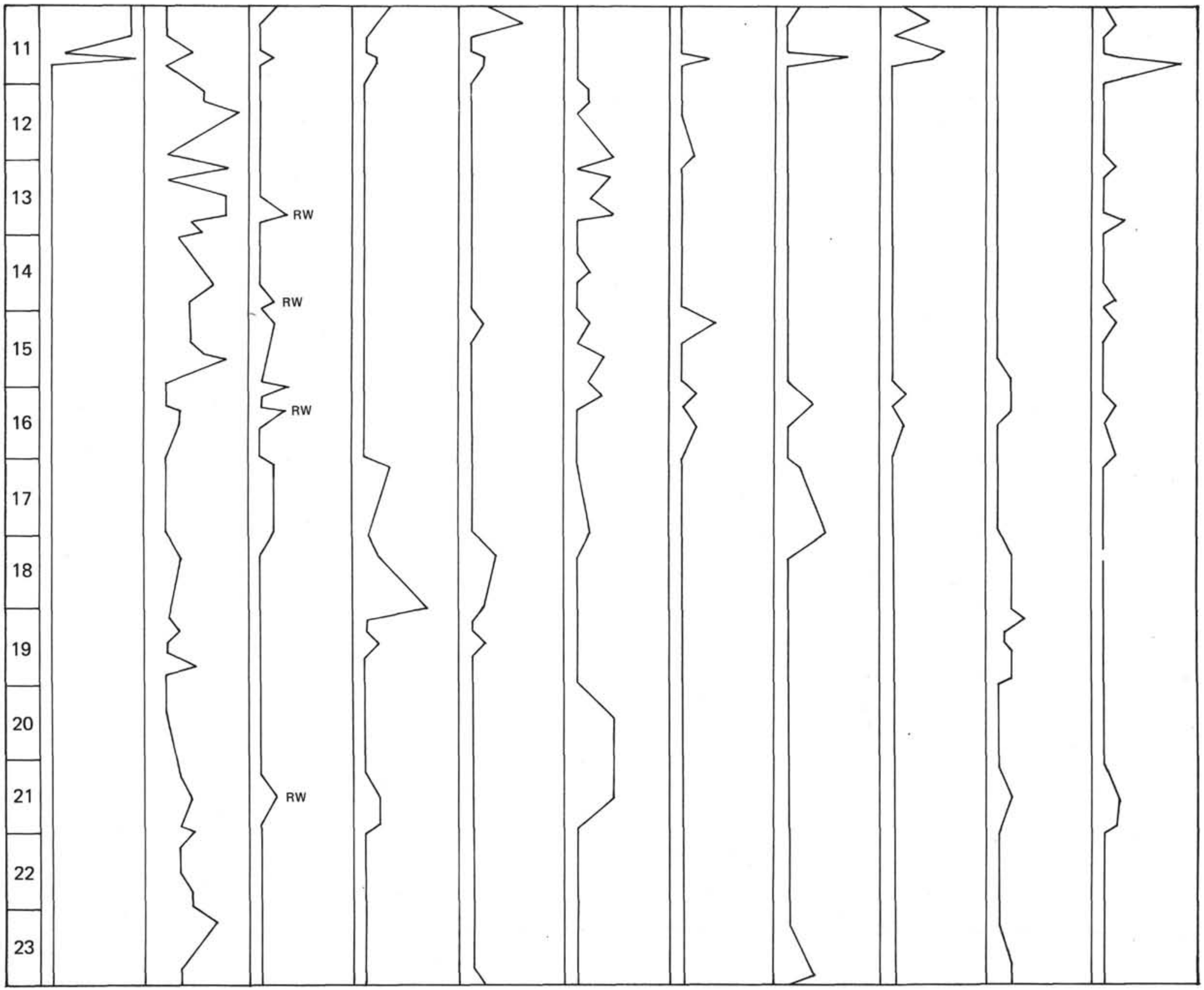

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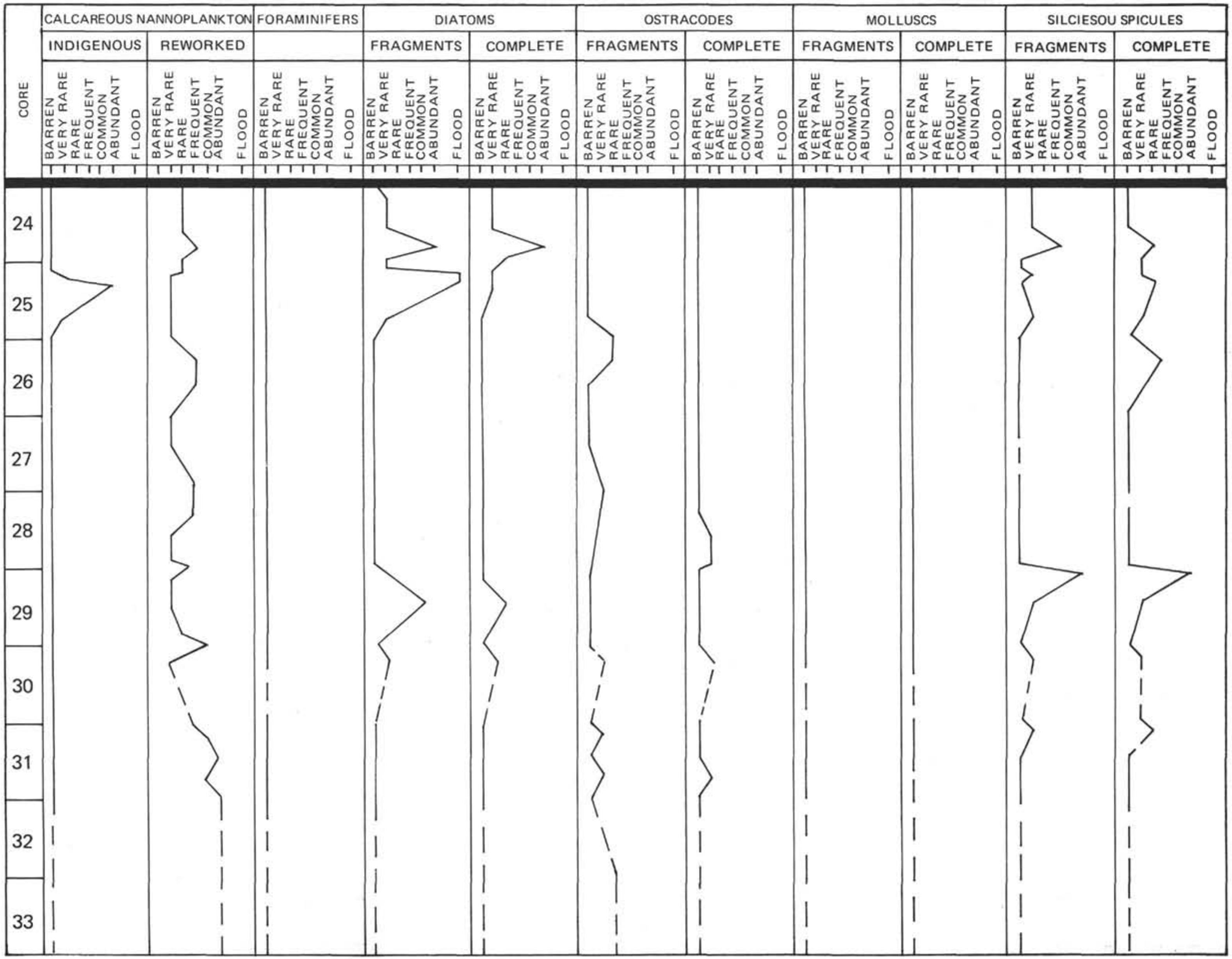
TABLE 4 – *Continued*

HOLE 379A



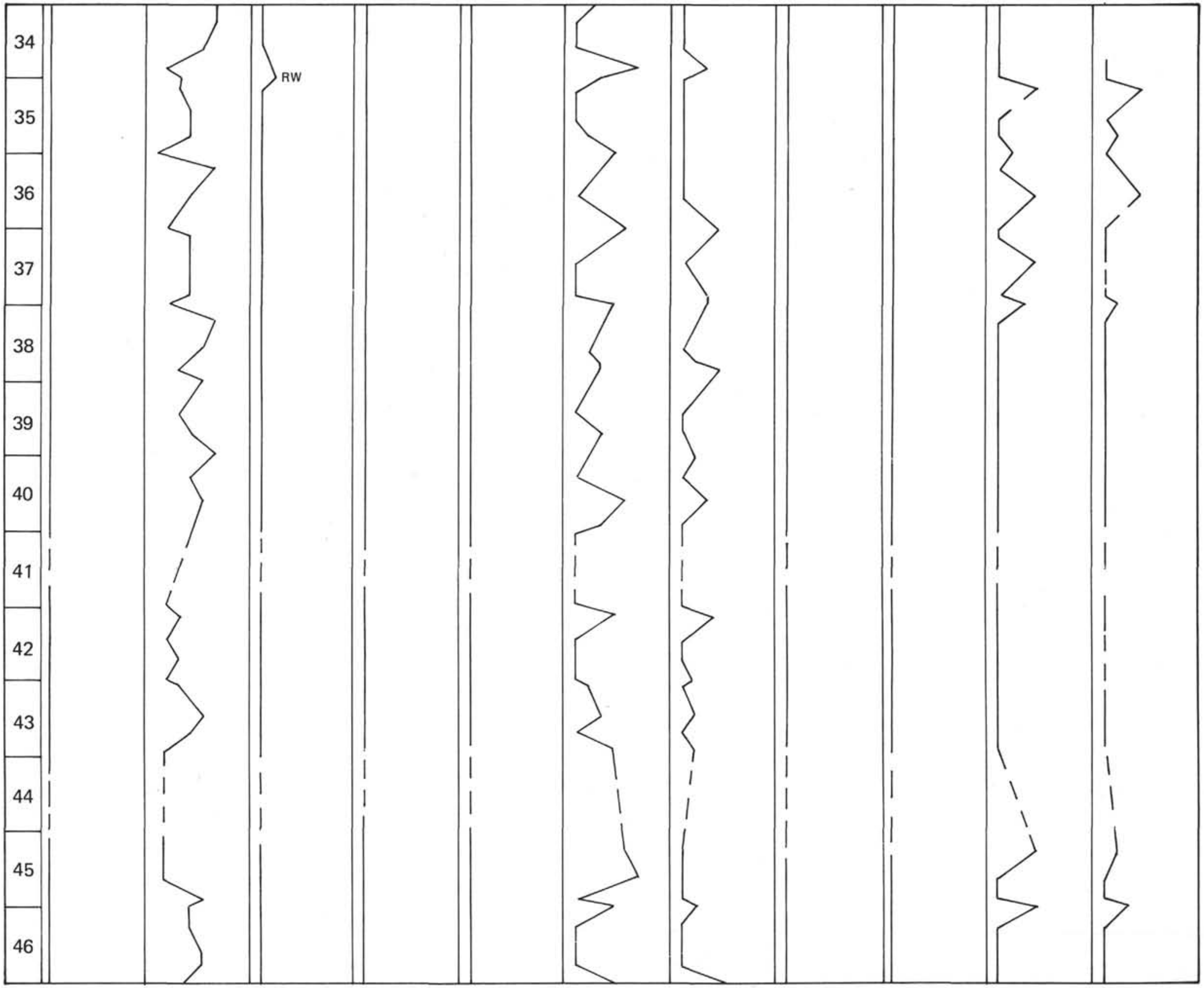

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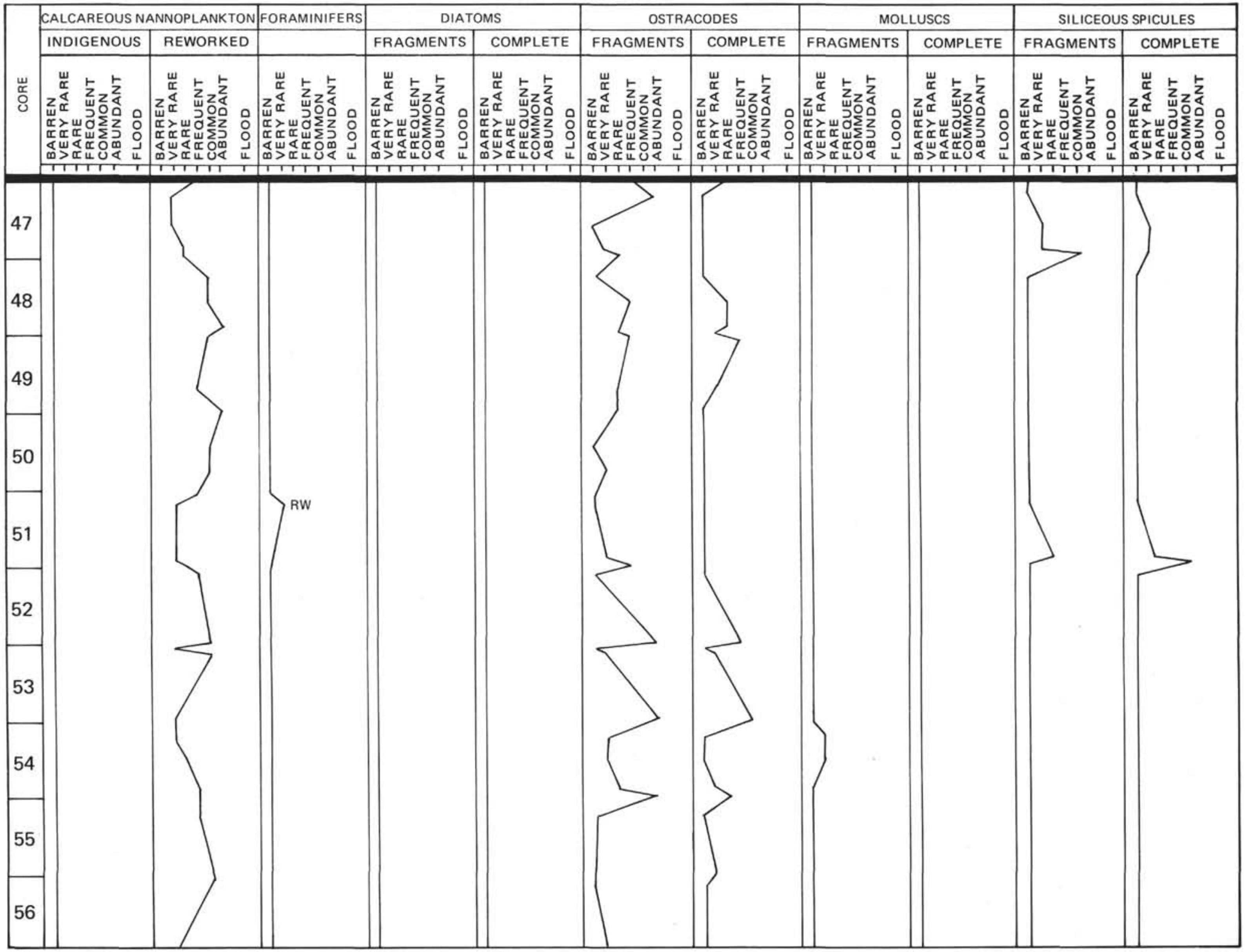
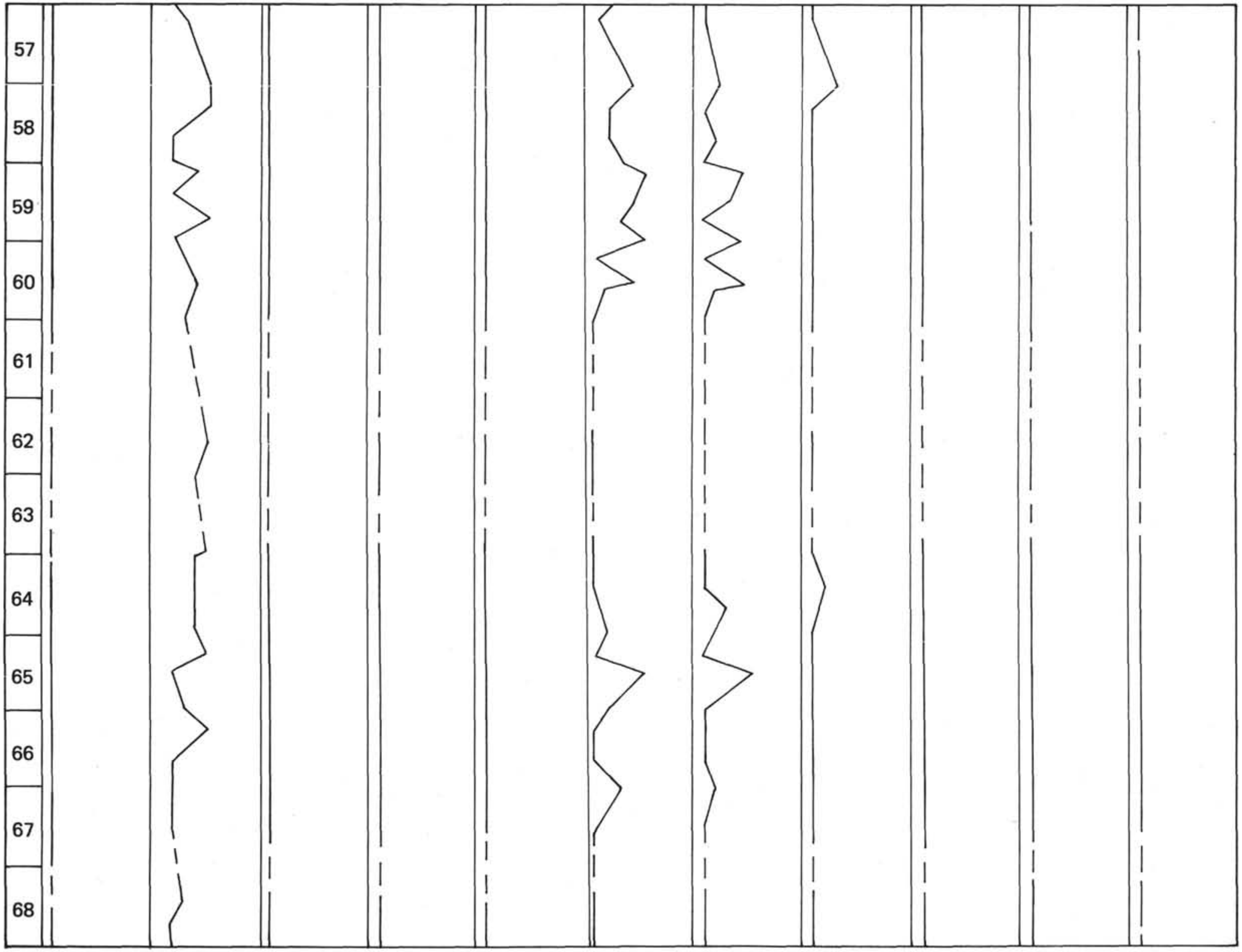
TABLE 4 – *Continued*

HOLE 379A

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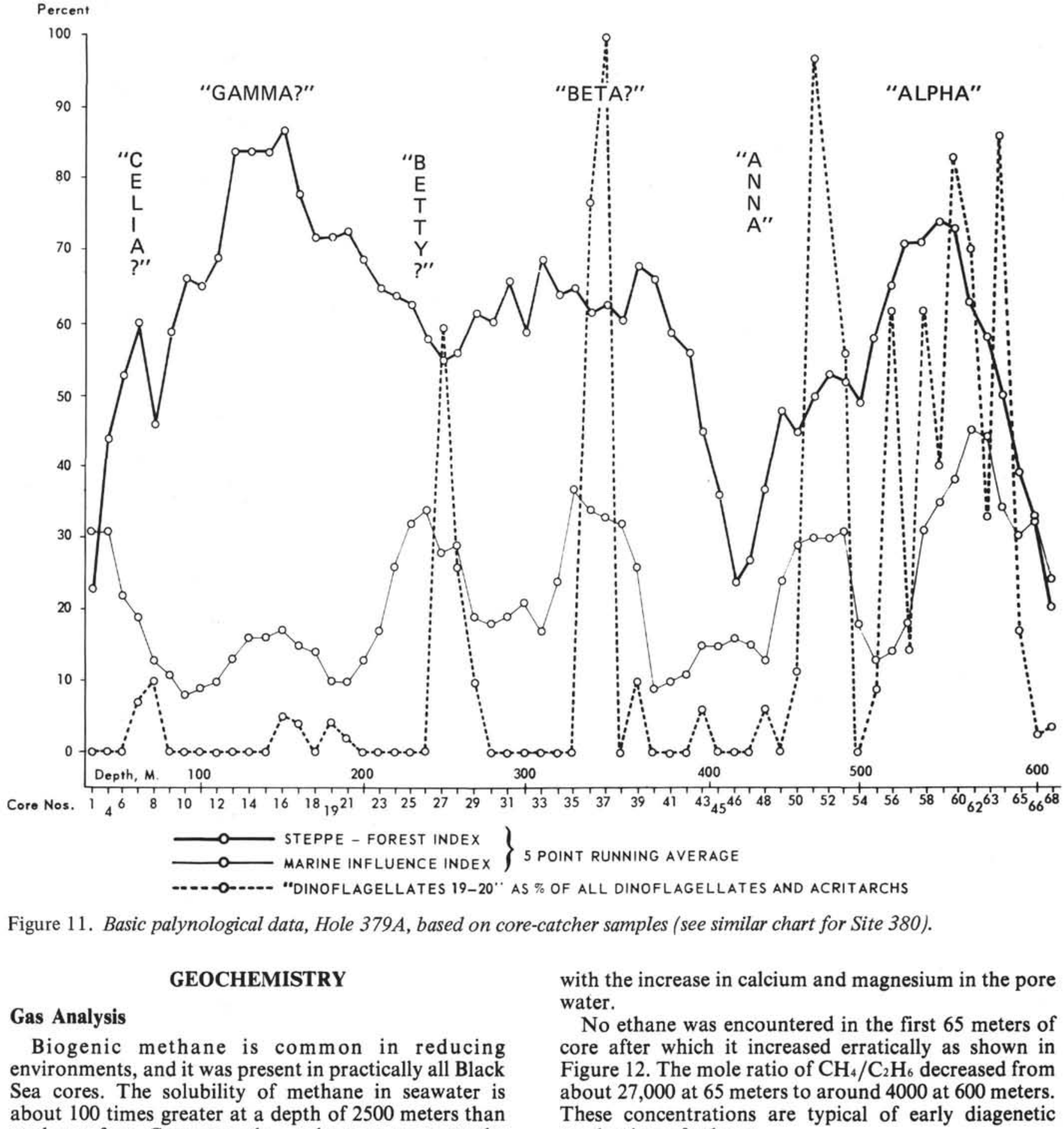

Figure 11. *Basic palynological data, Hole 379A, based on core-catcher samples (see similar chart for Site 380).*

GEOCHEMISTRY

Gas Analysis

Biogenic methane is common in reducing environments, and it was present in practically all Black Sea cores. The solubility of methane in seawater is about 100 times greater at a depth of 2500 meters than at the surface. Consequently, as the core comes to the surface, gas pockets form and compress the adjacent core material. These gas pockets were sampled continuously with depth in the core and analyzed on a Carle gas chromatograph.

Carbon dioxide also is a major gas product from the microbial and chemical decomposition of organic matter during early diagenesis. At Site 379 the mole ratio of CH_4/CO_2 was about 100 over the range from the site sediment surface to 200 meters below the mudline. At greater depth, it increased erratically, reaching 750 at 275 meters and 1500 at 600 meters. The decrease in CO_2 at depth below 200 meters correlates with the increase in calcium and magnesium in the pore water.

No ethane was encountered in the first 65 meters of core after which it increased erratically as shown in Figure 12. The mole ratio of CH_4/C_2H_6 decreased from about 27,000 at 65 meters to around 4000 at 600 meters. These concentrations are typical of early diagenetic production of ethane.

The odor of hydrogen sulfide was noted in one of the shallow cores. There was no evidence of it after the first few cores.

Pore Fluids

Pore fluids in cores from Holes 379A and 379B were dominated by fresh-brackish waters in the upper 400 meters, after which a strong increase in salinity was observed. Within the freshened section several major cycles could be observed (Figure 13). The shaded cycles correspond, respectively, to marine episodes designated as Mindel-Riss and Riss-Würm by Jousé and Mukhina

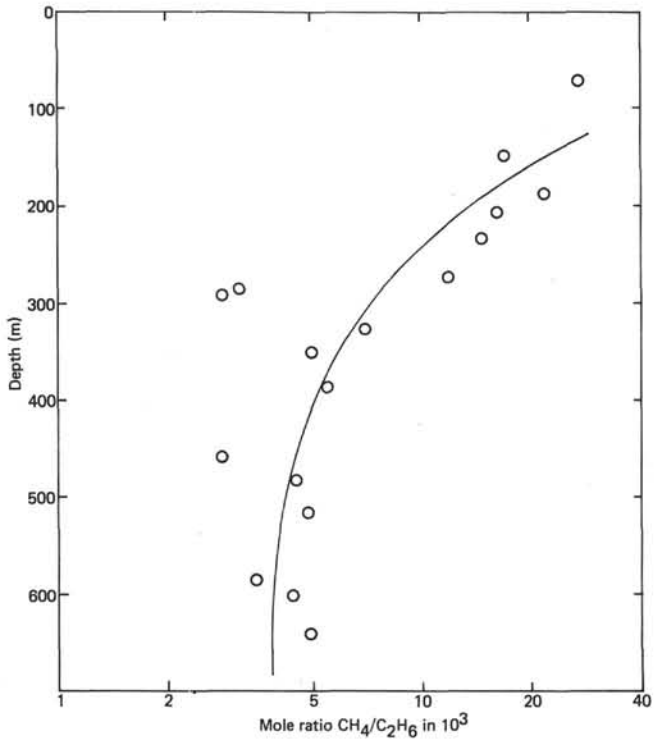

Figure 12. *Mole ratio of CH_4/C_2H_6 with depth from cores taken at Site 379.*

(this volume). The subpeak in salinity at 50-100 meters correlates very well with interstadial-type floral indices, and the presence of brackish-marine nannofossils. More specific details of the pore fluid composition are given in Manheim and Schug (this volume). In interpreting pore fluid data one must bear in mind the effect of diffusion, which tends to smooth out peaks, and permeate underlying sediments with the character of bottom waters and sediments that succeed them. These relationships are shown schematically in Figure 14.

The second major observation, observed in the lower part of the section, is the occurrence of brines exceeding both the current salinity of Black Sea bottom waters (22‰) and Mediterranean waters. An increase of calcium and magnesium, largely in the form of chlorides, can be accounted for only by ocean-derived evaporative brines or solid evaporites of ocean origin. The onset of the brines is marked by increasing evidences of carbonate precipitation and accumulation in the sediments, and corrosion and chemical weathering of organism remains below 400 meters. The brines may have played a role in the formation of wheat grain-shaped aragonite crystals that distinguish some Black Sea layers.

Electrical resistivity studies showed decreases in diffusive permeability of 3 to 7 times free-water diffusion constants

Below 400 meters cementation phenomena account for further decreases to 1/20 meter of free fluid diffusive mobility (see Manheim, this volume).

PHYSICAL PROPERTIES

Water Content, Porosity, Density, and Thermal Conductivity

The high gas content of the cores recovered from Site 379 rendered them unfit for the determination of either porosity or wet bulk density values requiring volumetric measurements. Water content data, however, should be valid, if the interstitial pore water has not undergone movement in response to the creation of interstitial gas bubbles.

Water content decreases with depth from maximum values of about 35 weight percent near the mudline to about 20 weight percent at 622 meters (Figure 15). The high variability of the water content data (19.7% to 33.0%) in the upper 51 meters probably reflects the presence of highly porous sandy layers which have lost substantial proportions of their interstitial water during and after recovery, description, and sampling of the core.

Wet bulk density increases smoothly with depth from very low values (1.45 g/cc) near the top of the hole to 1.9 to 2.0 g/cc near 600 meters subbottom (Figure 16). The observed densities may be lower than in situ densities due to the presence of interstitial gases in the form of tiny bubbles.

Thermal conductivity values are highly variable, ranging from values of 2.37 mcal/cm sec°C near the top of the borehole (28 m subbottom) to 3.27 mcal/cm sec°C near 600 meters subbottom (Figure 17). The mean of all the thermal conductivity data obtained at Site 379 was 2.82 ±0.26 mcal/cm sec°C. No systematic increase in conductivity with depth is noted. The highest values (3.06 ±0.17 mcal/cm sec°C) are associated with terrigenous muds recovered from the interval 340 to 460 meters subbottom. Slightly lower values (2.90 and 2.76 mcal/cm sec°C) are characteristic of the terrigenous muds, nannofossil diatom marls, and the dolomite-rich muds above and below that interval.

The general smoothness of the downward increase in wet bulk density and the decrease in water content suggest that the main factors responsible for these changes is normal compaction. The more variable thermal conductivity data, on the other hand, suggest that vertical variations in the amounts of interstitial gases in the sediments may have a larger effect on the thermal properties than on the wet bulk density. This is reasonable in view of the very large contrast between the thermal conductivity of air and that of water or mineral grains.

No sound velocity data were obtained at this site because the high gas content of the sediment cores precluded passage of the 400-kHz signal through the sediment, or attenuated it to such an extent that accurate determination of the first arrival became impossible.

The wet bulk density, water content, and thermal conductivity data discussed above are listed in Tables 2, 3, and 4 of the Appendix.

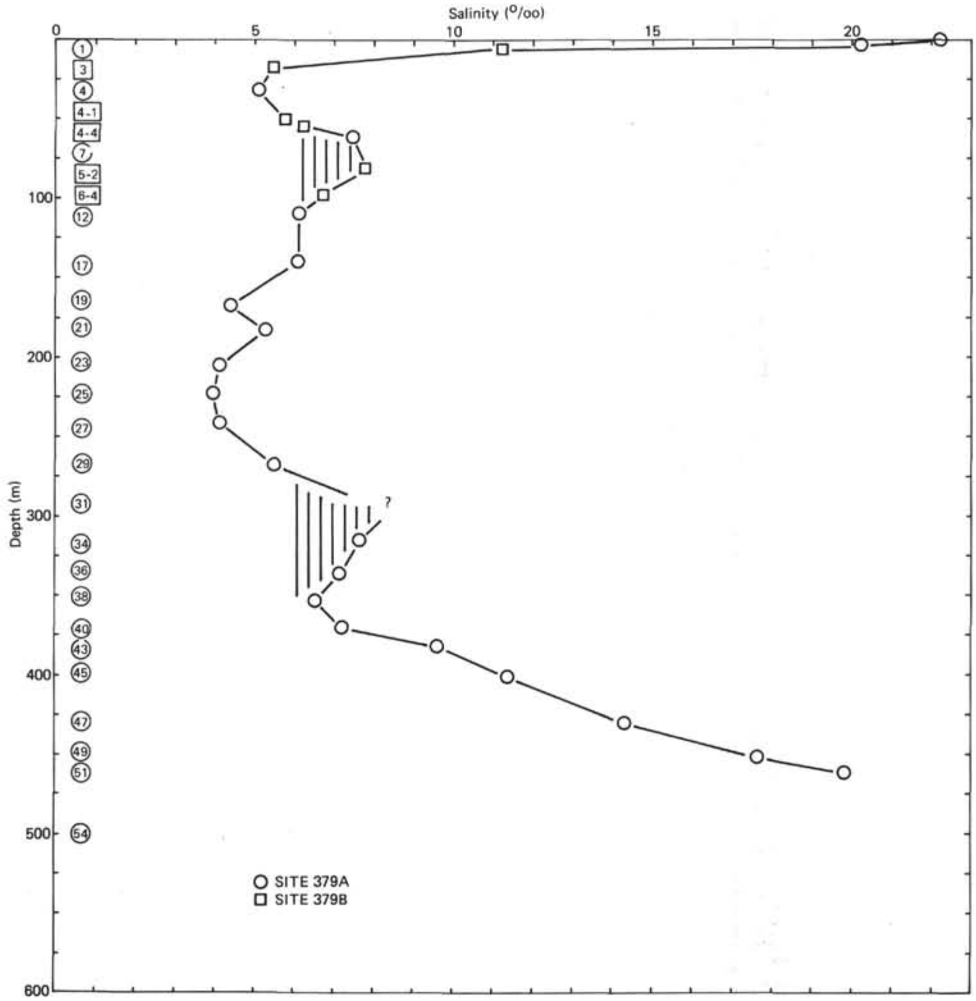

Figure 13. *Salinity variations of pore fluids in cores from Holes 379A and 379B.*

Heat Flow

Ten downhole temperature measurements were made at Site 379 between 35.5 and 624.0 meters subbottom. Anomalously high temperatures were recorded at 45.0 meters subbottom and more strikingly, at a depth of 149.5 meters. The remaining downhole temperature data plus an estimate of bottom water temperature recorded in the drill pipe and thermal conductivity data permit calculation of five interval heat-flow values ranging from 0.77 to 1.21 $\times$ 10^{-6} cal/cm^{2}sec between the sea floor and 425.0 meters subbottom. The average and standard deviation of these interval heat-flow values is 0.94 $\pm$0.10 $\times$ 10^{-6} cal/cm^{2}sec, and is considered to be the best heat flow value for this site. Additional measurement details and discussion of the significance of these data are available in a chapter by Erickson (this volume).

CORRELATION OF REFLECTION PROFILES AND LITHOLOGIES

In recent years several seismic investigations have been made in the central part of the Black Sea basin. Deep seismic sounding (DSS) have shown a large thickness of sediments and in the area of Site 379 about 10 km have been detected (Goncharov et al., 1972; Neprochnova, 1975). A widespread refractor (seismic velocity 3.0 km/sec) is found in this area at a depth of about 1 km and several good reflections have been obtained from this boundary by explosive techniques.

Continuous seismic profiling records have been obtained from the Black Sea Soviet expeditions in 1968 and later years (Sagalevich et al., 1970) by the American research vessel *Atlantis* II in 1969 (Ross et al., 1974) and by a French expedition in 1973. A special survey of the Site 379 area was taken be the Soviet R/V *Akademik S. Vavilov* in 1974 (see report by Malovitsky et al., this volume). Generally the profiles taken by this expedition from the central part of the Black Sea basin, about 1 km of the sediment penetrated, and usually showed a thinly layered, nearly horizontal structure.

The seismic profile and line drawing interpretation of the profile taken by *Glomar Challenger* on departure from Site 379 going to the west is shown in Figure 18. Two airguns of 40 in.^{3} and 10 in.^{3} were used and the recording was made within the frequency band of 40-160 Hz. The profile shows a penetration of about 0.8 seconds two-way travel time (DT). Numerous seismic reflectors have been picked from this interval. The main ones are shown in Table 5 and Figure 19.

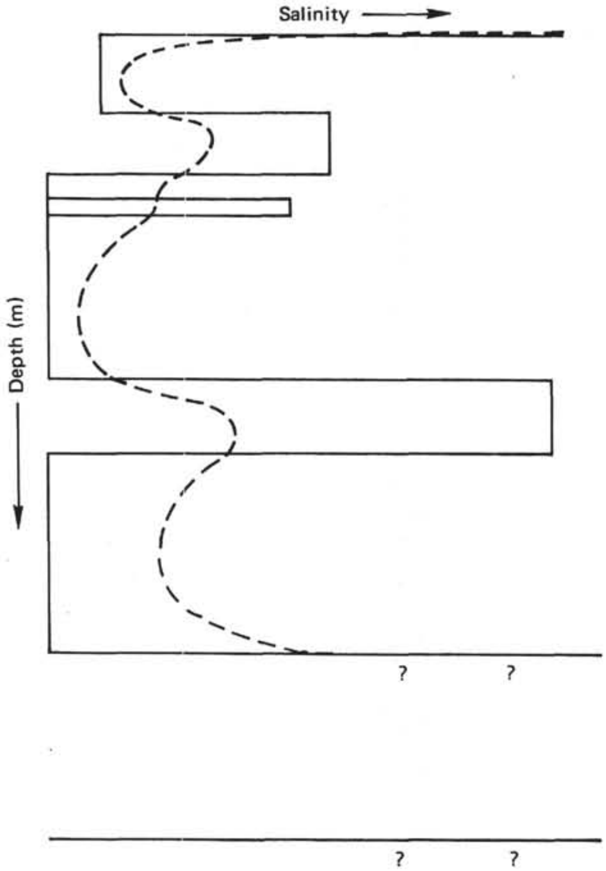

Figure 14. *Schematic drawing of "original" bottom water-paleosalinity relationships (solid line) and pore fluid distributions at later date, Site 379.*

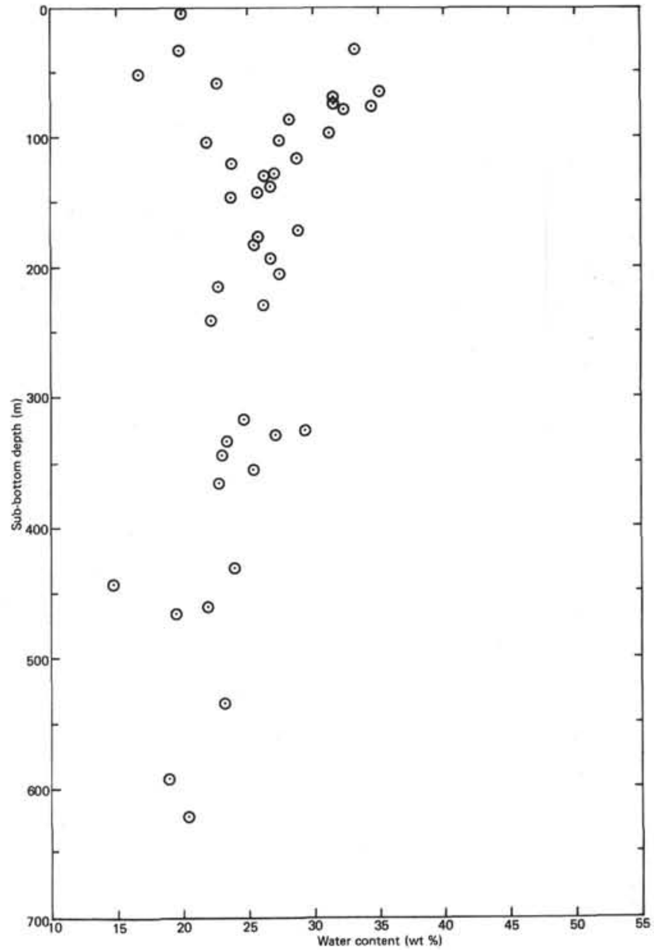

Figure 15. *Plot of water content data versus sub-bottom depth at Site 379. Water content data were calculated by weighing sediment samples obtained by syringe techniques before and after drying.*

The depths of reflectors 4-10 were calculated by assuming a sound velocity of 1.80-1.85 km/sec since sonic velocity measurements on the cored sediments were unsuccessful because of their high gas content. This velocity range is probably fairly accurate for the upper 1 km of sediment and is similar to special measurements made with a multichannel receiving system using explosives northeast of Site 379 (Goncharov et al., 1972). For the upper reflectors 1-3, velocities from DSS data were used (Neprochnov and Semenov, 1972). The depth and boundary velocity of reflector 11 was also taken from DSS data (Neprochnova, 1975).

On the basis of seismic reflection profile data, the sediment column was divided into several sections with different densities of reflectors (number of reflectors per unit of depth interval) (see middle part of Figure 19).

A comparison of the layers with lithology (right part of Figure 19) shows that some of the reflectors may correlate with lithologic changes. Thus, reflector 2 may correspond to the marl layer at a depth of about 90 meters. Reflector 4 probably corresponds to the upper part of a turbidite sequence. Reflector 8 may correspond to the boundary between calcareous mud and dolomite-rich mud at a depth of about 460 meters. It is also interesting to correlate refractors with measured bulk wet densities of cored samples (see Figure 19). Most reflectors occur at the intervals where the density changes. Reflectors 2, 4, 6, and 7 also correspond to reductions of penetration rates.

SUMMARY AND CONCLUSIONS

Site 379, Holes 379, 379A, and 379B were drilled at 43°00.29′N and 36°00.68′E at a water depth of 2159 meters in the abyssal plain of the Black Sea. Hole 379 was just a test for a pressure core barrel. Hole 379A was cored continuously (except for one 2.5-m section) to a depth of 624.5 meters. A total of 68 cores and 10 heat flow measurements was taken. Seven additional cores, mainly for geochemical studies, and two heat flow measurements were made at Hole 379B.

Generally all the cores collected from these sites were gassy and in several instances sediment material was forcibly extruded by gas pressure from the core barrel once the cores were on deck. Most recovered cores had void areas due to the expanding gas. Gas content was monitored on all cores and methane and CO_2 were the most common gases, with considerably smaller amounts of ethane. Butylanes and propane, probably from early diagenesis of organic matter, were detected from Cores 31 and 32 in a few parts per million, but the

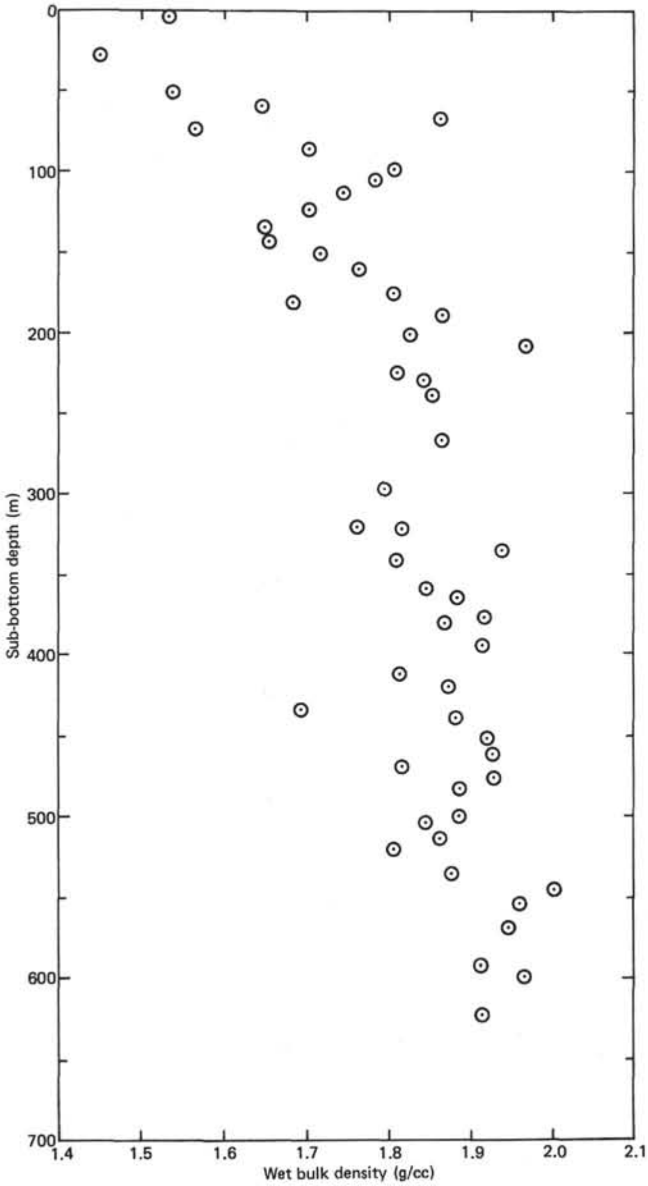

Figure 16. *Plot of wet bulk density versus sub-bottom depth at Site 379. Wet bulk density data were obtained using the gamma ray attenuation technique.*

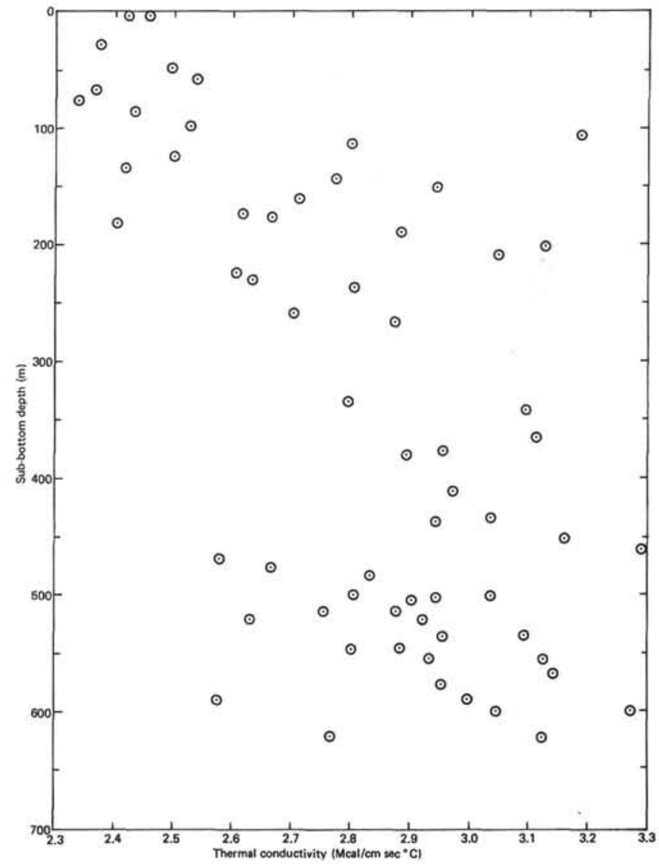

Figure 17. *Plot of thermal conductivity data versus sub-bottom depth at Site 379.*

methane/ethane ratio for these and all other cores clearly stayed within safety limits.

The main objective at this site was to obtain as complete as possible a Pleistocene and Pliocene stratigraphic and biostratigraphic section. This in turn, would permit an extremely detailed evaluation of Pleistocene sea-level changes and a description of the recent history of the Black Sea. A separate hole was also planned at Site 379 for geochemical studies. Our main objective at Site 379 was not completely successful because sedimentation rates were much higher than anticipated, and the decision was made to pursue this main objective at Site 380 where the sedimentary sequences appeared to be thinner.

A total of nine sedimentary units was defined in Hole 379A. These included two near-surface units sampled by piston coring from an earlier *Atlantis* II cruise. Terrigenous mud (Units 3, 6, and 8) generally with turbidite sequences was the most common unit. Unit 4, a diatomaceous nannofossil mud, is, except for its diatoms and nannofossils, similar to Unit 3. This fossil assemblage occurs again in Unit 7 which is a nannofossil diatomaceous marl. Unit 1 was nanno ooze composed primarily of *Emiliania huxleyi*. Sapropels (Units 2 and 5) of about 30 cm thickness were found in two instances.

Unit 9, a dolomitic rock mud, is especially interesting in that it has a rhythmic pattern consisting of an alternating sequence of dark clay, dolomite and pyrite. The sequence, generally 3-6 cm thick, starts with a fine layer of pyrite (1-2 mm thick) at the bottom followed by dark clay grading upwards into a light clay. This clay layer is overlain by a white dolomite, some of which occurs in small burrows in the underlying clay. The uppermost part of each cycle is a yellowish colored layer of dolomite. All boundaries are generally distinct.

The sediments are all of Pleistocene age, although older reworked fossils were common. Shipboard analysis of fossil content was mainly limited to core-catcher samples.

Calcareous nannoplankton were found from Cores 1-10 and dated them as late Quaternary in age. Cores 11-68 were devoid of indigenous calcareous nannoplankton. Planktonic and benthic foraminifers were generally too rare to be of stratigraphic or ecologic use. Ostracodes and diatoms were found and may be of later use after land-based laboratory studies.

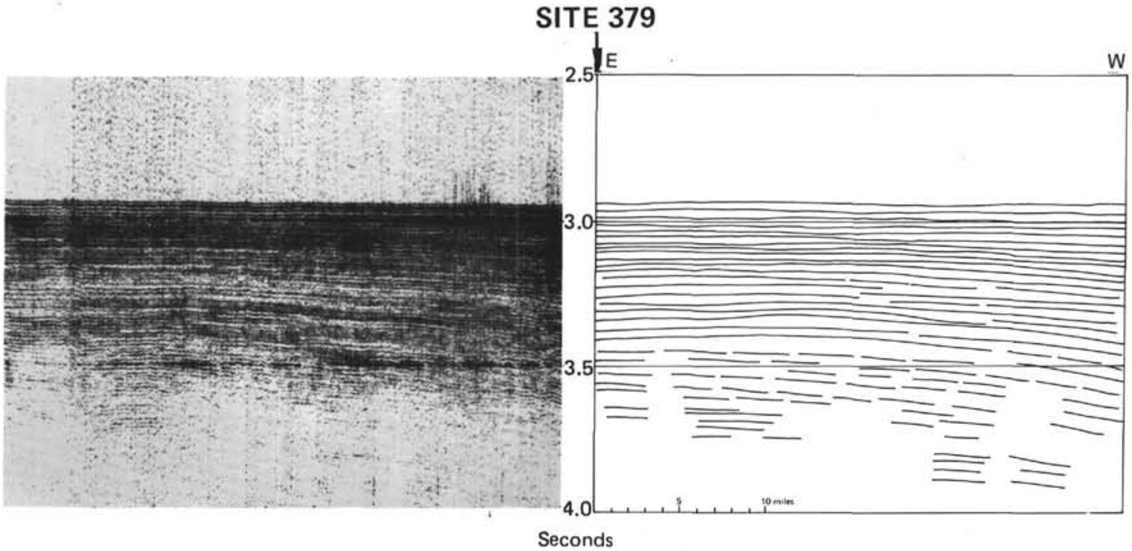

Figure 18. *Seismic profile and interpretation of the profile taken on departure from Site 379.*

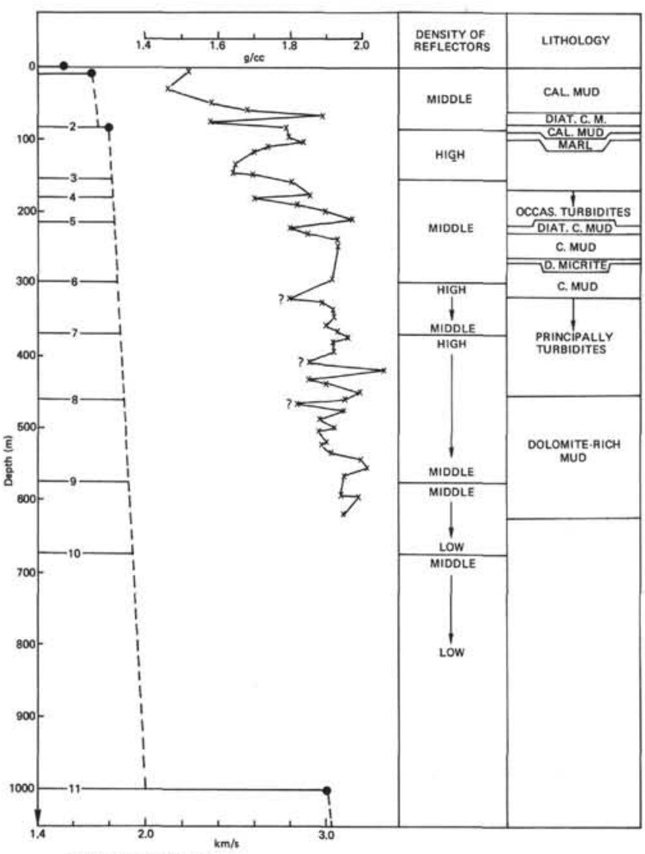

Figure 19. *Corrected depth of principal seismic reflectors (see Table 5) and their possible correlation with bulk wet density and lithology.*

Spores and pollen were very abundant and mainly of Quaternary age. Preliminary analysis of the spore and pollen data show that 40 of the 68 core-catcher samples indicate an apparent "glacial" or cool, dry environment; while 25 seem to be closer to an

TABLE 5
Site 379 Seismic Data

Reflector	DT (sec)	V (km/sec)	H (m)	
1	0.013	1.6	10	
2	0.10	1.7	85	Velocities from DSS data
3	0.17	1.8	153	
4	0.20	1.8[a]	180	
5	0.24	1.8[a]	216	
6	0.33	1.8[a]	297	
7	0.40	1.85[a]	370	
8	0.50	1.85[a]	462	
9	0.62	1.85[a]	574	
10	0.73	1.85[a]	675	
11			1000	From DSS data; V_B = 3.0 km/sec

[a]Assumed velocity.

"interglacial" or warm, moist environment. The lower third of the section tends to have less "glacial" indications and higher organic residues, plant debris, and floras dominated by conifer pollen than the upper two-thirds.

The main objective of the organic geochemical program is to study the diagenetic and catagenic changes in organic matter. This objective has received little attention in marine sediments from intermediate depths (20 to 500 m). Numerous samples, and entire portions of cores (158 sections were frozen) were taken for later land-based analyses.

The inorganic geochemical program included interstitial water measurements of salinity, chlorinity, calcium and magnesium, and electrical resistivity-diffusivity studies on on the sediment-water system.

Among the preliminary results are:

1) Low interstitial salinities were found below the previously known (piston cores) salinity gradient from present day to Neoeuxinian (Glacial max) strata. These salinities, are about 4-6‰ S or 2.5-4.00‰ Cl, in the interval 30-350 meters, are broken by two peaks of somewhat greater salinity. These are possibly remnants

of more saline episodes in the Black Sea, such as may have characterized interglacials or interstadials.

2) A marked increase in salinity, and especially calcium and magnesium, occurs toward the bottom, reaching 40.5‰ S and 120 and 83 mmole/l of calcium and magnesium, respectively. The calcium concentration is more than 10 times that of normal seawater, and is presumed to be formed by $MgCl_2$-rich residual brines reacting with calcium carbonate to form dolomite, noted in the basal cores.

3) The diffusive permeability of the sediment decreases more sharply with depth than the absolute porosity, reflecting probable blockage by cementation processes, rather than extensive consolidation. However, the lowermost clays are still far from being good sealing beds and readily permit diffusion of dissolved salts and gases.

A total of 12 temperature measurements was made at the three holes. The data show a nearly linear increase in temperature with depth at a rate of 3.2 to 4.0°C/100 meters which may in turn suggest fairly constant bottom water temperatures. The temperature data can put restraints on some of the proposed climatic models since the temperature curve can be changed by the sedimentation rate. Anomalously high temperatures measured at 149.5 meters and 55 meters are believed to be due to a geochemical reaction that occurred as the measurements were being made. The physical property program was not very successful at this site because of the effect of the high gas content on these properties.

The seismic profiles made over Site 379 show differing densities of reflectors per unit depth that may correlate with sediment type. For example high densities are found at about the depth where turbidite sequences were drilled.

An accurate appraisal of environmental conditions in the Black Sea during the time interval (whatever it is) covered by our cores is premature at this time. Final conclusions must await further studies, especially by the paleontologists and the geochemists (see lab-based reports, this volume). However, it appears that we penetrated both the Würm (Weichselian) and Riss (Saalian) glacial periods and ended perhaps in the Mindel-Riss (Holsteinian) interglacial. A further evaluation can be made after the study of data from Site 380. Most of the section cored is mainly non-marine although two or three major marine periods have been detected by faunal and interstitial water measurements. Later conditions, near end of section cored, are either a playa lake or evaporitic.

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Site 379 Hole A Core 1 Cored Interval: 0.0-7.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION

Zone: NN-21 Emiliania huxleyi Zone

Sections: 0; 1 (0.5, 1.0); 2; 3; 4; 5; Core Catcher

Nannos (Core Catcher): A

Litho. samples: 45, 90, 120, 66, 80, 128, 90, 61, 132, CC

5B 6/1

N6

5GY 4/1
5B2/1

5GY 6/1

5GY 4/1

5B 6/1
to
5B 5/1

Medium gray to greenish gray TERRIGENOUS MUD with occasional greenish black to black layers abundant fine sand layers in Sections 1 and 2.

In Section 4 an interval of finely laminated white coccolith ooze occurs.

DOMINANT LITHOLOGY:
SS 4-61 cm
60% Clay
5% Calcareous nannos
3% Opaques
20% Carb. unspec.
10% Quartz and Feldspar

MINOR LITHOLOGY:
SS 2-128 cm
60% Quartz and Feldspar
10% Clay
30% Carb. unspec.

Smear Slide CC
10% Quartz and Feldspar
40% Clay
5% Pyrite
40% Carb. unspec.
5% Reworked nannos

X-ray:

	1-90 to 97
Calcite	15%
Dolomite	1%
Quartz	20%
Feldspar	8%
Layered silicates	56%
Carb. bomb	16%

Grain Size:

	1-90 to 97
Sand	0%
Silt	54%
Clay	46%

Carbonate:

	$CaCO_3$	Corg.
2-70 to 78	13%	0.6%

Site 379A, Core 2, 7.0-16.5 m: NO RECOVERY
Site 379A, Core 3, 16.5-26.0 m: NO RECOVERY

Site 379 Hole A Core 4 Cored Interval: 26.0-35.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION

Sections: 0; 1 (0.5, 1.0); 2; 3; 4; 5; Core Catcher

Fossil character (Core Catcher): – – – –

Litho. samples: 100, 145, 1, 110, 127, 129, CC

5G 4/1

5G 4/1
and
5GY 2/1
streaks

5G 4/1
and
5GY 2/1
streaks

grading

5G 4/1 and
5B 7/1 or
N2 streaks

grading
1/3

5G 4/1

Dark greenish gray TERRIGENOUS MUD to CLAY.

Silty sand layers which suggest graded bedding occur in Sections 4 and 5.

Abundant diatoms occur at the start of the turbidite sequence in Section 5.

Streaks of light bluish gray and grayish black material (pyrite-10%) are present throughout the whole core.

DOMINANT LITHOLOGY:
SS 3-135 cm
50% Clay
25% Quartz and Feldspar
24% Carb. unspec.
1% Nannos (reworked)

MINOR LITHOLOGY:
SS 5-127 cm
30% Quartz and Feldspar
30% Clay
30% Carb. unspec.
3% Heavy minerals
1% Glauconite
3% Pyrite
1% Opaques

X-ray:

	5-107 to 108	5-129 to 130
Calcite	18%	18%
Dolomite	2%	0%
Quartz	15%	18%
Feldspar	7%	7%
Layered silicates	58%	57%
Carb. bomb	20%	18%

Site 379A, Core 5, 35.5-45.0 m: NO RECOVERY

Explanatory notes in Chapter 1

Site 379 Hole A Core 6 Cored Interval: 45.0-54.5 m

AGE	ZONE	POLLEN	NANNOS	OSTRACOD	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NN-21 Emiliania huxleyi Zone	S	F	—	F	0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0	VOID (Sect. 1); VOID, VOID (Sect. 4); VOID (Sect. 5)		75; 34, 105, 128; 64, 146	see below

5G 4/1

5B 5/1

to

5G 4/1 dark greenish gray

5GY 2/1 to 5GY 4/1

5GY 4/1 with streaks of 5G 2/1

5G 2/1 greenish black

5G 4/1

Alternating 5G 4/1 with 5G 2/1

N2

Dark greenish gray TERRIGENOUS CLAY to TERRIGENOUS MUD. All sections contain streaks of SANDY MUD, 2 to 5 cm SILT AND fine SAND LAYERS are present in Sections 5 and 6. The Core Catcher is rich in DIATOMS.

DOMINANT LITHOLOGY:
SS 1-75 cm
>60% Clay
10% Quartz and Feldspar
15% Carb. unspec. (detrital)
5% Nannos
5% Diatoms
Tr Glauconite

Smear Slide CC
15% Quartz and Feldspar
< 5% Unspec. carbonate
< 10% Diatoms
70% Clay

X-ray:

	5-60 to 62	5-118 to 119	6-42 to 44
Calcite	8%	10%	10%
Dolomite	0%	Tr	Tr
Quartz	36%	25%	29%
Feldspar	29%	11%	14%
Layered silicates	27%	56%	47%
Carb. bomb	8%	10%	10%

Grain Size:

	5-118 to 119
Sand	60%
Silt	33%
Clay	7%

Carbonate:

	$CaCO_3$	Corg.
2-32 to 38	12%	0.8%
5-36 to 46	9%	0.4%

Site 379 Hole A Core 7 Cored Interval: 54.5-64.0 m

AGE	ZONE	POLLEN	NANNOS	OSTRACOD	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NN-21 Emiliania huxleyi Zone	S-T	A	–	–	0, 1, 2, 3, 4, 5, Core Catcher	0.5, 1.0	VOID (Sect. 1); VOID (Sect. 2); VOID, VOID, VOID (Sect. 3); VOID (Sect. 5)		98; 40, 140	see below

5G 6/1 mixed with 5G 4/1

5G 4/1 streaks of 5G 2/1

5G 4/1 streaks 5G 2/1

5GY 2/1

5G 6/1 with streaks of 5G 4/1

N2

Greenish gray to dark greenish gray TERRIGENOUS MUD with streaks of darker material.

Sand patches are present in Section 5.

DOMINANT LITHOLOGY:
SS 2-98 cm
60% Clay
10% Quartz and Feldspar
20% Carb. unspec.
10% Nannos

MINOR LITHOLOGY:
SS 5-40 cm
60% Quartz and Feldspar
5% Mica
5% Heavy minerals
20% Clay
5% Opaques
Tr Glauconite
5% Carb. unspec.

X-ray:

	5-120 to 122	5-135 to 137
Calcite	12%	6%
Quartz	26%	25%
Feldspar	35%	13%
Layered silicates	27%	13%
Carb. bomb	12%	6%

Grain Size:

	5-120 to 122	5-135 to 137
Sand	4%	0.5%
Silt	57%	63.5%
Clay	39%	36 %

Explanatory notes in Chapter 1

Site 379 Hole A Core 8 Cored Interval: 64.0-73.5 m

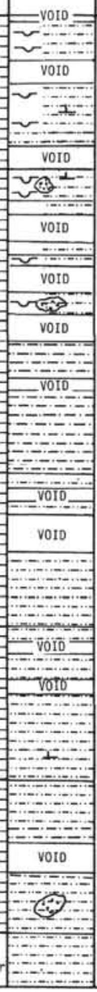
AGE | ZONE: NN-21 Emiliania huxleyi Zone

FOSSIL CHARACTER (Core Catcher): POLLEN S, NANNOS F, OSTRACOD. —, OTHERS F

SECTION: 0, 1, 2, 3, 4, 5, 6, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY:



LITHO. SAMPLE: 95 (Section 1), 130 (Section 2), 100 (Section 4), 140 (Section 5)

LITHOLOGIC DESCRIPTION

Dark gray DIATOMACEOUS TERRIGENOUS MUD to SANDY MUD.

N3 with streaks of N2

Abundant DIATOMS occur in Sections 1 and 2. NANNOFOSSIL are rare.

DOMINANT LITHOLOGY:
SS 4-100 cm
55% Clay
10% Quartz and Feldspar
5% Opaque
5% Nannos
5% Diatoms
20% Carb. unspec.

N3 and N2

MINOR LITHOLOGY:
SS 1-95 cm
10% Quartz and Feldspar
40% Clay
15% Opaque
10% Carb. unspec.
20% Diatoms
5% Nannos

5GY 2/1

5GY 4/1

X-ray:

	1-22 to 24	5-31 to 33	6-94 to 96
Calcite	11%	11%	10%
Dolomite	0%	2%	0%
Quartz	24%	20%	22%
Feldspar	10%	7%	21%
Layered silicates	55%	60%	47%
Carb. bomb	11%	13%	10%

N3 with streaks of N1

Grain Size:

	1-22 to 24	5-31 to 33	6-94 to 96
Sand	1%	7%	2%
Silt	60%	48%	60%
Clay	39%	45%	38%

Carbonate:

	$CaCO_3$	Corg.
4-4 to 16	17%	0.8%

N3

Site 379 Hole A Core 9 Cored Interval: 73.5-83.0 m

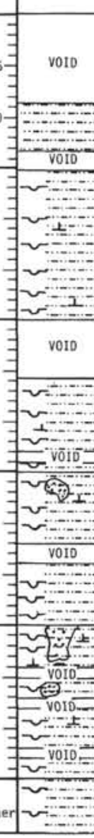
AGE | ZONE: NN-21 Emiliania huxleyi Zone

FOSSIL CHARACTER (Core Catcher): POLLEN S, NANNOS C, OSTRACOD. —, OTHERS —

SECTION: 0, 1, 2, 3, 4, 5, Core Catcher

METERS: 0.5, 1.0

LITHOLOGY:



LITHO. SAMPLE: 106 (Section 1), 84 (Section 2), 94 (Section 3), 10 (Section 4)

LITHOLOGIC DESCRIPTION

Dark greenish gray DIATOMACEOUS TERRIGENOUS MUD with streaks and patches of fine sand.

NANNOFOSSILS are present.

5GY 4/1

DOMINANT LITHOLOGY:
SS 3-94 cm
30% Quartz and Feldspar
30% Clay
30% Carb. unspec.
10% Diatoms

X-ray:

	4-73 to 75	5-142 to 144
Calcite	7%	12%
Quartz	18%	15%
Feldspar	13%	7%
Layered silicates	62%	66%
Carb. bomb	7%	12%

Grain Size:

	4-73 to 75	5-142 to 144
Sand	7%	3%
Silt	65%	67%
Clay	28%	29%

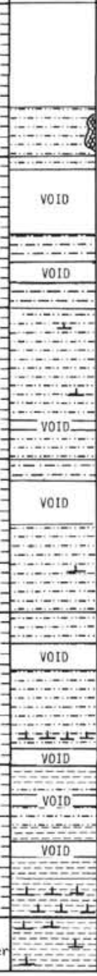
5GY 4/1

5GY 4/1

Explanatory notes in Chapter 1

Site 379 Hole A Core 10 Cored Interval: 83.0-92.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
	NN-21 Emiliania huxleyi Zone					0					
						1	0.5, 1.0			110	5G 4/1
						2		VOID, VOID		90	5G 2/1
						3		VOID			5G 4/1; 5G 6/1
						4		VOID		100	5G 2/1
						5		VOID, VOID		100, 128	5G 4/1
						6		VOID, VOID		130	
		T	A	—	—	Core Catcher					



Dark greenish gray alternating laminae (1-5 cm) of TERRIGENOUS CLAY to TERRIGENOUS MUD rich in nannofossils; diatoms are present while nannofossil horizons occur at the end of Sections 5 and 6. Some organic rich patches are present.

DOMINANT LITHOLOGY:
SS 5-100 cm
30% Quartz and Feldspar
15% Clay
5% Pyrite
45% Carb. unspec.
2% Diatoms
3% Nannos

MINOR LITHOLOGY:
SS 6-130 cm
10% Quartz and Feldspar
10% Mica
10% Clay
5% Pyrite
10% Carb. unspec.
50% Nannos
5% Diatoms

X-ray:

	6-113 to 115
Calcite	25%
Quartz	13%
Feldspar	10%
Layered silicates	52%
Carb. bomb	25%

Grain Size:

	6-113 to 115
Sand	0%
Silt	65%
Clay	35%

Carbonate:

	$CaCO_3$	Corg.
1-120 to 130	11%	1.0%

Site 379 Hole A Core 11 Cored Interval: 92.5-102.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5, 1.0	VOID		125, 140	N4
						2				82, 100	5GY 4/1
						3					N4; 5GY 5/2; N4; 5GY 5/2
						4		VOID, VOID, VOID, VOID		52, 125	N4; 5G 4/1; 5G 4/1
						5				50, 97, 116, 122	N4; N9; 5G 4/1; N3; N1; N9; N3; 5GY 4/1
		S	—	—	—	Core Catcher					

Medium gray to dark gray NANNOFOSSIL MARL.

Patches of white nanno ooze are present in Sections 1 and 2. Nannos are getting abundant in Section 4 and top of Section 5. Where fine laminated layers, completely composed of nannos occur. Abundant fine aragonite needles are also present. A sapropel layer is found between 52 to 61 cm. Grading is observed in the upper part of Section 5. Below the sapropel layer the sediment is composed of dark greenish gray TERRIGENOUS SANDY MUD.

DOMINANT LITHOLOGY:
SS 4-125 cm
10% Quartz and Feldspar
10% Clay
5% Pyrite
35% Calcareous nannos

X-ray:

	Sec. 4 119-121	Sec. 5 20-21	25-26	30-31	35-36	40-41
Calcite	20%	15%	12.5%	11%	12%	10%
Dolomite	0%	0%	0 %	0%	0%	2%
Quartz	10%	20%	14 %	13%	17%	22%
Feldspar	6%	15%	5 %	6%	3%	24%
Layered silicates	64%	50%	54.5%	56%	43%	42%
Aragonite	0%	0%	14 %	14%	13%	0%
Carb. bomb	20%	15%	26.5%	25%	25%	12%

Sec. 5	45-46	50-51	54	62	75-76	80-81	85-86
Calcite	16%	7%	97%	14%	14%	10%	12%
Dolomite	0%	0%	0%	0%	0%	0%	0%
Quartz	17%	7%	3%	17%	23%	27%	38%
Feldspar	21%	17%	0%	15%	26%	18%	43%
Layered silicates	46%	45%	0%	54%	31%	45%	7%
Aragonite	0%	24%	0%	0%	0%	0%	0%
Carb. bomb	16%	31%	0%	14%	14%	10%	12%

Sec. 5	90-91	95-96	100-101	105-106	110-111
Calcite	13%	12%	12%	10%	10%
Dolomite	0%	0%	0%	0%	0%
Quartz	35%	17%	20%	21%	27%
Feldspar	26%	23%	45%	46%	6%
Layered silicates	26%	58%	23%	23%	57%
Aragonite	0%	0%	0%	0%	0%
Carb. bomb	13%	12%	12%	10%	10%

Sec. 5	115-116	120-121
Calcite	12%	22%
Dolomite	0%	0%
Quartz	46%	11%
Feldspar	42%	6%
Layered silicates	0%	61%
Aragonite	0%	0%
Carb. bomb	12%	22%

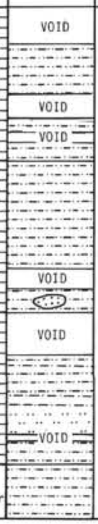
Grain Size:

	4-119 to 121
Sand	0%
Silt	58%
Clay	42%

Explanatory notes in Chapter 1

Site 379 Hole A Core 12 Cored Interval: 102.0-111.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5, 1.0	VOID, VOID, VOID		50	5Y 3/2
						2		VOID		75	5GY 4/1
						3		VOID, VOID			
		–	–	–	–	Core Catcher					



Dark greenish gray to olive gray TERRIGENOUS MUD. Patches of fine sand occur in Section 2. Graded bedding is present in Section 3.

DOMINANT LITHOLOGY:
SS 1-50 cm
35% Quartz and Feldspar
5% Mica
5% Pyrite
50% Carb. unspec.
5% Nannos (reworked)

X-ray:

	1-136 to 138
Calcite	13%
Quartz	16%
Feldspar	4%
Layered silicates	67%
Carb. bomb	13%

Grain Size:

	1-136 to 138
Sand	3%
Silt	41%
Clay	56%

Carbonate:

	$CaCO_3$	Corg.
3-36 to 72	11%	0.7%
3-120 to 130	18%	0.6%

Site 379 Hole A Core 13 Cored Interval: 111.5-121.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5, 1.0			106, 129	
						2				135	5GY 4/1
						3					
						4					
						5					
						6					
		–	–	–	–	Core Catcher					

Dark greenish gray TERRIGENOUS MUD. Grayish black (5GY 2/1) layers and patches of coarser silt to sandy silt occur throughout the core. Due to gas expansion, numerous 5-10 cm voids are present in the core.

DOMINANT LITHOLOGY:
SS 1-106 cm
30% Quartz and Feldspar
20% Clay
5% Opaques
30% Carb. unspec.
5% Nannos (reworked)

X-ray:

	4-29 to 31	6-9 to 11
Calcite	12%	15%
Dolomite	2%	2%
Quartz	21%	30%
Feldspar	9%	32%
Layered silicates	56%	21%
Carb. bomb	14%	17%

Grain Size:

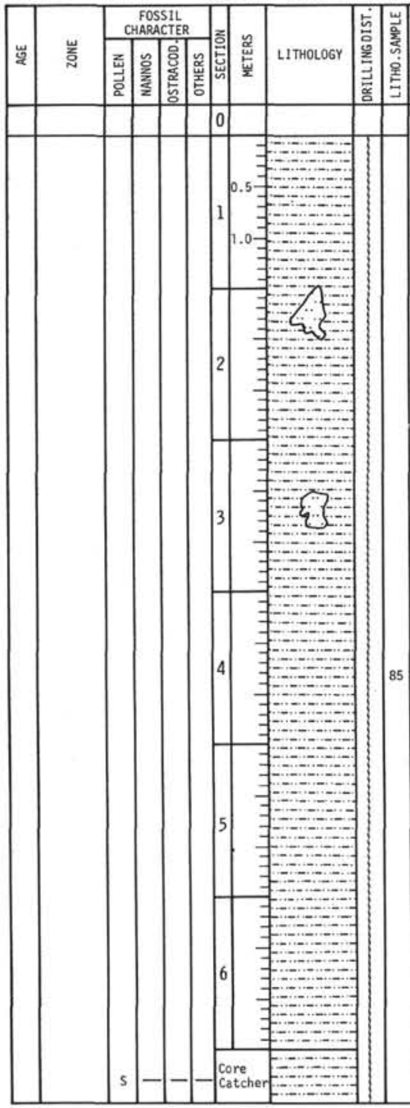
	4-29 to 31	6-9 to 11
Sand	6%	23%
Silt	81%	49%
Clay	13%	28%

Carbonate:

	$CaCO_3$	Corg.
5-1 to 7	15%	0.6%

Explanatory notes in Chapter 1

Site 379 Hole A Core 14 Cored Interval: 121.0-130.5 m



LITHOLOGIC DESCRIPTION

5GY 4/1

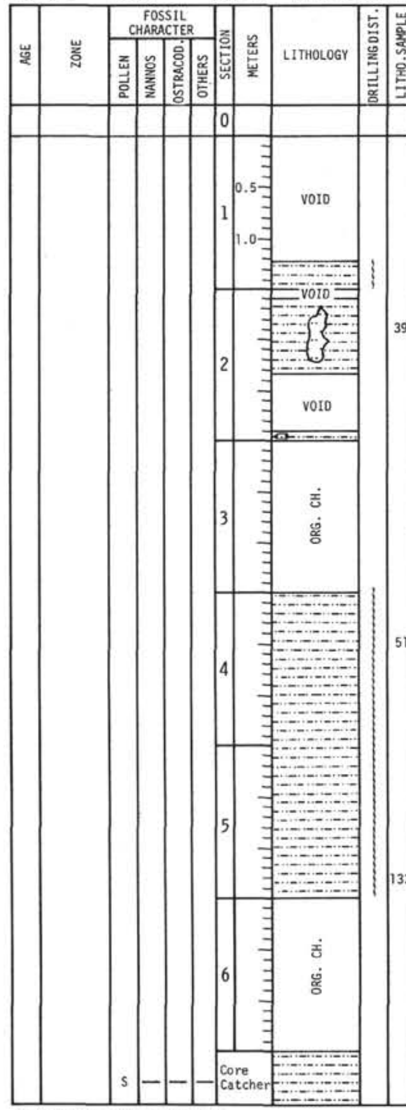
Dark greenish gray TERRIGENOUS MUD with occasional patches of fine to medium grained sand. A few 5-15 cm gaps are present throughout the core.

DOMINANT LITHOLOGY:
SS 4-85 cm
50% Quartz and Feldspar
3% Mica
2% Heavy minerals
20% Clay
5% Opaques
15% Carb. unspec.
5% Nannos (reworked)

Carbonate:

	$CaCO_3$	Corg.
4-0 to 10	20%	0.5%

Site 379 Hole A Core 15 Cored Interval: 130.5-140.0 m



LITHOLOGIC DESCRIPTION

5GY 4/1

Dark greenish gray TERRIGENOUS MUD with occasional lenses of even darker SANDY MUD which contains slightly less carbonate.

DOMINANT LITHOLOGY:
SS 2-39 cm
40% Quartz and Feldspar
3% Mica
1% Heavy minerals
15% Clay
5% Opaque
30% Carb. unspec.
5% Nannos (reworked)

Carbonate:

	$CaCO_3$	Corg.
2-55 to 65	12%	0.5%

5GY 4/1

Explanatory notes in Chapter 1

Site 379 Hole A Core 16 Cored Interval: 140.0-149.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5, 1.0	VOID; VOID; VOID		122, 132	5GY 5/1; 5GY 5/1
						2		VOID		56	
						3		VOID; VOID; VOID			
						4		VOID			5GY 5/1
		S	—	—	C	Core Catcher					

Mixture of greenish gray TERRIGENOUS MUD and dark greenish gray TERRIGENOUS CLAY. Wisps and patches of fine quartz sand occur in Sections 2 and 3.

DOMINANT LITHOLOGY:
SS 1-127 cm
20% Quartz and Feldspar
40% Clay
3% Heavy minerals
30% Carb. unspec.
5% Nannos (reworked)

MINOR LITHOLOGY:
SS 1-132 cm
10% Quartz and Feldspar
65% Clay
5% Opaque
20% Carb. unspec.
Tr Nannos

Site 379 Hole A Core 17 Cored Interval: 149.5-159.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5, 1.0	VOID		68	N3
		ST	—	—	—	Core Catcher					

Dark gray (N3) TERRIGENOUS MUD.

DOMINANT LITHOLOGY:
SS 1-68 cm
15% Quartz and Feldspar
60% Clay
3% Pyrite
15% Carb. unspec.
5% Diatoms
Tr Nannos

X-ray:

	1-100 to 102
Calcite	9%
Quartz	19%
Feldspar	8%
Layered silicates	64%
Carb. bomb	9%

Grain Size:

	1-100 to 102
Sand	6%
Silt	60%
Clay	25%

Carbonate:

	$CaCO_3$	Corg.
1-25 to 35	9%	0.8%

Site 379 Hole A Core 18 Cored Interval: 159.0-168.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5, 1.0	VOID			N5
						2		VOID			5G 4/1; Pyrite rich layer; Pyrite rich layer
		S	—	—	—	Core Catcher					

Dark greenish gray TERRIGENOUS MUD.

Explanatory notes in Chapter 1

Site 379 Hole A Core 19 Cored Interval: 168.5-178.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	VOID		148
						2		VOID, VOID		23, 68, 114
						3		VOID		112, 130
						4		VOID		
						5		VOID		
						6				
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

5G 2/1 — TERRIGENOUS MUD basically dark greenish gray (5G 4/1). A number of sandy mud layers occur in general cycles of 10-15 cm. Most of these layers suggest grading.

5G 6/1 — DOMINANT LITHOLOGY:
SS 2-114 cm
10% Quartz and Feldspar
60% Clay

5G 2/1 — 30% Carb. unspec.
Tr Nannos

5G 4/1

X-ray:

	Sec. 2 89-90	91-97	94-95	Sec. 4 119-121
Calcite	15%	15%	3%	20%
Dolomite	2%	0%	0%	0%
Quartz	19%	40%	14%	14%
Feldspar	12%	15%	4%	7%
Layered silicates	52%	30%	79%	59%
Carb. bomb	17%	15%	3%	20%

5G 2/1

5G 4/1

5GY 4/1

	Sec. 4 122-124	Sec. 5 105-107
Calcite	4%	18%
Quartz	18%	19%
Feldspar	6%	8%
Layered silicates	72%	55%
Carb. bomb	4%	18%

5G 4/1

Grain Size:

	4-119 to 121	4-122 to 124
Sand	0%	0%
Silt	55%	47%
Clay	45%	53%

	5-105 to 107
Sand	0%
Silt	60%
Clay	40%

N4

Carbonate:

	$CaCO_3$	Corg.
3-82 to 98	14%	0.5%

Site 379 Hole A Core 20 Cored Interval: 178.0-187.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2		ORG. CH.		
						3		VOID, P P P		
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

TERRIGENOUS MUD to SANDY MUD.

X-ray:

	3-89 to 91
Calcite	4%
Dolomite	2%
Quartz	22%
Feldspar	6%
Layered silicates	64%
Carb. bomb	6%

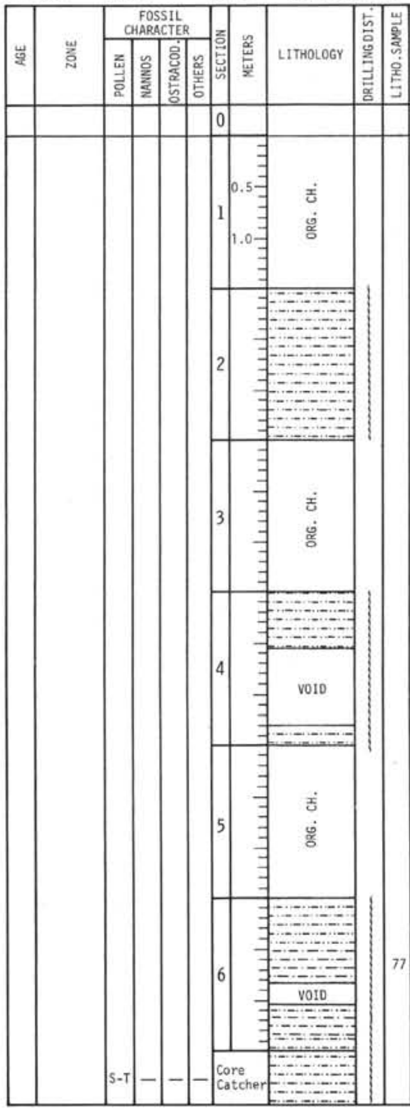
Grain Size:

	3-89 to 91
Sand	0%
Silt	84%
Clay	16%

5Y 2/1
pyrite rich
organic mud
layer
5G 4/1

Explanatory notes in Chapter 1

Site 379 Hole A Core 21 Cored Interval: 187.5-197.0 m



LITHOLOGIC DESCRIPTION

Dark greenish gray (5G 4/1) TERRIGENOUS MUD. Sandy mud layers occur in the lower part of the core.

DOMINANT LITHOLOGY:
SS 6-77 cm
50% Quartz and Feldspar
5% Heavies
20% Clay
25% Carb. unspec.
Tr Nannos

X-ray:

	4-14 to 16	6-20 to 22
Calcite	18%	4%
Dolomite	2%	0%
Quartz	16%	23%
Feldspar	8%	8%
Layered silicates	56%	65%
Carb. bomb	20%	4%

Grain Size:

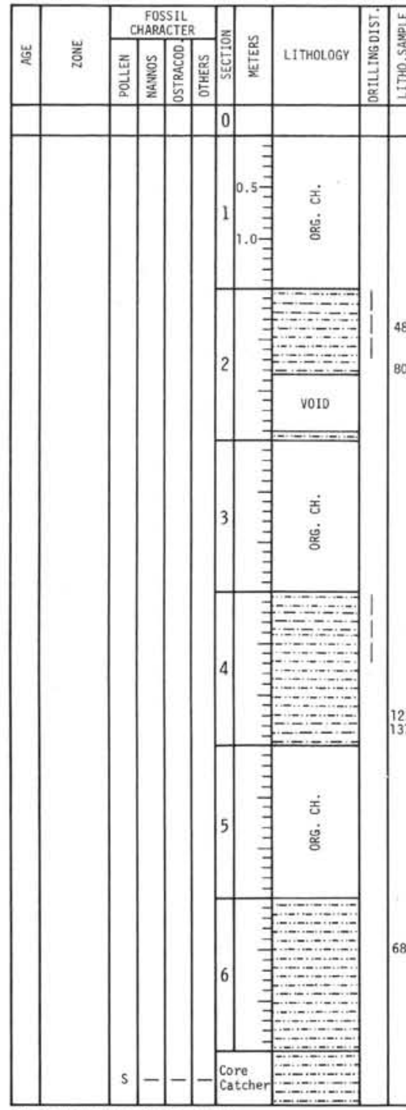
	4-14 to 16	6-20 to 22
Sand	1%	0%
Silt	68%	45%
Clay	32%	55%

Carbonate:

	$CaCO_3$	Corg.
4-0 to 10	9%	0.6%

5G 4/1

Site 379 Hole A Core 22 Cored Interval: 197.0-206.5 m



LITHOLOGIC DESCRIPTION

Dark greenish gray (5G 4/1) TERRIGENOUS MUD.

Several sandy mud layers occur Some suggest grading.

5G 4/1

5G 4/1

X-ray:

	2-48 to 49	2-58 to 51
Calcite	18%	24%
Quartz	15%	14%
Feldspar	5%	5%
Layered silicates	61%	5%
Carb. bomb	19%	24%

	4/110-112	4/115-117	6/30-32
Calcite	22%	18%	10%
Dolomite	0%	2%	0%
Quartz	19%	16%	31%
Feldspar	5%	6%	7%
Layered silicates	54%	58%	52%
Carb. bomb	22%	20%	10%

Grain Size:

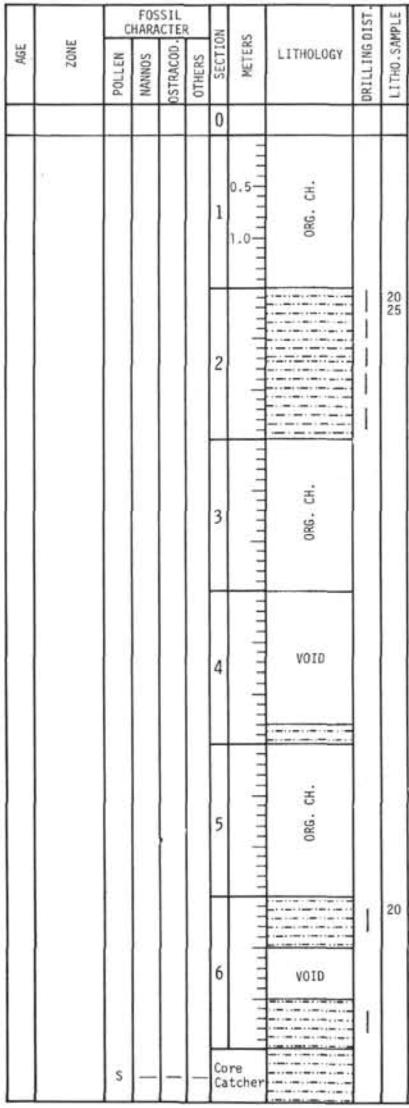
	4/110-112	4/115-117	6/30-32
Sand	0%	0%	1%
Silt	67%	58%	43%
Clay	33%	42%	56%

Carbonate:

	$CaCO_3$	Corg.
4-47 to 55	18%	0.6%

Explanatory notes in Chapter 1

Site 379 Hole A Core 23 Cored Interval: 206.5-216.0 m



LITHOLOGIC DESCRIPTION

Basic lithology is a dark greenish gray (5GY 4/1) TERRIGENOUS MUD.

A number of sandy mud to muddy sand layers occur. Some of them suggest gradation. Top of the graded intervals are blackish (N3) due to more abundant FeS (lower carbonate content).

DOMINANT LITHOLOGY:
SS 2-25 cm
15% Quartz and Feldspar
< 5% Heavies
60% Clay
25% Carb. unspec.
Tr Nannos

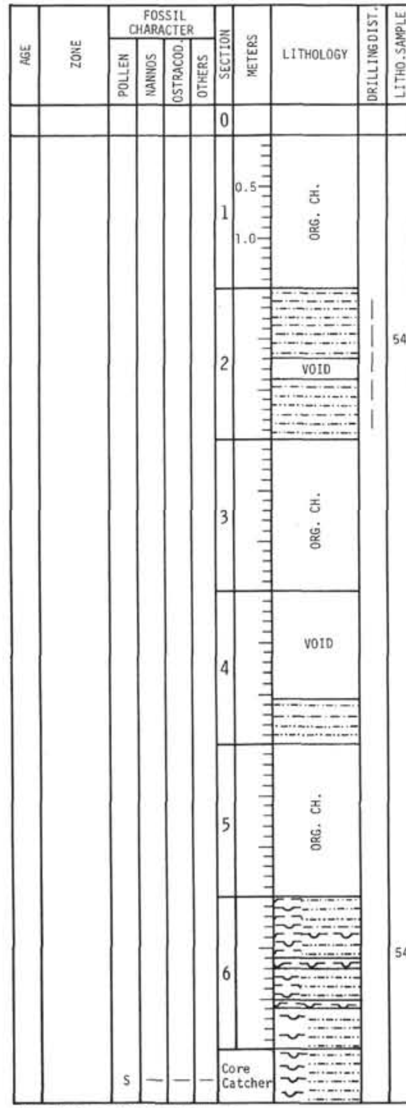
X-ray:

	2-25 to 27
Calcite	16%
Quartz	18%
Feldspar	7%
Layered silicates	59%
Carb. bomb	16%

Grain Size:

	2-25 to 27
Sand	1%
Silt	60%
Clay	39%

Site 379 Hole A Core 24 Cored Interval: 216.0-225.8 m



LITHOLOGIC DESCRIPTION

Basic lithology of Sections 2 and 4 is a dark greenish gray (5G 4/1) TERRIGENOUS MUD. A number of sandy mud layers are found. Some suggest grading. Also locally thin blackish layers (N3) (rich in iron sulfides) occur.

Section 6 is composed of olive gray (5Y 4/1) DIATOMACEOUS MUD.

Layers with very abundant diatoms occur 30-36; 60-70; and 103-106 cm.

DOMINANT LITHOLOGY:
SS 2-54 cm
15% Quartz and Feldspar
5% Heavies
65% Clay
15% Carb. unspec.
Tr Diatoms and Nannos

LITHOLOGY:
SS 6-54 cm
10% Quartz and Feldspar
15% Diatoms
55% Clay
10% Carb. unspec.
< 10% Silicoflagellates
< 10% Pyrite

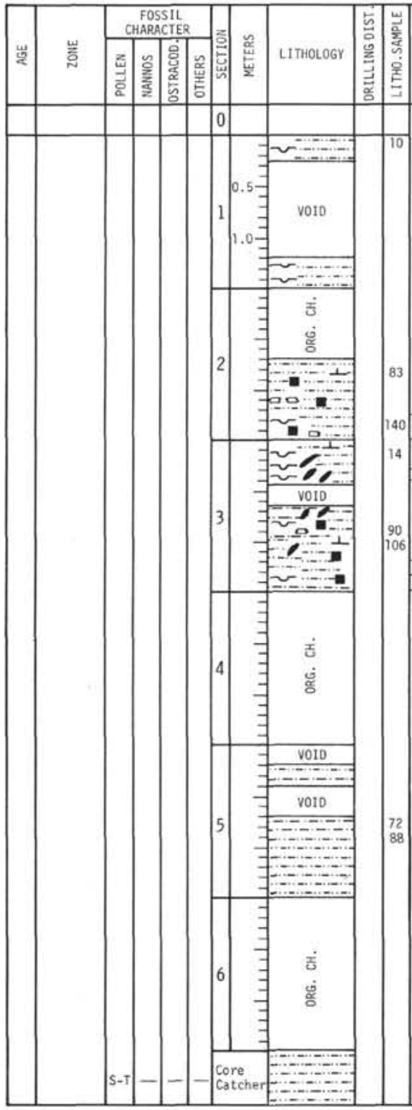
X-ray:

	2-52 to 53	2-53 to 54
Calcite	10%	16%
Dolomite	0%	0%
Quartz	20%	19%
Feldspar	7%	7%
Layered silicates	63%	58%
Carb. bomb	10%	16%

	4-102 to 103	6-62 to 63
Calcite	19%	5%
Dolomite	1%	0%
Quartz	20%	17%
Feldspar	6%	7%
Layered silicates	54%	71%
Carb. bomb	20%	5%

Explanatory notes in Chapter 1

Site 379 Hole A Core 25 Cored Interval: 225.5-235.0 m



LITHOLOGIC DESCRIPTION

Color	
5Y 4/1	Basic lithology (Sections 1, 2, and 3) is an olive gray (5Y 4/1) DIATOMACEOUS MARL. NANNOFOSSILS are present. Wood fragments are abundant in Section 3. Locally there are thin layers of sandy mud and layers which are mainly composed of authigenic carbonate with abundant pyrite. Sections
5Y 4/1	5 and 7 are a dark greenish gray TERRIGENOUS MUD (5G 4/1). Several sandy mud to muddy sand layers are present; some suggest grading.
	DOMINANT LITHOLOGY (Sections 1 and 3): SS 1-10 cm 50% Clay
5G 4/1	10% Pyrite 10% Carb. unspec. 20% Diatoms
5GY 4/1	10% Quartz and Feldspar
5G 4/1	DOMINANT LITHOLOGY (Sections 5 and 7): 20% Quartz and Feldspar
5Y 4/4	50% Clay 10% Pyrite
5G 4/1	20% Carb. unspec.
	Probably authigenic carbonate.
5Y 5/6	
5G 4/1	

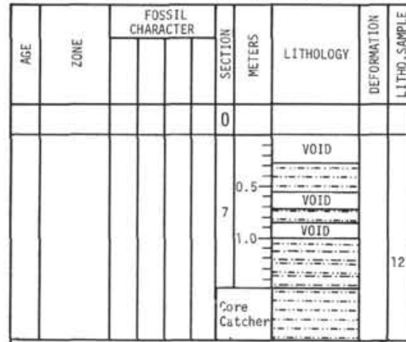
X-ray:

	Sec. 3 94-95	139-140	Sec. 7 45-47	124-126
Calcite	29%	9%	17%	7%
Dolomite	0%	0%	2%	0%
Quartz	15%	16%	13%	20%
Feldspar	4%	18%	7%	14%
Layered silicates	52%	57%	61%	59%
Carb. bomb	29%	9%	19%	7%

Grain Size:

	7-45 to 47	7-124 to 126
Sand	0%	0%
Silt	63%	65%
Clay	37%	35%

Site 379 Hole A Core 25 Cored Interval:



LITHOLOGIC DESCRIPTION

Dark greenish gray TERRIGENOUS MUD. Some sandy mud layers suggest grading. There are darker layers at the lower part of the section (FeS).

X-ray:

	1-136 to 137	1-142 to 143
Calcite	18%	18%
Quartz	14%	15%
Feldspar	8%	7%
Layered silicates	60%	60%
Carb. bomb	18%	18%

Carbonate:

	$CaCO_3$	Corg.
5-95 to 106	18%	0.6%

Explanatory notes in Chapter 1

Site 379 Hole A Core 26 Cored Interval: 235.0-244.5 m

AGE	ZONE	POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	ORG. CH.			
						2				90	5G 4/1
						3		ORG. CH.			
						4		VOID / VOID		80 90	
						5		ORG. CH.			
		S-T	—	—	—	Core Catcher					

Dark greenish gray (5G 4/1) TERRIGENOUS MUD. Abundant sandy mud layers are present, some suggest grading. Local subtle variations to more darker color occur (FeS).

DOMINANT LITHOLOGY:
SS 4-90 cm
[0, 40, 60]
20% Quartz and Feldspar
60% Clay
20% Carb. unspec.
Tr Nannos

MINOR LITHOLOGY:
SS 4-80
[40, 60, 0]
65% Quartz and Feldspar
5% Heavies
20% Rock fragments
10% Carb. unspec.

Carbonate:

	$CaCO_3$	Corg.
4-0 to 12	8%	0.6%

Site 379 Hole A Core 27 Cored Interval: 244.5-254.0 m

AGE	ZONE	POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	VOID			5G 4/1
						2		ORG. CH.			
						3					
						4		ORG. CH.			
						5		VOID / VOID			5G 4/1
						6		ORG. CH.			
		S-T	—	—	—	Core Catcher					

Dark greenish gray TERRIGENOUS MUD with abundant sand layers, some suggest grading.

X-ray:

	3-30 to 32
Calcite	5%
Quartz	20%
Feldspar	6%
Layered silicates	69%
Carb. bomb	5%

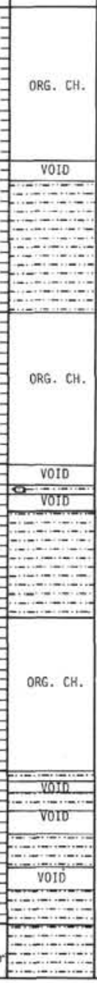
Grain Size:

	3-30 to 32
Sand	0%
Silt	47%
Clay	53%

Explanatory notes in Chapter 1

Site 379 Hole A Core 28 Cored Interval: 254.0-263.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5, 1.0	ORG. CH.			
						2		VOID			5G 4/1
						3		ORG. CH.			
						4		VOID, VOID			
						5		ORG. CH.			
						6		VOID, VOID, VOID			
		S-T	—	—	—	Core Catcher					



Dark greenish gray (5G 4/1) TERRIGENOUS MUD with abundant muddy sand to sandy mud layers suggesting turbidites.

X-ray:

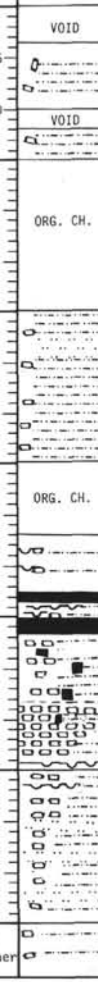
	2-60 to 62
Calcite	12%
Quartz	16%
Feldspar	7%
Layered silicates	65%
Carb. bomb	12%

Grain Size:

	2-60 to 62
Sand	0%
Silt	68%
Clay	32%

Site 379 Hole A Core 29 Cored Interval: 263.5-273.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5, 1.0	VOID, VOID			
						2		ORG. CH.			
						3					
						4		ORG. CH.			5GY 4/1, N8, 5GY 4/1, N3, 5Y 5/6, N5, 5G 4/1, N3, 5B 5/1
						5				100, 110	
						6				1, 55	5Y 5/6, 5Y 4/1 to 5G 4/1, 10R 6/2, 10R 6/2
		S-T	—	—	—	Core Catcher					



Sections 1 to 3 are basically a 5G 4/1 CALCAREOUS MUD with a number of sand layers, some show grading. In Sections 4 and 5 and top of 6 DIATOMS and SILICOFLAGELLATES? are abundant, often concentrated in olive brown (5Y 5/6) thin layers. Two SAPROPEL LAYERS occur at Section 4, 127 to 134 cm and Section 5, 0 to 13 cm. Section 5 shows cycles of medium bluish gray (5B 5/1) pyrite rich marly micrite to light gray (N3) pure micrite. The micrite suggests authigénic precipitation, (SEEKREIDE). A sequence of pale red (10R 6/2) calcareous mud (carb. >15%) topped by sandy mud to muddy sand is present in the lower part of Core 6. The upper olive gray part shows only thin coarse layers containing abundant pyrite.

X-ray:

	Sec. 4 130	132	136	142	Sec. 5 4
Calcite	3%	2%	8%	21%	2%
Quartz	14%	5%	16%	17%	17%
Feldspar	3%	2%	4%	7%	5%
Pyrite	1%	Tr	1%	1%	3%
Gypsum	1%	Tr	Tr	Tr	1%
Layered silicates	78%	91%	71%	54%	72%
Carb. bomb	3%	2%	8%	21%	2%

	Sec. 5 5	69-70	75-76	90
Calcite	1%	63%	25%	61%
Dolomite	0%	3%	2%	2%
Quartz	17%	6%	28%	6%
Feldspar	4%	2%	13%	3%
Pyrite	4%	0%	0%	0%
Gypsum	1%	0%	0%	0%
Layered silicates	73%	26%	32%	28%
Carb. bomb	1%	66%	27%	63%

Sec. 6	88	93	99
Calcite	5%	6%	21%
Quartz	19%	20%	16%
Feldspar	5%	6%	8%
Layered silicates	71%	68%	55%
Carb. bomb	5%	6%	21%

Explanatory notes in Chapter 1

Site 379 Hole A Core 30 Cored Interval: 273.0-282.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	ORG. CH.			Dark greenish gray (5G 4/1) TERRIGENOUS MUD.
						2		VOID	o o o		
		—	—	—	—	Core Catcher					

Site 379 Hole A Core 31 Cored Interval: 282.5-292.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	VOID	o o o		Dark greenish gray (5G 4/1) TERRIGENOUS MUD. 5G 4/1
						2		ORG. CH.	o		
						3		VOID	o o o o o		
						4		ORG. CH.			
						5		VOID	o o o		
						6		ORG. CH.			
		S-T	—	—	—	Core Catcher					

Explanatory notes in Chapter 1

Site 379 Hole A Core 32 Cored Interval: 292.0-301.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	VOID			Dark greenish gray TERRIGENOUS MUD. Site 379A, Core 33, 301.5-311.0 m: PRESSURE CORE BARREL, NO RECOVERY
						2		ORG. CH.			
		S	—	—	—	Core Catcher					

Site 379 Hole A Core 34 Cored Interval: 311.0-320.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5 1.0	ORG. CH.		
						2		VOID		15 64
						3		ORG. CH.		
						4		VOID		135
						5		ORG. CH.		
						6		VOID VOID		
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray TERRIGENOUS MUD. Coarser small sandy mud layers are present, some suggest grading.

DOMINANT LITHOLOGY:
SS 2-64
[0, 30, 70]
30% Quartz and Feldspar
30% Clay
40% Carb. unspec.

X-ray:

	2-131 to 133	6-84 to 86
Calcite	16%	31%
Quartz	33%	14%
Feldspar	8%	13%
Layered silicates	43%	42%
Carb. bomb	16%	31%

Grain Size:

	2-131 to 133	6-84 to 86
Sand	12%	1%
Silt	71%	62%
Clay	17%	38%

Carbonate:

	$CaCO_3$	Corg.
2-38 to 50	24%	0.6%

Explanatory notes in Chapter 1

Site 379 Hole A Core 35 Cored Interval: 320.5-330.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	VOID, VOID, VOID		
						2		ORG. CH.		
						3		VOID		130 144
						4		ORG. CH.		
						5		VOID, VOID		
						6		ORG. CH.		
		S	—	F	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray (5G 4/1) TERRIGENOUS MUD with numerous lighter gray sandy mud layers; some suggest grading. Darker layers (N4) which are present (Sec. 3) consist of clay with hardly any carbonate.

X-ray:

	1-123 to 125
Calcite	15%
Quartz	20%
Feldspar	8%
Layered silicates	57%
Carb. bomb	15%

Grain Size:

	1-123 to 125
Sand	2%
Silt	46%
Clay	53%

Carbonate:

	$CaCO_3$	Corg.
1-131 to 141	14%	0.6%

Site 379 Hole A Core 36 Cored Interval: 330.0-339.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2				100 110
						3		ORG. CH.		
						4				75
						5		ORG. CH.		
		ST	—	A	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray TERRIGENOUS MUD with numerous sandy mud layers.

DOMINANT LITHOLOGY:
SS 2-100
[0, 20, 80]
20% Quartz and Feldspar
60% Clay
20% Carb. unspec.
Tr Nannos

X-ray:

	2-69 to 71
Calcite	18%
Quartz	19%
Feldspar	7%
Layered silicates	56%
Carb. bomb	18%

Explanatory notes in Chapter 1

Site 379 Hole A Core 37 Cored Interval: 339.5-349.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO.SAMPLE
						0				
						1	0.5, 1.0	VOID		
						2		ORG. CH.		
						3		VOID, VOID, VOID, VOID, VOID		
						4		ORG. CH.		
						5		VOID, VOID, VOID		139, 142
						6		ORG. CH.		
		S	—	F	—	Core Catcher				

LITHOLOGIC DESCRIPTION

5G 4/1

Dark greenish gray TERRIGENOUS MUD with abundant sandy mud layers, some of them suggest grading.

X-ray:

	1-94 to 96	3-105 to 107
Calcite	17%	37%
Dolomite	0%	2%
Quartz	41%	23%
Feldspar	36%	9%
Layered silicates	6%	29%
Carb. bomb	17%	39%

Grain Size:

	1-94 to 96	3-105 to 107
Sand	11%	0%
Silt	59%	80%
Clay	30%	20%

Site 379 Hole A Core 38 Cored Interval: 349.0-358.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO.SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2		VOID, VOID, VOID		
						3		ORG. CH.		
						4		VOID		100
						5		ORG. CH.		
						6		VOID, VOID		35, 40
		—	—	F	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray (5GY 4/1) TERRIGENOUS MUD.

The coarser layers are more light olive gray (5Y 6/1). Some of the layer suggest grading.

DOMINANT LITHOLOGY:
SS 6-40 cm
[0, 15, 85]
15% Quartz and Feldspar
40% Clay
5% Pyrite
40% Carb. unspec.

X-ray:

	4-83 to 85	6-9 to 11
Calcite	5%	11%
Dolomite	1%	0%
Quartz	15%	13%
Feldspar	4%	3%
Layered silicates	75%	73%
Carb. bomb	6%	11%

Grain Size:

	4-83 to 85	6-9 to 11
Sand	0%	0%
Silt	18%	19%
Clay	82%	81%

Explanatory notes in Chapter 1

Site 379 Hole A Core 39 Cored Interval: 358.5-368.0 m

AGE | ZONE | FOSSIL CHARACTER: POLLEN, NANNOS, OSTRACOD., OTHERS | SECTION | METERS | LITHOLOGY | DRILLING DIST. | LITHO.SAMPLE | LITHOLOGIC DESCRIPTION

Section	Meters	Lithology	Litho. Sample
0			
1	0.5, 1.0	VOID	
2		ORG. CH.	
3			39, 78
4		ORG. CH.	
5			
Core Catcher			

Fossil character (Core Catcher): Pollen S-T; Nannos —; Ostracod. —; Others —

Dark greenish gray (5G 4/1) TERRIGENOUS MUD with numerous greenish gray (5GY 6/1) coarser horizons. Some of these sandy mud layers suggest grading.

DOMINANT LITHOLOGY:
SS 3-39 cm
10% Quartz and Feldspar
60% Clay
30% Carb. unspec.

X-ray:

	3-99 to 100	3-101 to 102
Calcite	5%	5%
Quartz	24%	18%
Feldspar	8%	6%
Layered silicates	73%	79%
Carb. bomb	5%	5%

	3-104 to 105	3-107 to 108
Calcite	16%	19%
Quartz	14%	32%
Feldspar	8%	18%
Layered silicates	62%	31%
Carb. bomb	16%	19%

	5-60 to 62
Calcite	1%
Quartz	16%
Feldspar	6%
Layered silicates	77%
Carb. bomb	1%

Grain Size:

	5-60 to 62
Sand	1%
Silt	39%
Clay	60%

Site 379 Hole A Core 40 Cored Interval: 368.0-377.5 m

AGE | ZONE | FOSSIL CHARACTER: POLLEN, NANNOS, OSTRACOD., OTHERS | SECTION | METERS | LITHOLOGY | DRILLING DIST. | LITHO.SAMPLE | LITHOLOGIC DESCRIPTION

Section	Meters	Lithology
0		
1	0.5, 1.0	ORG. CH.; VOID
2		VOID
3		ORG. CH.
4		VOID; VOID
5		ORG. CH.
6		VOID
Core Catcher		

Fossil character (Core Catcher): Pollen S-T; Nannos —; Ostracod. —; Others —

Dark greenish gray (5G 4/1) TERRIGENOUS MUD. Numerous sandy mud layers, some show grading.

X-ray:

	2-126 to 128	4-16 to 18
Calcite	10%	10%
Quartz	19%	18%
Feldspar	9%	5%
Layered silicates	62%	67%
Carb. bomb	10%	10%

	6-58 to 60
Calcite	13%
Quartz	20%
Feldspar	5%
Layered silicates	62%
Carb. bomb	13%

Grain Size:

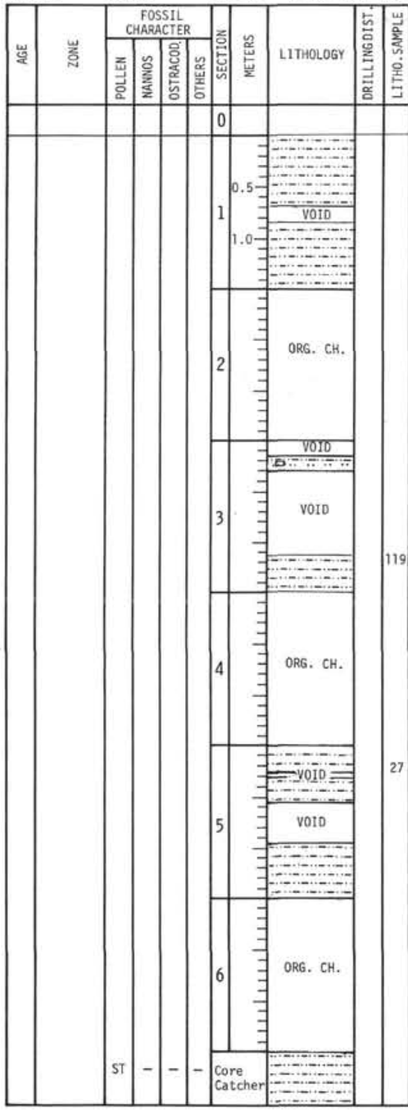
	2-126 to 128	4-16 to 18
Sand	1%	0%
Silt	38%	49%
Clay	61%	51%

	6-58 to 60
Sand	1%
Silt	50%
Clay	49%

Site 379A, Core 41, 377.5-379.5 m: 0.5 m RECOVERED, SAME FACIES, NOT SHOWN

Explanatory notes in Chapter 1

Site 379 Hole A Core 42 Cored Interval: 379.5-387.0 m



LITHOLOGIC DESCRIPTION

Dark greenish gray (5G 4/1) TERRIGENOUS MUD with numerous silt to sandy mud layers, some suggest grading. Some clay layers without any carbonate content occur in Section 5.

DOMINANT LITHOLOGY:
SS 3-119 cm
25% Quartz and Feldspar
<5% Heavies
40% Clay
5% Pyrite
30% Carb. unspec.

The bottom of the coarser layers are often rich in pyrite.

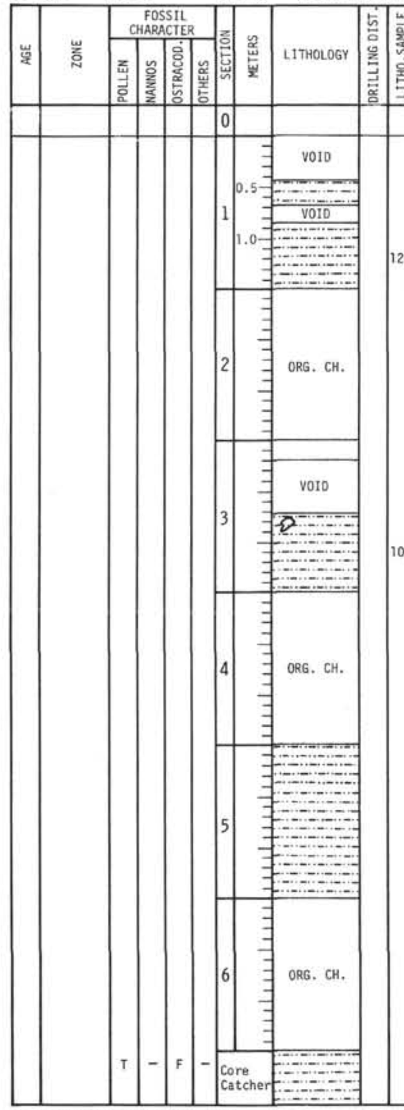
X-ray:

	3-37 to 39	5-35 to 37
Calcite	14%	6%
Dolomite	0%	1%
Quartz	18%	20%
Feldspar	5%	6%
Layered silicates	63%	67%
Carb. bomb	14%	7%

Grain Size:

	3-37 to 39	5-35 to 37
Sand	0%	0%
Silt	49%	50%
Clay	51%	50%

Site 379 Hole A Core 43 Cored Interval: 387.0-396.5 m



LITHOLOGIC DESCRIPTION

Dark greenish gray TERRIGENOUS MUD with numerous silt and sandy mud layers, some indicating turbidite deposits.

DOMINANT LITHOLOGY:
SS 3-106 cm
[0, 40, 60]
15% Quartz and Feldspar
40% Clay
5% Pyrite
40% Carb. unspec.

X-ray:

	1-53 to 55	3-105 to 107
Calcite	18%	18%
Dolomite	1%	2%
Quartz	14%	16%
Feldspar	6%	7%
Layered silicates	61%	57%
Carb. bomb	19%	20%

	5-27 to 29
Calcite	14%
Dolomite	0%
Quartz	16%
Feldspar	4%
Layered silicates	66%
Carb. bomb	14%

Grain Size:

	1-53 to 55	3-105 to 107	5-27 to 29
Sand	0%	1%	0%
Silt	60%	67%	57%
Clay	40%	32%	43%

Carbonate:

	$CaCO_3$	Corg.
3-140 to 150	21%	0.4%

Site 379A, Core 44, 396.5-406.0 m: NO RECOVERY

Explanatory notes in Chapter 1

Site 379 Hole A Core 45 Cored Interval: 406.0-415.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2		VOID, VOID, VOID		86, 138
						3		ORG. CH.		
						4		VOID, VOID, VOID		
						5		VOID, VOID, VOID		39, 130
						6		ORG. CH.		
		T	—	F	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray TERRIGENOUS MUD with numerous silt layers, some suggest grading.

The bottom of the silt layers in Section 4 is pyrite rich.

DOMINANT LITHOLOGY:
SS 2-86 cm
10% Quartz and Feldspar
55% Clay
35% Carb. unspec.

X-ray*:

	2-91 to 93	4-49 to 51
Calcite	20%	12%
Dolomite	0%	0%
Quartz	40%	19%
Feldspar	27%	7%
Layered silicates	13%	62%
Carb. bomb	20%	12%

	6-138 to 140
Calcite	16%
Dolomite	2%
Quartz	30%
Feldspar	37%
Layered silicates	15%
Carb. bomb	18%

Grain Size:

	2-91 to 93	4-49 to 51	6-138 to 140
Sand	15%	6%	5%
Silt	70%	67%	73%
Clay	14%	27%	22%

Carbonate:

	$CaCO_3$	Corg.
4-98 to 106	20%	0.5%

*Traces of Hornblende.

Site 379 Hole A Core 46 Cored Interval: 415.5-425.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2		VOID		
						3		ORG. CH.		
						4		VOID, VOID		
						5		ORG. CH.		
						6		VOID		
		T	—	C	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray TERRIGENOUS MUD with lighter colored layers of silt to sandy mud, some of them indicate turbidites.

X-ray:

	2-112 to 114	4-86 to 88
Calcite	19%	20%
Dolomite	1%	2%
Quartz	22%	30%
Feldspar	11%	15%
Layered silicates	47%	33%
Carb. bomb	20%	22%

	6-12 to 14
Calcite	20%
Dolomite	2%
Quartz	19%
Feldspar	9%
Layered silicates	50%
Carb. bomb	22%

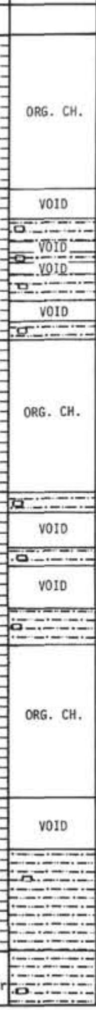
Grain Size:

	2-112 to 114	4-86 to 88	6-12 to 14
Sand	2%	1%	2%
Silt	61%	70%	85%
Clay	37%	29%	13%

Explanatory notes in Chapter 1

Site 379 Hole A Core 47 Cored Interval: 425.0-434.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	ORG. CH.			
						2		VOID VOID VOID VOID			5G 4/1
						3		ORG. CH.			
						4		VOID VOID		34 130	5G 4/1
						5		ORG. CH.			
						6		VOID		113	
		T	—	—	—	Core Catcher					



Dark greenish gray TERRIGENOUS MUD with detrital silt rich layers, some graded.

The darker N3 intervals are at most pure clay.

DOMINANT LITHOLOGY:
SS 4-74 cm
30% Quartz and Feldspar
40% Clay
30% Carb. unspec.

Some carbonate seems to be of authigenic origin.

X-ray:

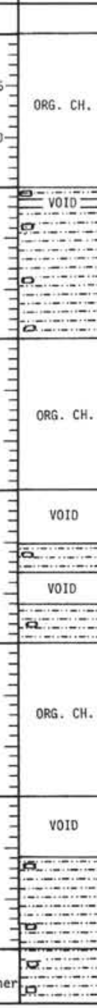
	2-48 to 50	4-14 to 16
Calcite	27%	13%
Quartz	41%	31%
Feldspar	21%	14%
Layered silicates	11%	42%
Carb. bomb	27%	13%

Grain Size:

	2-48 to 50	4-14 to 16
Sand	14%	7%
Silt	73%	55%
Clay	15%	38%

Site 379 Hole A Core 48 Cored Interval: 434.5-444.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	ORG. CH.			
						2		VOID			
						3		ORG. CH.			
						4		VOID VOID		126	
						5		ORG. CH.			
						6		VOID			
		T	—	F	—	Core Catcher					



Dark greenish gray TERRIGENOUS MUD with lighter colored layer of detrital silt, some indicating grading.

DOMINANT LITHOLOGY:
SS 4-126 cm
15% Quartz and Feldspar
55% Clay
30% Carb. unspec. (calcite and dolomite)

Probably authigenic calcite.

X-ray:

	2-22 to 24	4-62 to 64	6-103 to 105
Calcite	27%	17%	15%
Dolomite	0%	3%	1%
Quartz	25%	37%	13%
Feldspar	19%	27%	5%
Layered silicates	29%	16%	66%
Carb. bomb	27%	20%	16%

Grain Size:

	2-22 to 24	4-62 to 64	6-103 to 105
Sand	2%	2%	0%
Silt	77%	85%	65%
Clay	21%	13%	35%

Carbonate:

	$CaCO_3$	Corg.
1-132 to 140	21%	0.5%

Explanatory notes in Chapter 1

Site 379 Hole A Core 49 Cored Interval: 444.0-453.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0			87
						2		ORG. CH.		
						3		VOID		
						4		ORG. CH.		
						5		VOID		
						6		ORG. CH.		
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray (5G 4/1) TERRIGENOUS MUD with numerous lighter colored layers of detrital silt. These layers have sharp lower contacts and some exhibit obvious size grading.

DOMINANT LITHOLOGY:
SS 1-87 cm
15% Quartz and Feldspar
55% Clay
30% Carb. unspec.

Probably some authigenic calcite present.

X-ray:

	1-21 to 23	5-80 to 82
Calcite	19%	18%
Dolomite	2%	2%
Quartz	21%	14%
Feldspar	10%	4%
Layered silicates	48%	62%
Carb. bomb	21%	20%

Grain Size:

	1-21 to 23	5-80 to 82
Sand	0%	1%
Silt	87%	65%
Clay	13%	34%

Carbonate:

	$CaCO_3$	Corg.
5-122 to 130	19%	0.4%

Site 379 Hole A Core 50 Cored Interval: 453.5-463.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	VOID		
						2		ORG. CH.		
						3		VOID VOID		90
						4		ORG. CH.		
						5				88
						6		ORG. CH.		
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray CALCITE rich MUD with numerous silt layers occurs in Sections 1 to 3.

In the upper part of Section 5 a distinct cyclic sedimentation occurs. The cycles are about 3-6 cm thick and consist of greenish gray (5GY 6/1) nearly pure SEEKREIDE and dark greenish gray (5GY 4/1) calcite rich mud. At the base the sequence starts with a fine layer of pyrite, an average 1 to 2 mm thick. There follows a dark clay which facies into the gray clay. Throughout the gray clay mottling occurs and white SEEKREIDE from the overlying calcite rich mud has been drawn into the burrows. The sequence closes with a white colored SEEKREIDE boundary between the SEEKREIDE and pyrite and clay are always sharp and distinct.

Probably authigenic calcite.

X-ray:

	2-51 to 53	5-31 to 39
Calcite	18%	31%
Quartz	14%	18%
Feldspar	7%	8%
Pyrite	Tr	Tr
Layered silicates	61%	43%
Carb. bomb	18%	31%

Grain Size:

	3-51 to 53
Sand	0%
Silt	60%
Clay	40%

5GY 4/1
5GY 6/1 alternating

Explanatory notes in Chapter 1

Site 379 Hole A Core 51 Cored Interval: 463.0-472.5 m

AGE	ZONE	POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2		VOID; VOID		78
						3		ORG. CH.		
						4		VOID		80, 137
						5		ORG. CH.		
						6		VOID; VOID		129
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray CALCITE RICH MUD with abundant lighter gray layers of detrital silt, sharp lower contacts, some layers show grading. Medium dark layers (N4) are interspersed with the dark greenish gray calcareous mud. They are very low in carbonate.

DOMINANT LITHOLOGY:
SS 4-137
25% Detr. carb.
20% Quartz and Feldspar
55% Clay

MINOR LITHOLOGY (dark layer):
SS 4-88
<5% Detr.carb.
10% Quartz and Feldspar
85% Clay

X-ray:

	2-144 to 146	6-114 to 115
Calcite	10%	19%
Quartz	19%	16%
Feldspar	14%	7%
Layered silicates	57%	58%
Carb. bomb	10%	19%

Grain Size:

	2-144 to 146
Sand	4%
Silt	47%
Clay	49%

Site 379 Hole A Core 52 Cored Interval: 472.5-482.0 m

AGE	ZONE	POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	VOID; VOID		
						2		ORG. CH.		
						3				26
						4		ORG. CH.		
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray (5GY 4/1) TERRIGENOUS MUD with abundant greenish gray (5GY 6/1) distrital silt layers in a sequence between 5-10 cm.

DOMINANT LITHOLOGY:
SS 3-26 cm
[0, 30, 70]
15% Quartz and Feldspar
50% Clay
5% Pyrite
30% Carb. unspec.

X-ray:

	1-31 to 33
Calcite	19%
Quartz	16%
Feldspar	10%
Layered silicates	55%
Carb. bomb	19%

Grain Size:

	1-31 to 33
Sand	0%
Silt	65%
Clay	35%

Explanatory notes in Chapter 1

Site 379 Hole A Core 53 Cored Interval: 482.0-491.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 / 1.0	VOID / VOID			Dark greenish gray CALCITE RICH MUD with numerous silt layers, some show grading.
						2		ORG. CH.			
		T	—	—	—	Core Catcher					

Site 379 Hole A Core 54 Cored Interval: 491.5-501.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 / 1.0	ORG. CH.			Dark greenish gray (5G 4/1) CALCITE RICH MUD with numerous silt layers, some look graded, others laminated.
						2		VOID			
						3		ORG. CH.			
						4		VOID			
						5		ORG. CH.			
						6					
		T	—	C	—	Core Catcher					

X-ray:

	4-24 to 26
Calcite	25%
Quartz	15%
Feldspar	5%
Layered silicates	55%

Carb. bomb	25%

Grain Size:

	4-24 to 26
Sand	1%
Silt	71%
Clay	28%

Explanatory notes in Chapter I

Site 379 Hole A Core 55 Cored Interval: 501.0-510.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2				110, 137
						3		ORG. CH.		
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Cycles 2-5 cm thick of CALCITE RICH MUD (5GY 6/1) grading up to medium dark gray (N4) CLAY. The light colored layers are burrowed down into the black clay.

DOMINANT LITHOLOGY:
SS 2-110 cm
[0, 20, 80]

10% Quartz and Feldspar
45% Clay
5% Pyrite
40% Calcite

Site 379 Hole A Core 56 Cored Interval: 510.5-520.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	VOID		25, 43
						2		ORG. CH.		
						3		VOID		
						4		ORG. CH.		
		T	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Cycles of grayish olive CALCITE rich MUD to dark (N4) CLAY.

Silt layers are present at 45 and 120 cm in Section 1 and at 17, 19, 29, 30, 54, 140 and 150 cm in Section 3.

DOMINANT LITHOLOGY:
SS 1-43 cm
[0, 40, 60]
35% Clay
2% Pyrite and Micronodules
60% Calcite
2% Nannos (reworked)

X-ray:

	1-51 to 53
Calcite	15%
Dolomite	2%
Quartz	35%
Feldspar	26%
Layered silicates	22%

Carb. bomb 17%

Grain Size:

	1-51 to 53
Sand	6%
Silt	77%
Clay	17%

Explanatory notes in Chapter 1

Site 379 Hole A Core 57 Cored Interval: 520.0-529.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0			
						2		ORG. CH.		
						3		VOID		131
						4		ORG. CH.		
		ST	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Distinct cycles of CALCITE rich MUD and CLAY as seen before. Burrowing of the lighter CALCITE RICH mud into the clay is observed.

Detrital silt layers are present.

DOMINANT LITHOLOGY:
SS 3-131 cm
[0, 60, 40]
40% Clay
60% Calcite

X-ray:

	5-100 to 102	CC
Calcite	26%	25%
Quartz	19%	12%
Feldspar	12%	5%
Layered silicates	43%	58%
Carb. bomb	26%	25%

Grain Size:

	5-100 to 102	CC
Sand	1%	0%
Silt	78%	64%
Clay	21%	36%

Site 379 Hole A Core 58 Cored Interval: 529.5-539.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2		VOID		
						3		ORG. CH.		
						4				90 92
						5		ORG. CH.		
		S	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

2-5 cm cycles of greenish gray (5GY 6/1) clay and medium gray (N5) calcite rich mud. The lighter material is burrowed down into the darker clay. For detailed description of these cycles see Core 50. Numerous silt layers occur, some are laminated, some suggest grading.

DOMINANT LITHOLOGY (Carbonate):
SS 4-90 cm
10% Quartz and Feldspar
30% Clay
60% Carbonate

DOMINANT LITHOLOGY (Clay):
SS 4-92 cm
85% Clay
10% Quartz and Feldspar
5% Pyrite and Opaque

X-ray:

	2-111 to 113	4-87 to 96
Calcite	18%	28%
Dolomite	0%	1%
Quartz	18%	11%
Feldspar	11%	4%
Layered silicates	53%	56%
Carb. bomb	18%	29%

Grain Size:

	2-111 to 113
Sand	2%
Silt	73%
Clay	25%

Explanatory notes in Chapter 1

Site 379 Hole A Core 59 Cored Interval: 539.0-548.5 m

AGE	ZONE	POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5 – 1.0	VOID; VOID		
						2		ORG. CH.		
						3				51; 110; 140
						4		ORG. CH.		
						5				
						6		ORG. CH.		
		ST	—	F	—	Core Catcher				

LITHOLOGIC DESCRIPTION

The top of the core is a dark greenish gray (5GY 4/1) TERRIGENOUS MUD with abundant silt and sand layers. In Section 3 the cyclic deposition of greenish gray carbonate mud and dark greenish gray (N5) clay starts again.

DOMINANT LITHOLOGY:
SS 3-51 cm
[0, 65, 35]
45% Quartz, feldspar
5% Heavies
15% Clay
5% Pyrite (nodules)
30% Carbonate

DOMINANT LITHOLOGY (5GY 6/1):
3-110 cm
10% Quartz and Feldspar
20% Clay
<5% Pyrite
20% Carbonate (calcite)

DOMINANT LITHOLOGY (N3):
3-110 cm
[0, 10, 90]
10% Quartz and Feldspar
<5% Heavies
80% Clay
10% Carb. unspec.

X-ray:

	1-100 to 102	3-83 to 95	5-32 to 42
Calcite	17%	11%	18%
Dolomite	2%	0%	7%
Quartz	37%	21%	12%
Feldspar	16%	4%	6%
Layered silicates	28%	64%	63%
Carb. bomb	19%	11%	19%

Grain Size:

	1-100 to 102	3-83 to 95
Sand	4%	0%
Silt	86%	59%
Clay	10%	40%

Carbonate:

	$CaCO_3$	Corg.
1-148 to 150	19%	0.4%
5-5 to 13	23%	0.5%

Site 379 Hole A Core 60 Cored Interval: 548.5-558.0 m

AGE	ZONE	POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5 – 1.0	ORG. CH.		
						2				
						3		ORG. CH.		
						4				
						5		ORG. CH.		
		—	—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Distinct cycles of SEEKREIDE and CLAY. See description Core 50.

X-ray:

	2-56 to 57	2-58 to 59	2-75 to 84
Calcite	23%	58%	32%
Dolomite	2%	0%	0%
Quartz	24%	7%	15%
Feldspar	12%	3%	7%
Layered silicates	39%	32%	46%
Carb. bomb	25%	58%	32%

	2-119 to 120	2-121 to 122
Calcite	63%	22%
Dolomite	0%	0%
Quartz	6%	15%
Feldspar	0%	5%
Layered silicates	31%	53%
Carb. bomb	63%	22%

	4-64 to 72	4-73 to 82
Calcite	25%	23%
Dolomite	2%	0%
Quartz	21%	19%
Feldspar	8%	7%
Layered silicates	44%	51%
Carb. bomb	25%	23%

Site 379A, Core 61, 558.0-562.0 m: NO RECOVERY

Explanatory notes in Chapter 1

Site 379 Hole A Core 62 Cored Interval: 562.0-567.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	VOID			SEEKREIDE and CLAY cyclically interbedded. X-ray: 4-36 to 37 Calcite 16% Dolomite 2% Quartz 15% Feldspar 5% Layered silicates 62% Carb. bomb 18%
						2					Site 379A, Core 63, 567.5-577.0 m: NO RECOVERY
		T	—	F	—	Core Catcher					

Site 379 Hole A Core 64 Cored Interval: 577.0-586.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	VOID VOID		95 105	Dark greenish gray (5GY 4/1) SEEKREIDE to CALCITE RICH SANDY MUD. Lower part of the core is a turbidite. DOMINANT LITHOLOGY: SS 1-95 cm 40% Carb. 60% Clay
						2		ORG. CH.			
						3		VOID VOID			
						4		ORG. CH.			
						5		VOID VOID			
			—	—	—	Core Catcher					

Explanatory notes in Chapter 1

Site 379 Hole A Core 65 Cored Interval: 586.5-596.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO.SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2				
						3		ORG. CH.		
						4		VOID, VOID		
						5		ORG. CH.		
						6				65 70
			—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Cycles of light olive gray (5Y 6/1) CLAYEY SEEKREIDE and TERRIGENOUS MUD to CLAY as described before (See Core 50).

Occasional intercalation of laminated and cross-laminated, silt layers occur.

DOMINANT LITHOLOGY (5Y 6/1):
SS 6-65 cm
20% Clay
80% Authigenic calcite

SS 6-70 cm
60% Clay
35% Carb. unspec.
5% Quartz and Feldspar

X-ray:

	6-1 to 8	6-45 to 46	6-51 to 52
Calcite	18%	22%	55%
Dolomite	0%	1%	0%
Quartz	17%	20%	7%
Feldspar	6%	5%	2%
Layered silicates	59%	52%	36%
Carb. bomb	18%	23%	55%

X-ray:

	6-55 to 56	6-60 to 61
Calcite	59%	25%
Quartz	8%	21%
Feldspar	3%	6%
Layered silicates	30%	48%
Carb. bomb	59%	25%

Grain size:

	6-1 to 8
Sand	0%
Silt	61%
Clay	39%

Carbonate:

	$CaCO_3$	Corg.
4-37 to 49	13%	0.5%

Site 379 Hole A Core 66 Cored Interval: 596.0-605.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO.SAMPLE
						0				
						1	0.5, 1.0			
						2				
						3		ORG. CH.		
						4		VOID		
			—	—	—	Core Catcher				

LITHOLOGIC DESCRIPTION

Dark greenish gray (5G 4/1) TERRIGENOUS MUD.

A turbidite of sandy silt to silt size is present between 117 to 132 cm.

X-ray:

	4-109 to 111
Calcite	12%
Quartz	23%
Feldspar	43%
Layered silicates	22%
Carb. bomb	12%

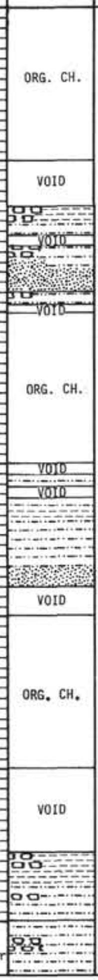
Grain Size:

	4-109 to 111
Sand	31%
Silt	62%
Clay	7%

Explanatory notes in Chapter 1

Site 379 Hole A Core 67 Cored Interval: 605.5-615.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	ORG. CH.		
						2		VOID		
						3		ORG. CH.		
						4		VOID		70
						5		ORG. CH.		
						6		VOID		110
						Core Catcher				



LITHOLOGIC DESCRIPTION

Distinct cyclic alterations of olive gray (5Y 6/1) CLAYEY SEEKREIDE with dark greenish gray (5G 4/1) to greenish black MUD to CLAY as described before (Core 50).

The cycles are interrupted by turbidites (Section 2, 95-130 cm; Section 4, 35-120 cm). The turbidites consist of organic and pyrite rich silt to sand. Abundant wood chips occur at the top of the turbidite in Section 2.

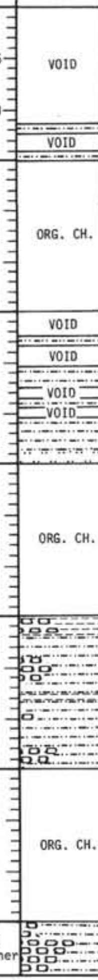
DOMINANT LITHOLOGY:
SS 6-110 cm
40% Carb. (Authigenic calcite)
10% Quartz and Feldspar
5% Pyrite
45% Clay

X-ray:

	2-62 to 63	2-129 to 130
Calcite	33%	55%
Quartz	11%	7%
Feldspar	7%	3%
Layered silicates	49%	35%
Carb. bomb	33%	55%

Site 379 Hole A Core 68 Cored Interval: 615.0-624.5 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACOD.	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO. SAMPLE
						0				
						1	0.5, 1.0	VOID		
						2		ORG. CH.		
						3		VOID		118
						4		ORG. CH.		
						5				
						6		ORG. CH.		
		–	–	–		Core Catcher				



LITHOLOGIC DESCRIPTION

Upper part of the Section is a TERRIGENOUS MUD (5G 4/1). The lower part of the section shows cycles of SEEKREIDE with CLAY as described in Core 50. Intercalation of thick silt layer are frequent, most are graded, thinner ones are laminated.

SS 3-118 cm
35% Carb. unspec.
5% Opaque
5% Heavies
55% Quartz and Feldspar

SS 5-45 cm
45% Carb. (Dolomite and Calcite)
5% Pyrite and Opaque
50% Clay

X-ray:

	3-133 to 135	5-97 to 99
Calcite	19%	32%
Dolomite	3%	0%
Quartz	15%	17%
Feldspar	6%	7%
Layered silicates	57%	44%
Carb. bomb	22%	32%

	5-139 to 141
Calcite	10%
Dolomite	2%
Quartz	36%
Feldspar	38%
Layered silicates	14%
Carb. bomb	12%

Grain Size:

	3-133 to 135	5-97 to 99
Sand	2%	2%
Silt	72%	71%
Clay	26%	27%

Explanatory notes in Chapter 1

Site 379 Hole B Core 6 Cored Interval: 92.5-102.0 m

AGE	ZONE	FOSSIL CHARACTER: POLLEN	NANNOS	OSTRACODS	OTHERS	SECTION	METERS	LITHOLOGY	DRILLING DIST.	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
						0					
						1	0.5 1.0	VOID			5Y 3/2
						2		VOID			
						3		VOID VOID VOID			5Y 3/2
						4		VOID VOID		70	N5
						5		VOID			5Y 3/2 5Y 5/2 (N8 streaks) N5
						6		VOID VOID		100	N5
						Core Catcher					

Olive gray (5Y 3/2) nannofossil rich mud to medium gray NANNO OOZE.

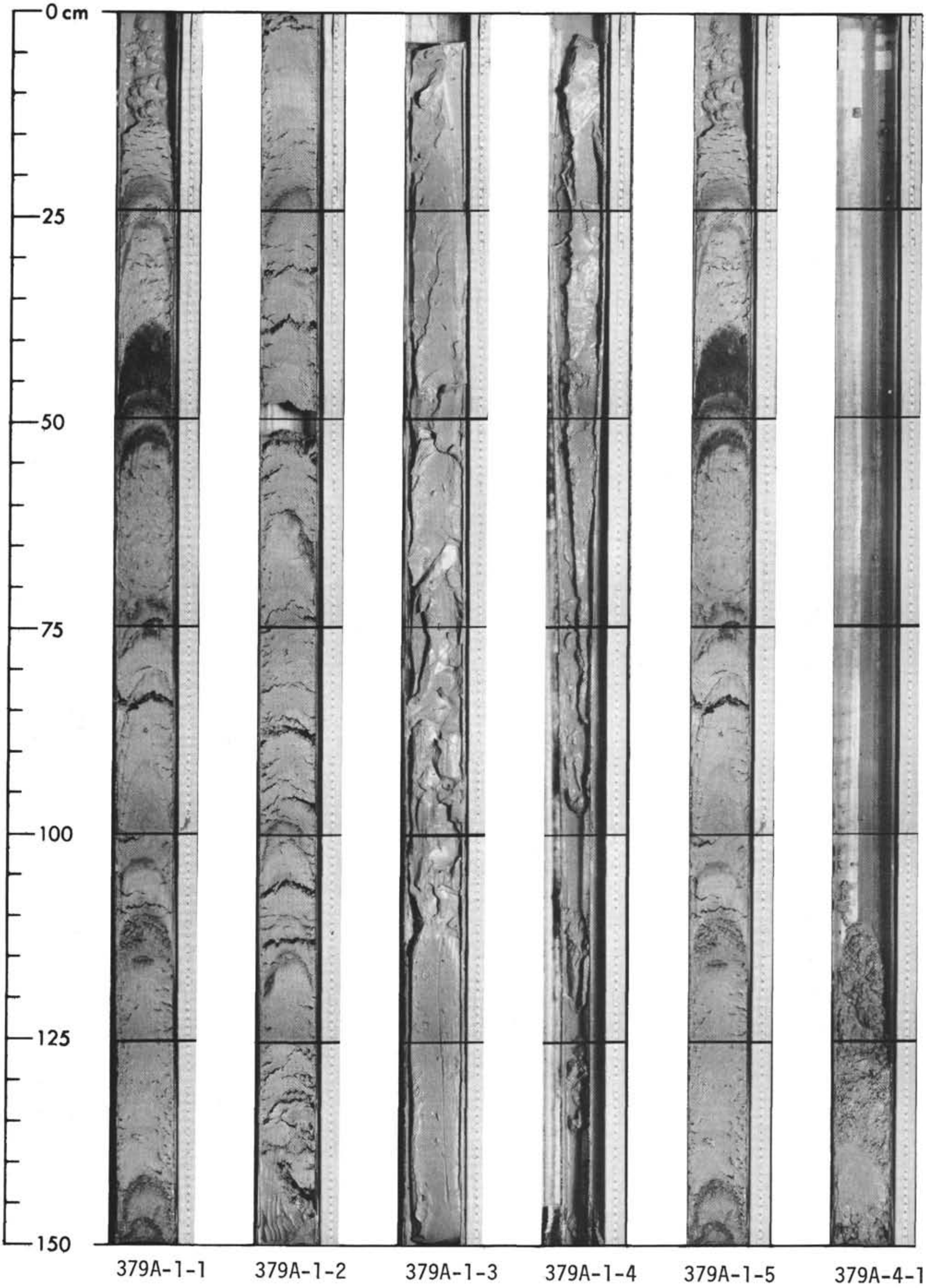
DOMINANT LITHOLOGY:
SS 4-70 cm
55% Nannos
45% Clay

X-ray:

	1-41 to 42
Calcite	13%
Quartz	18%
Feldspar	6%
Layered silicates	63%
Carb. bomb	13%

Site 379B:
Cores 1, 2 - No recovery
Cores 3, 4, 5 - Entire core removed for organic geochemistry sample
Core 7 - 20 cm recovery
Cores 8, 9 - Entire core removed for organic geochemistry sample

Explanatory notes in Chapter 1


0 cm
25
50
75
100
125
150
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379A-1-2
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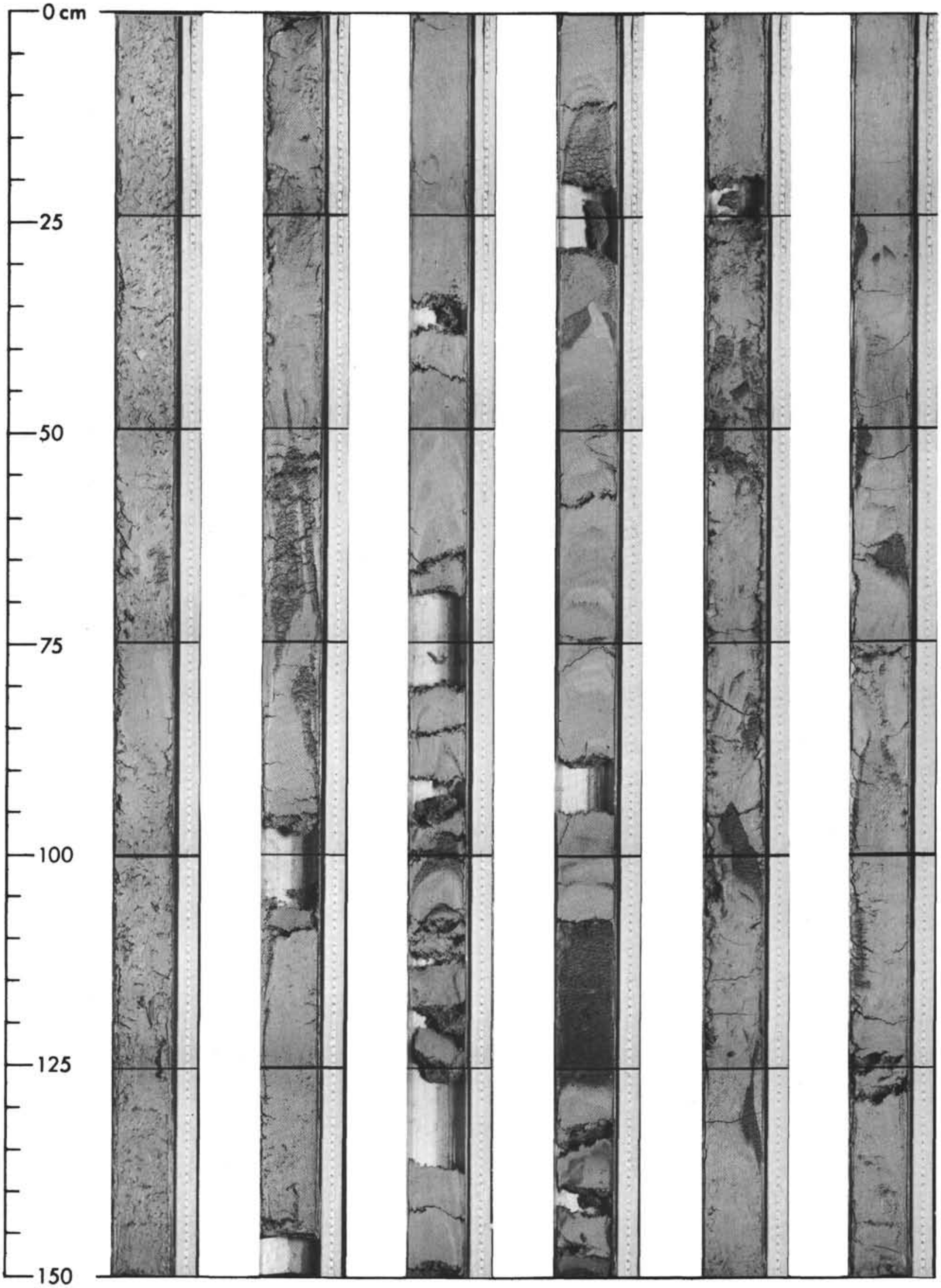
379A-1-4
379A-1-5
379A-4-1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50
75
100
125
150
379A-4-2
379A-4-3
379A-4-4
379A-4-5
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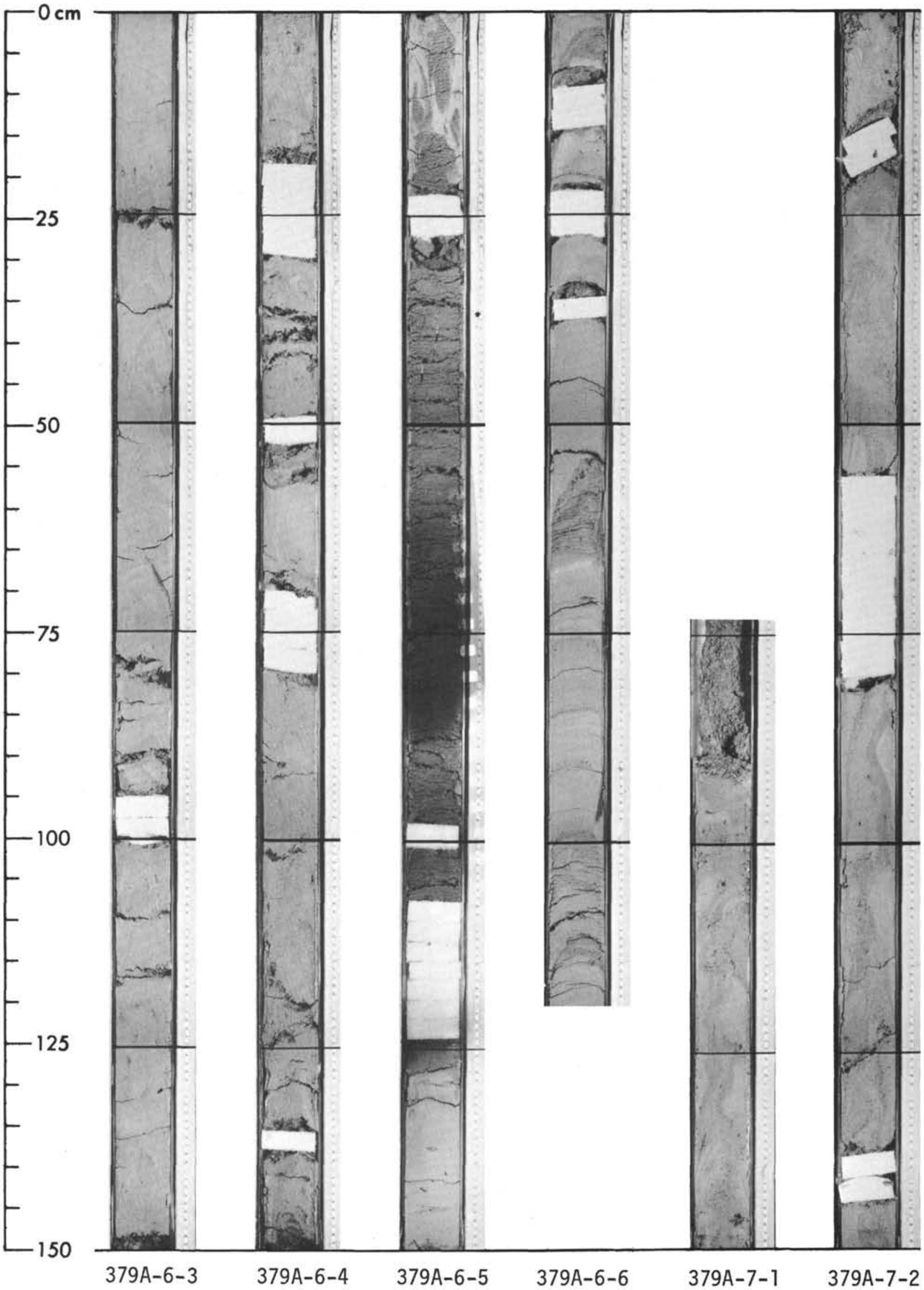
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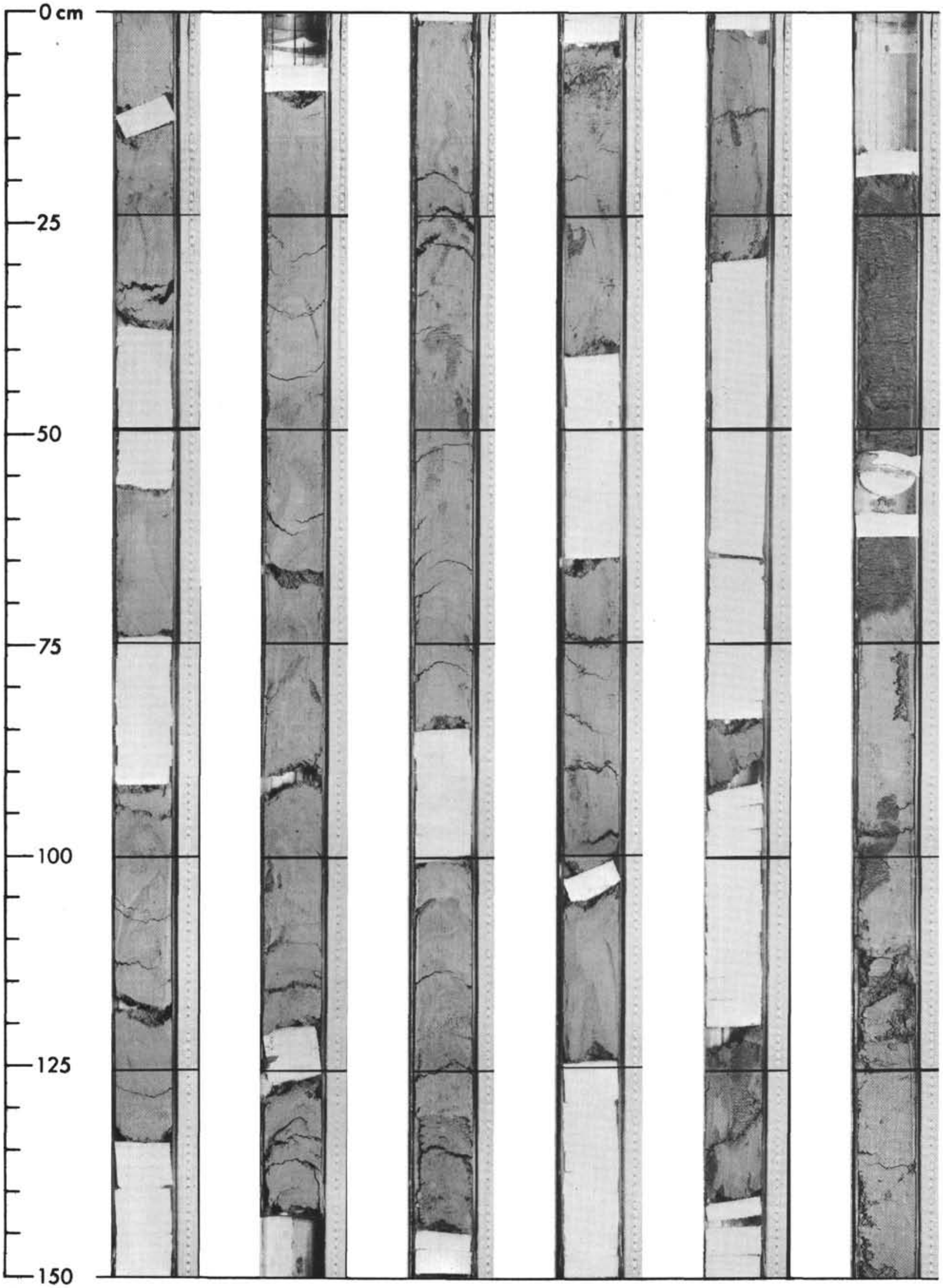
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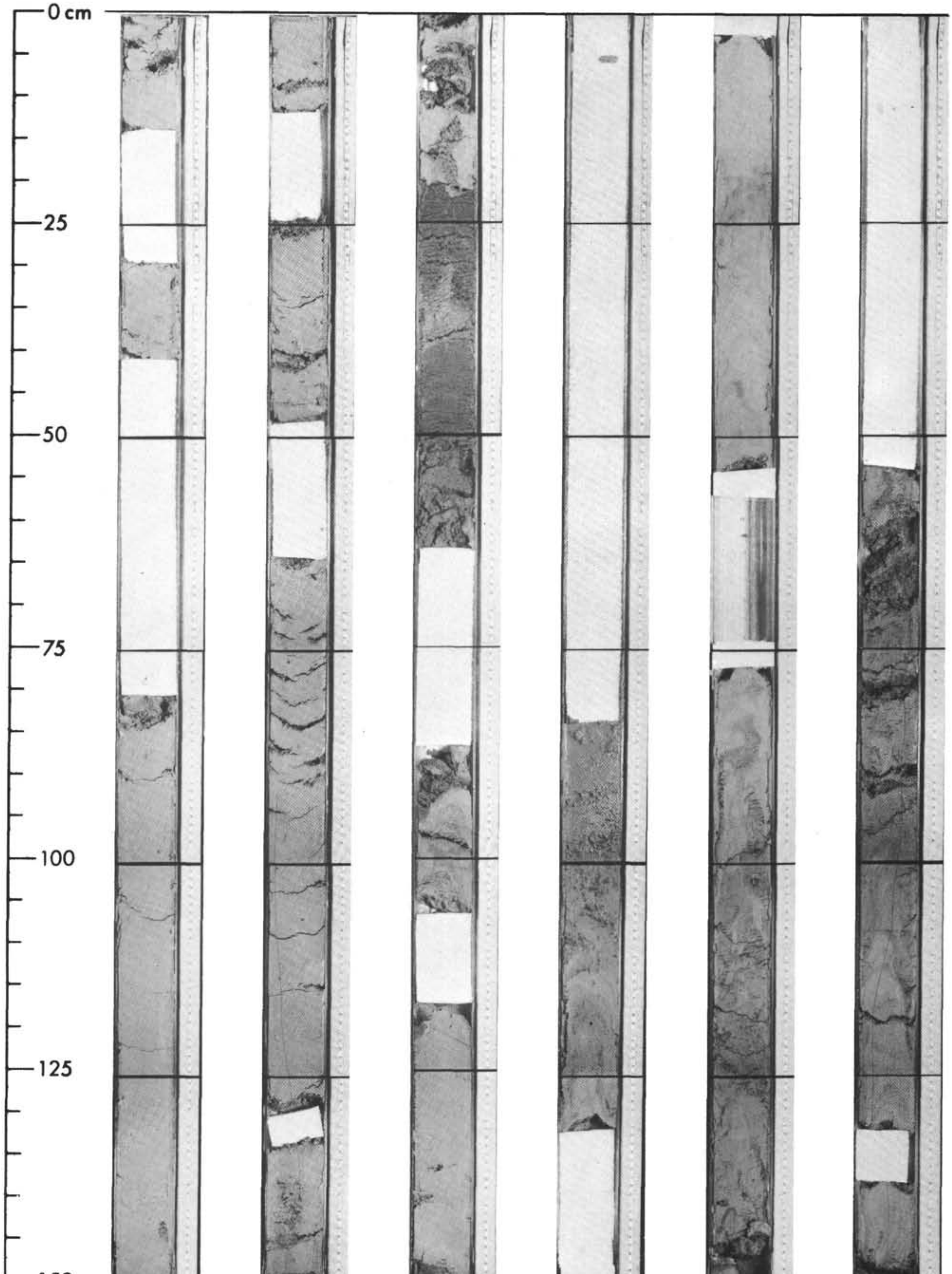
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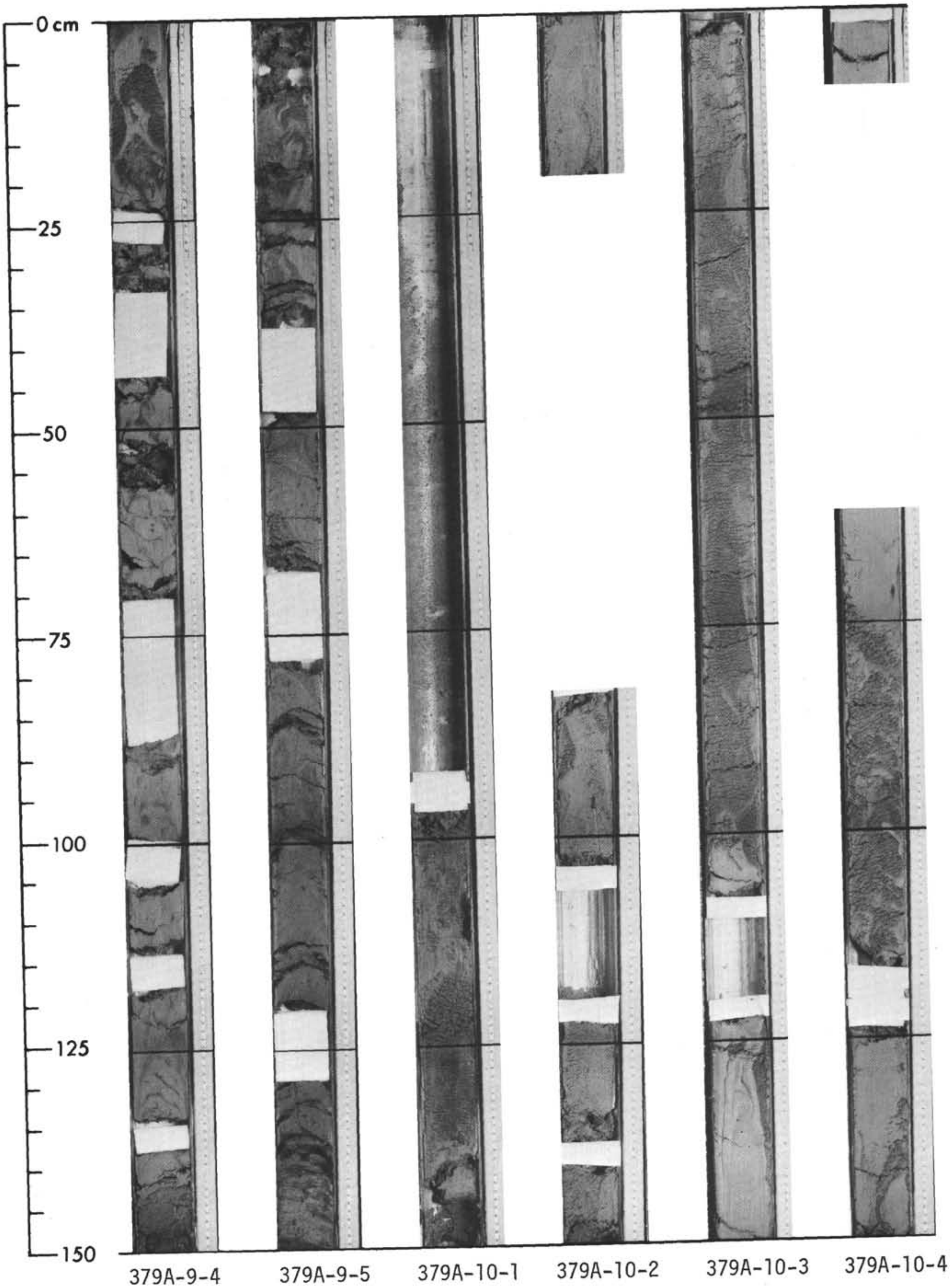
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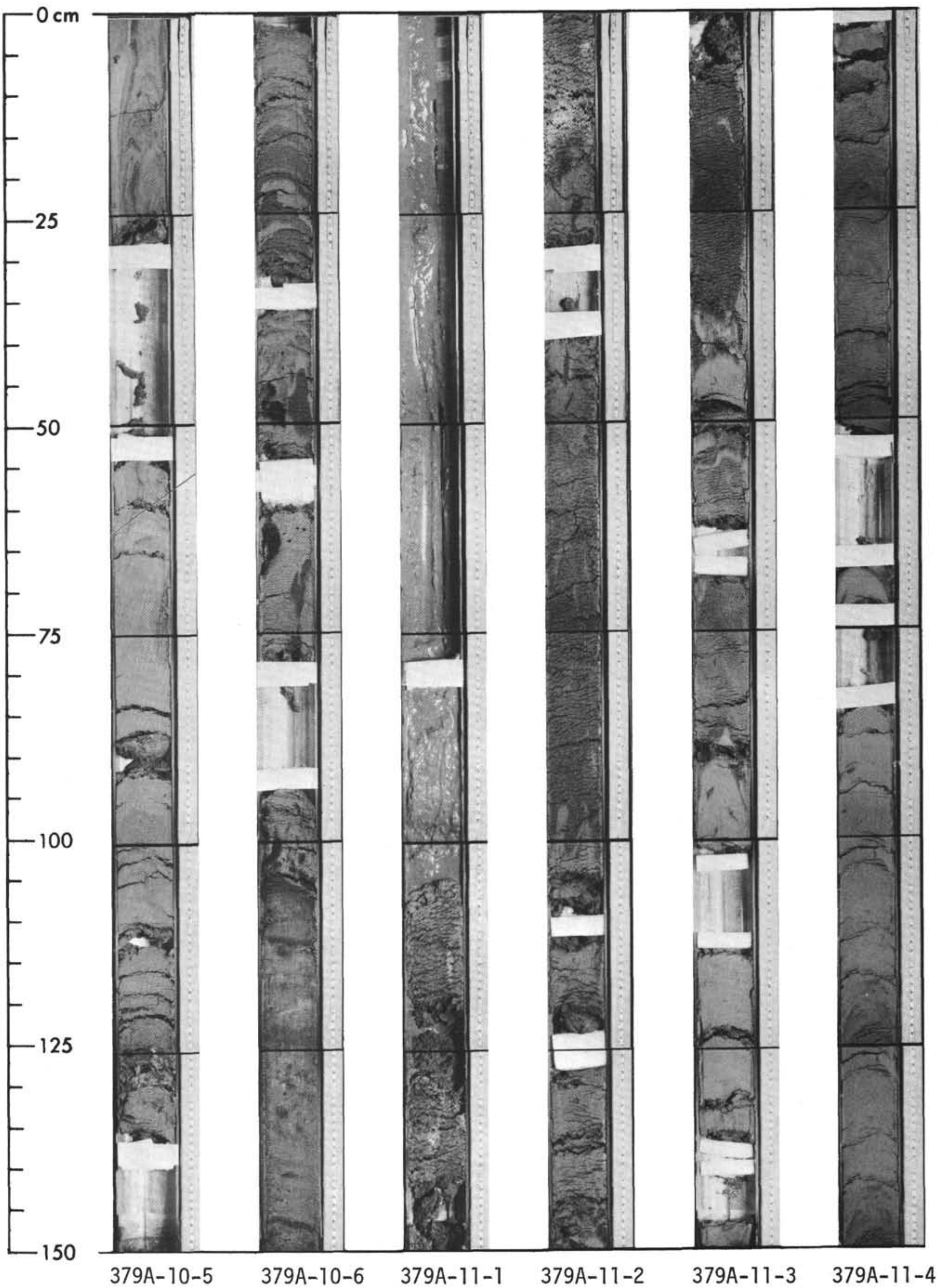
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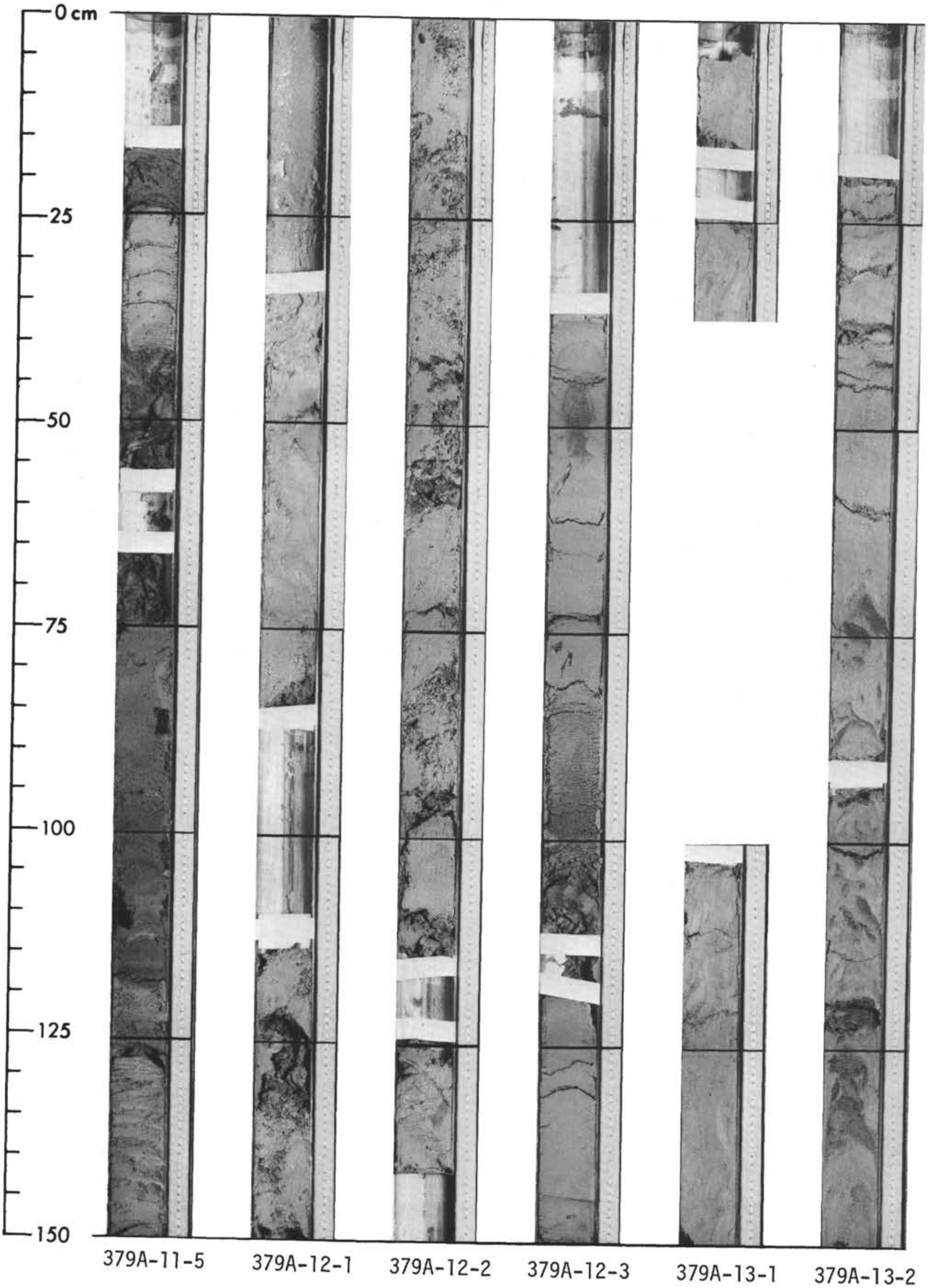
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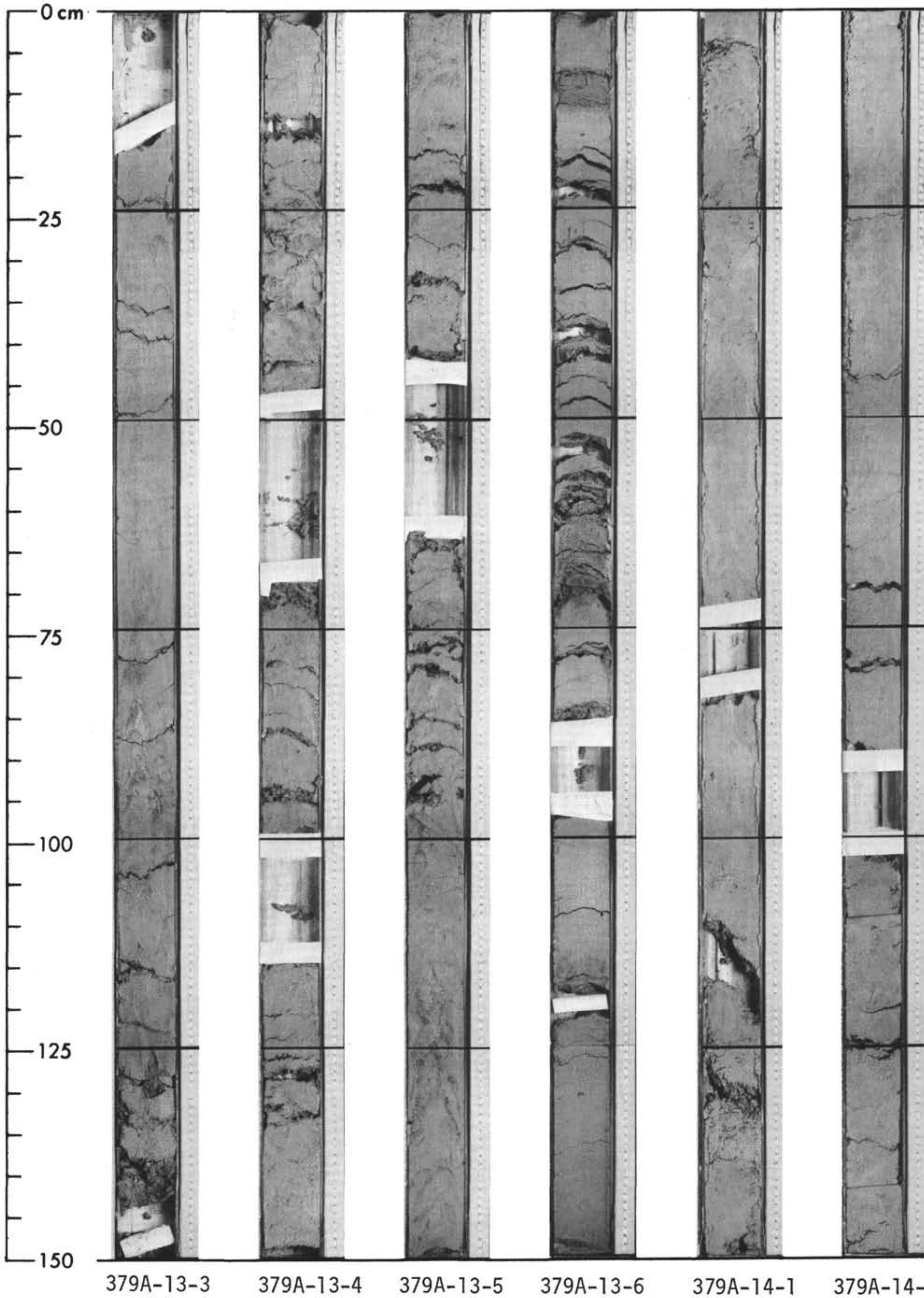
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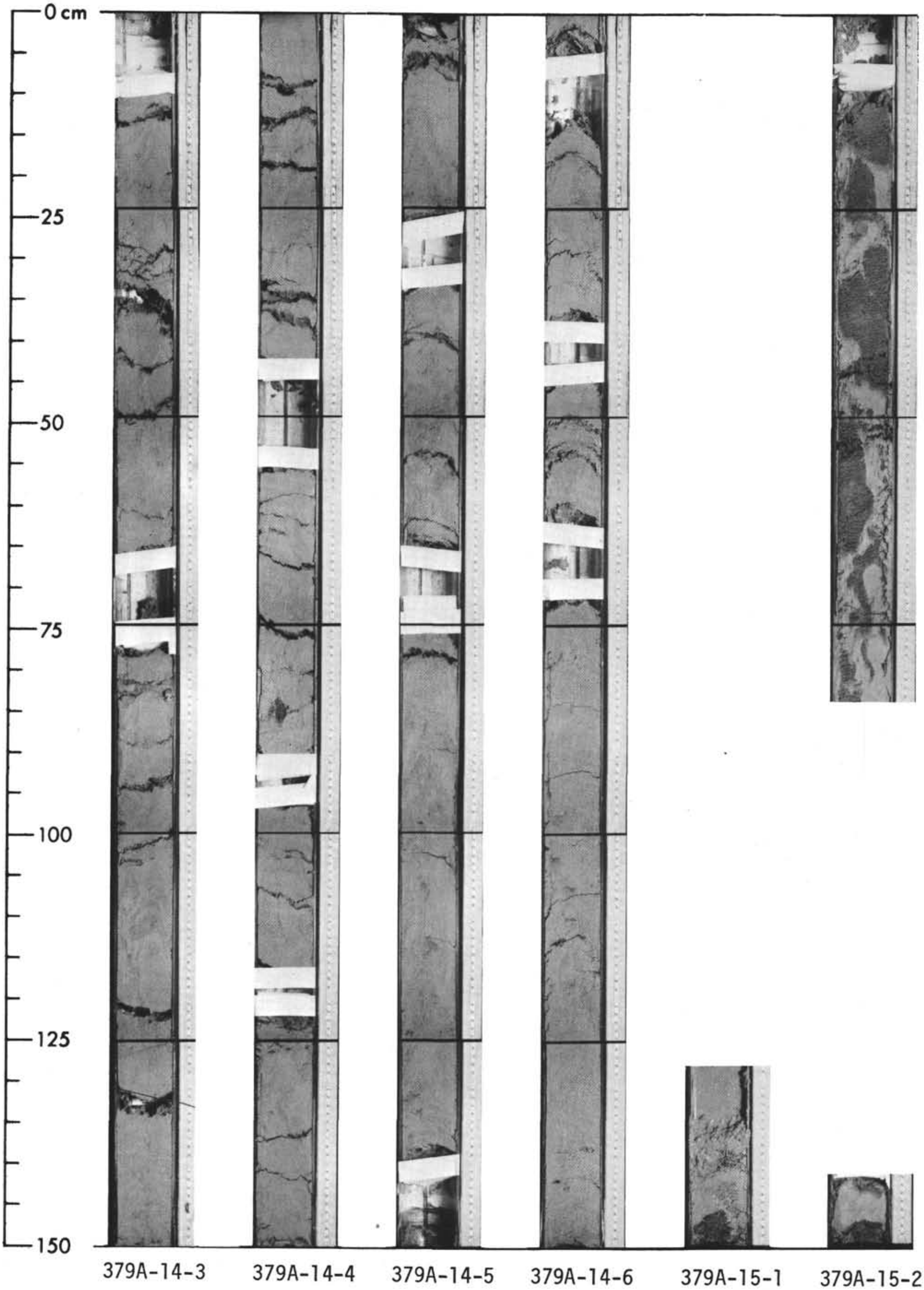
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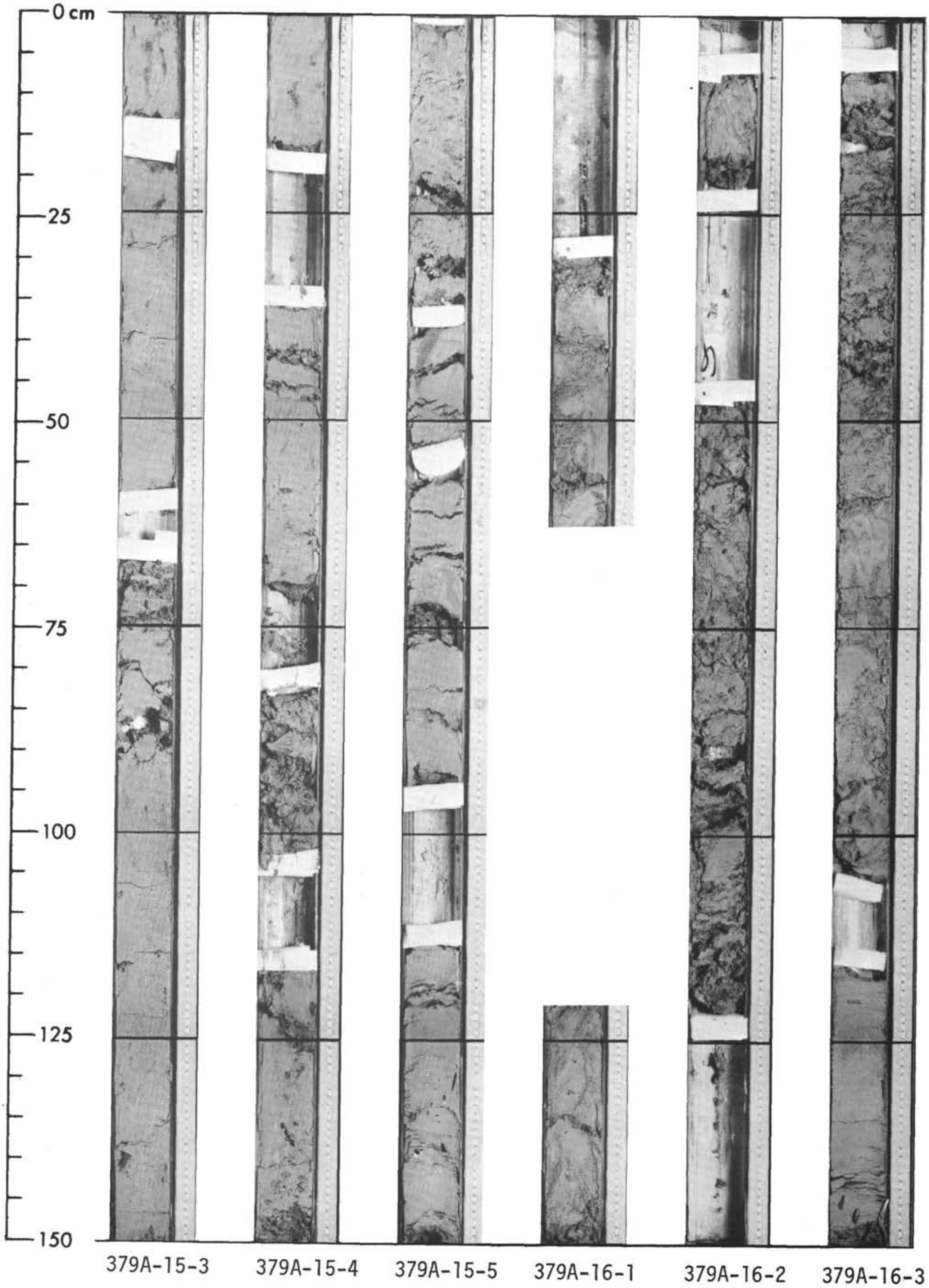
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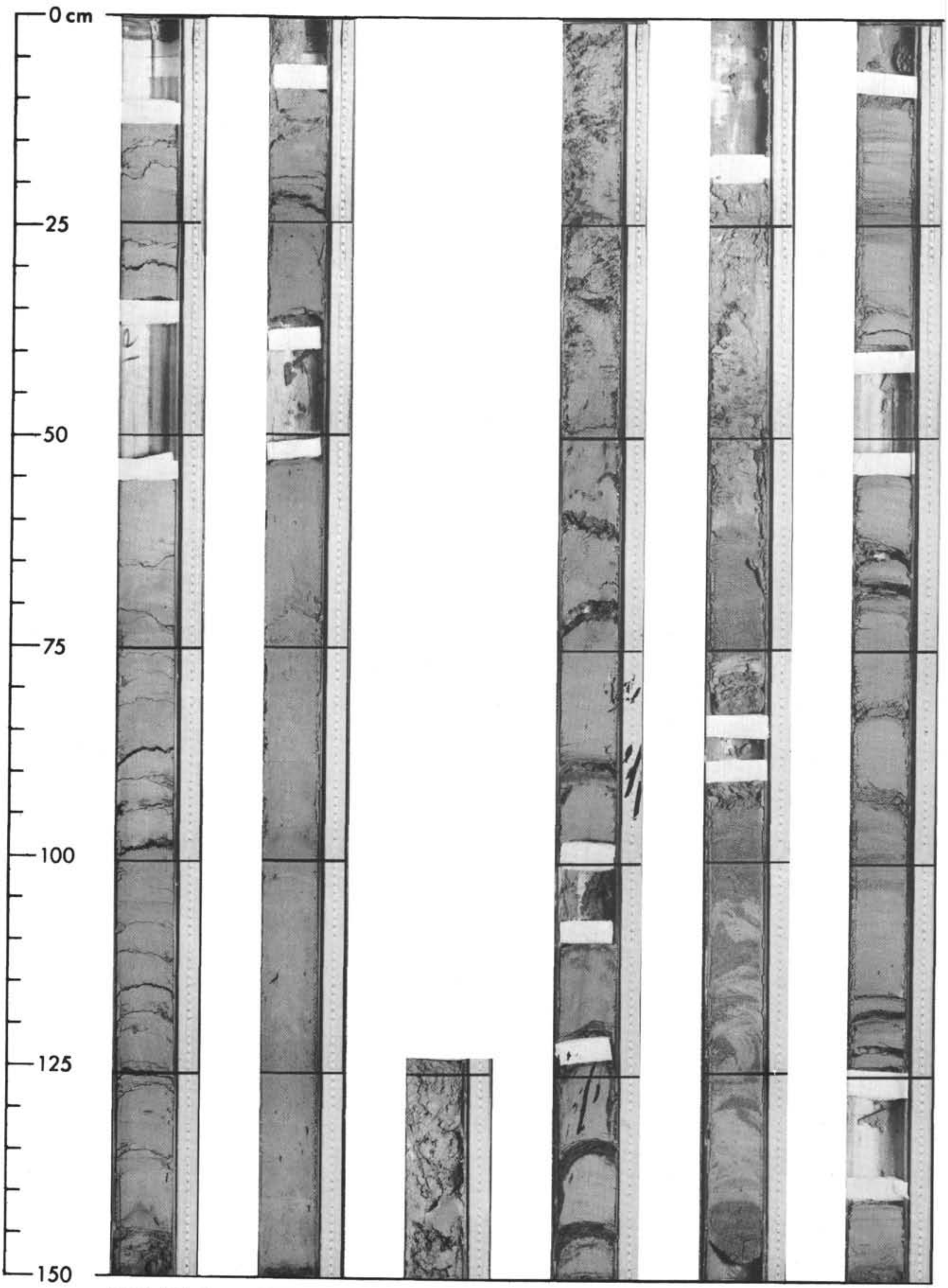

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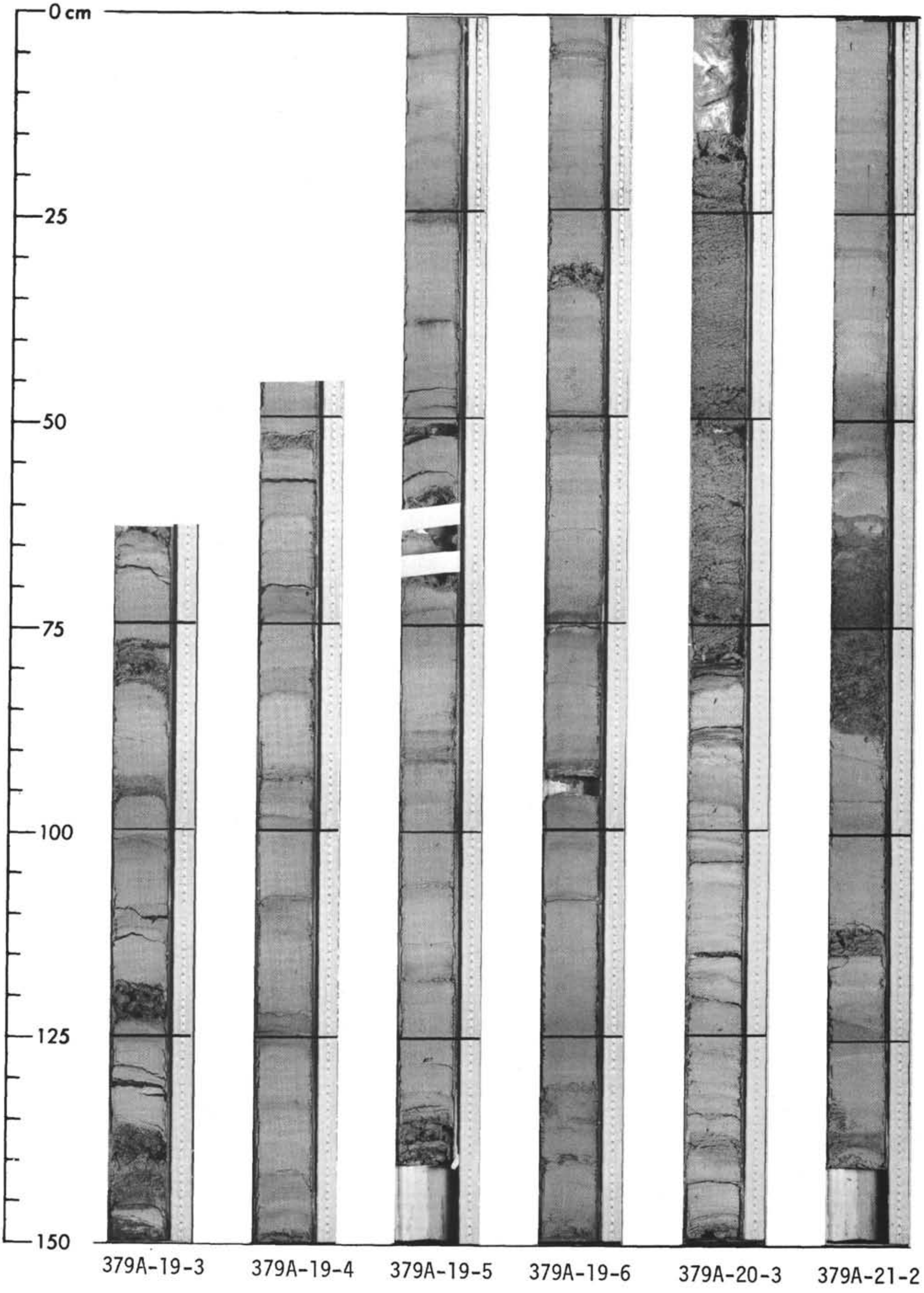
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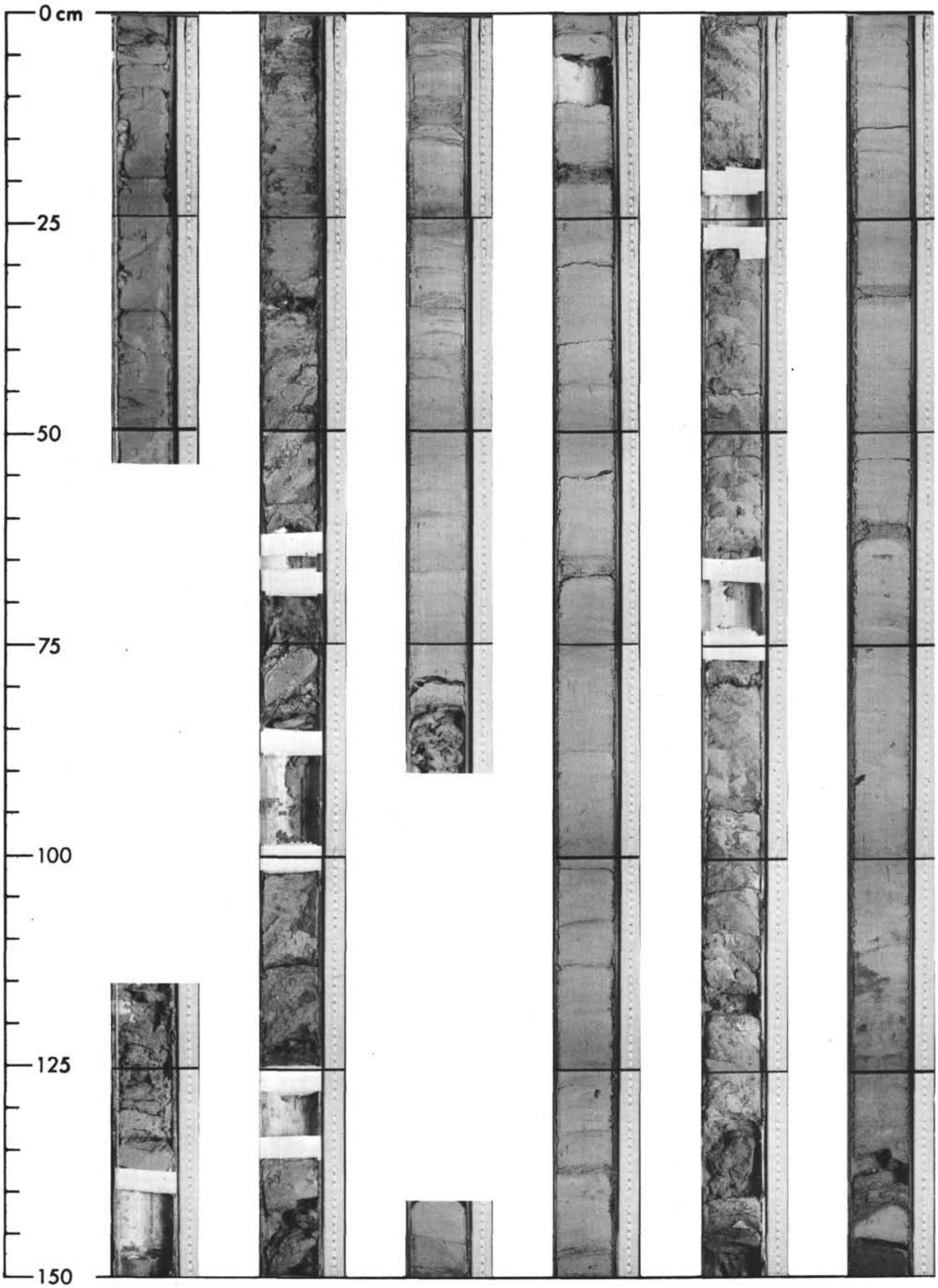
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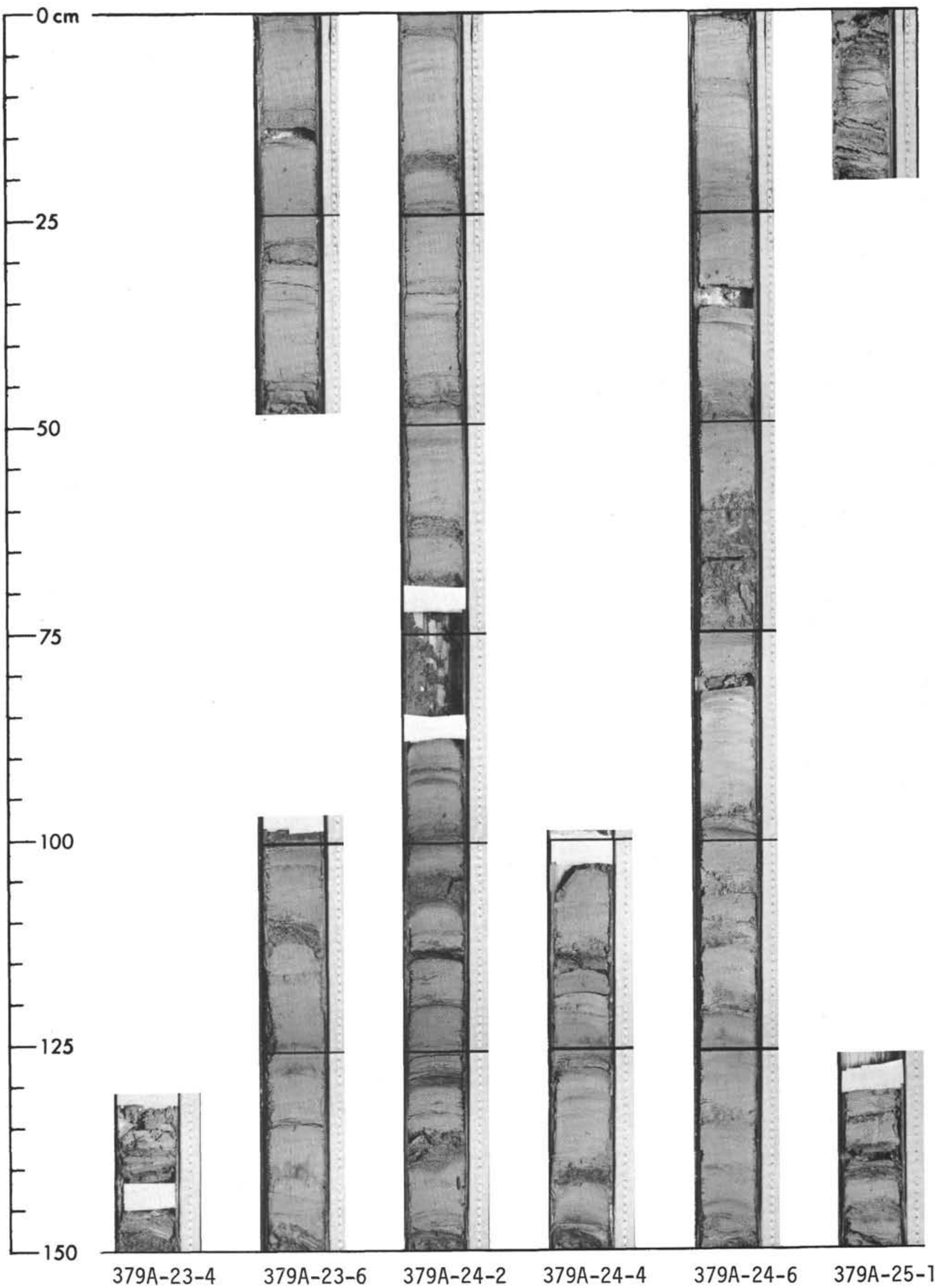
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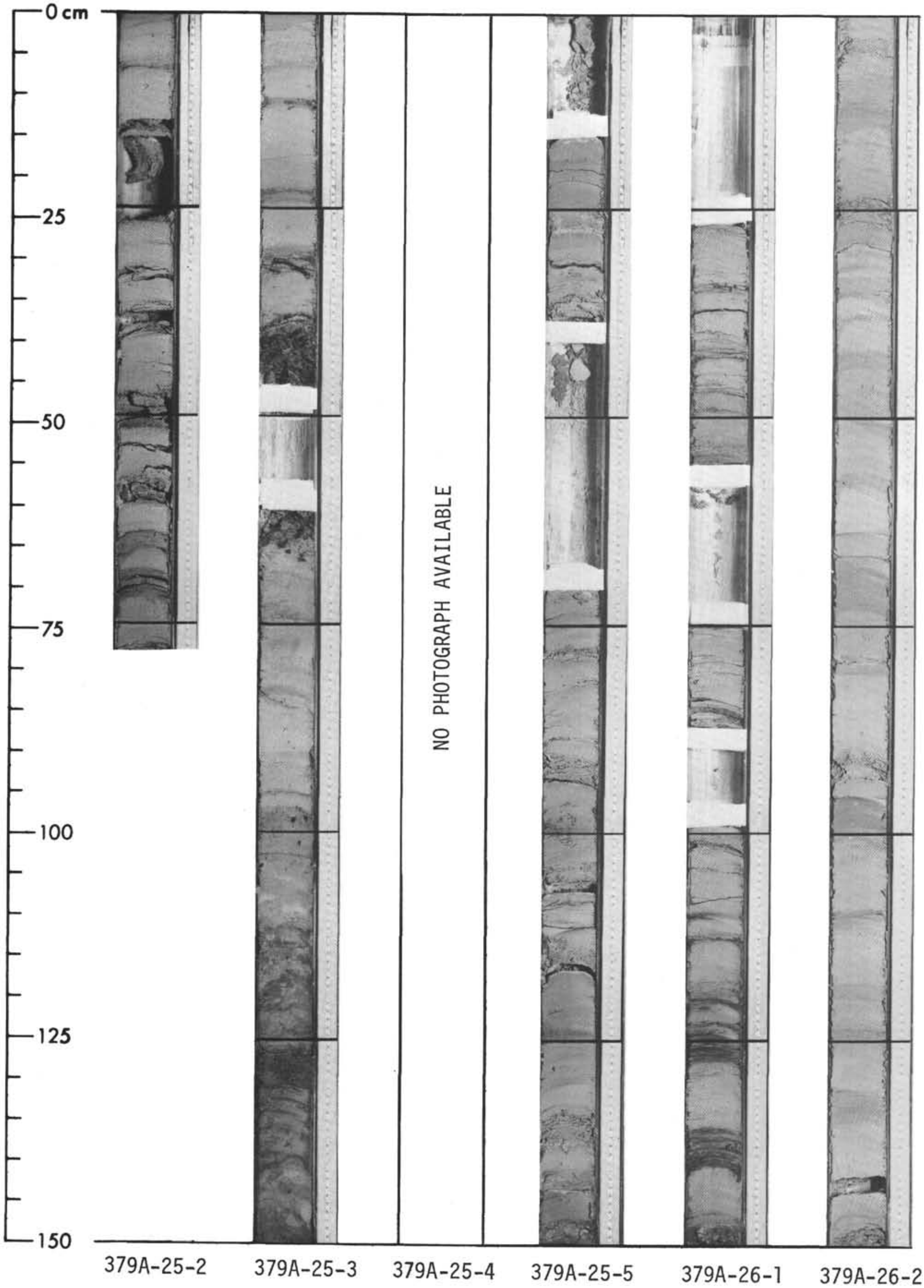
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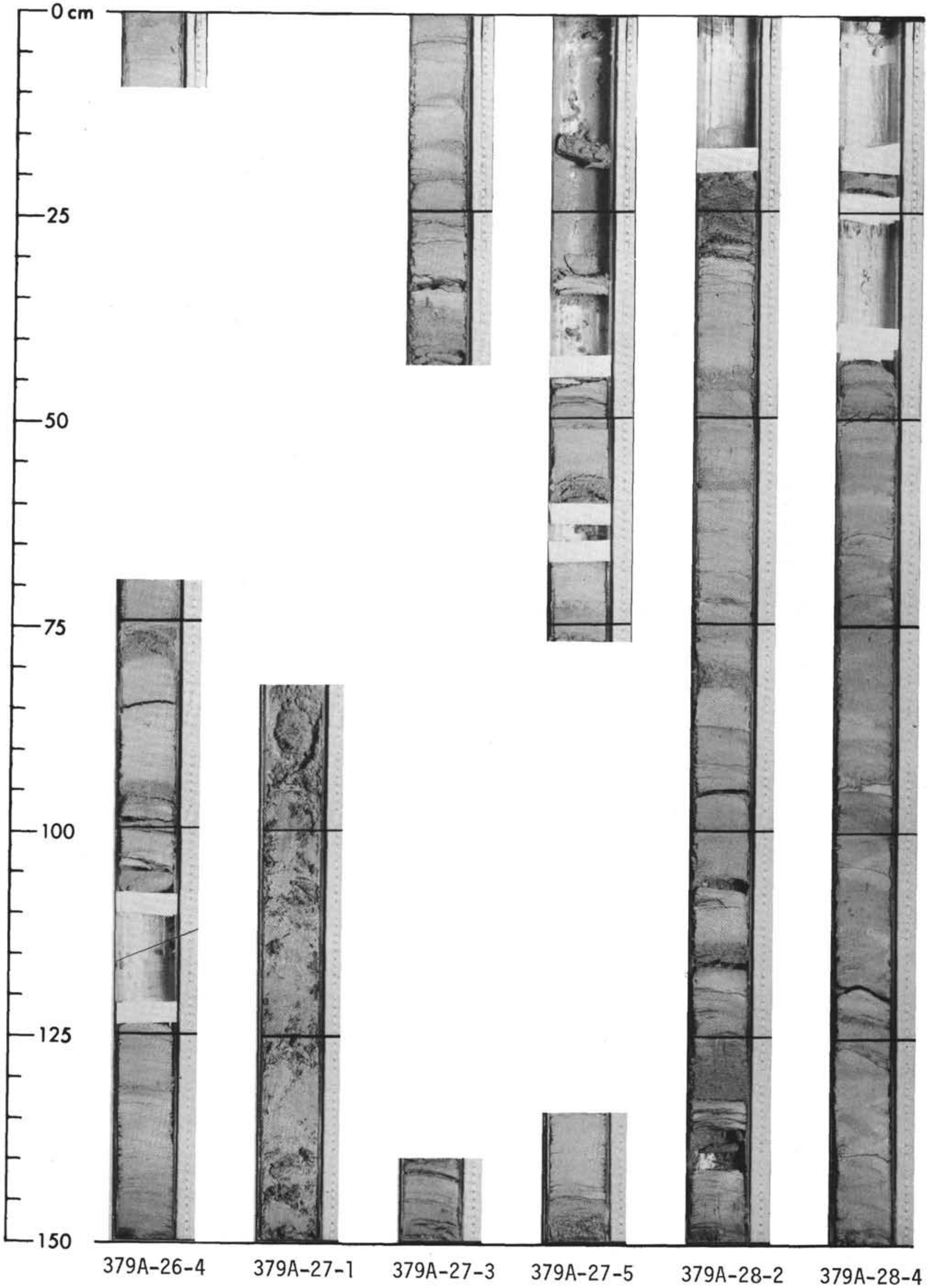
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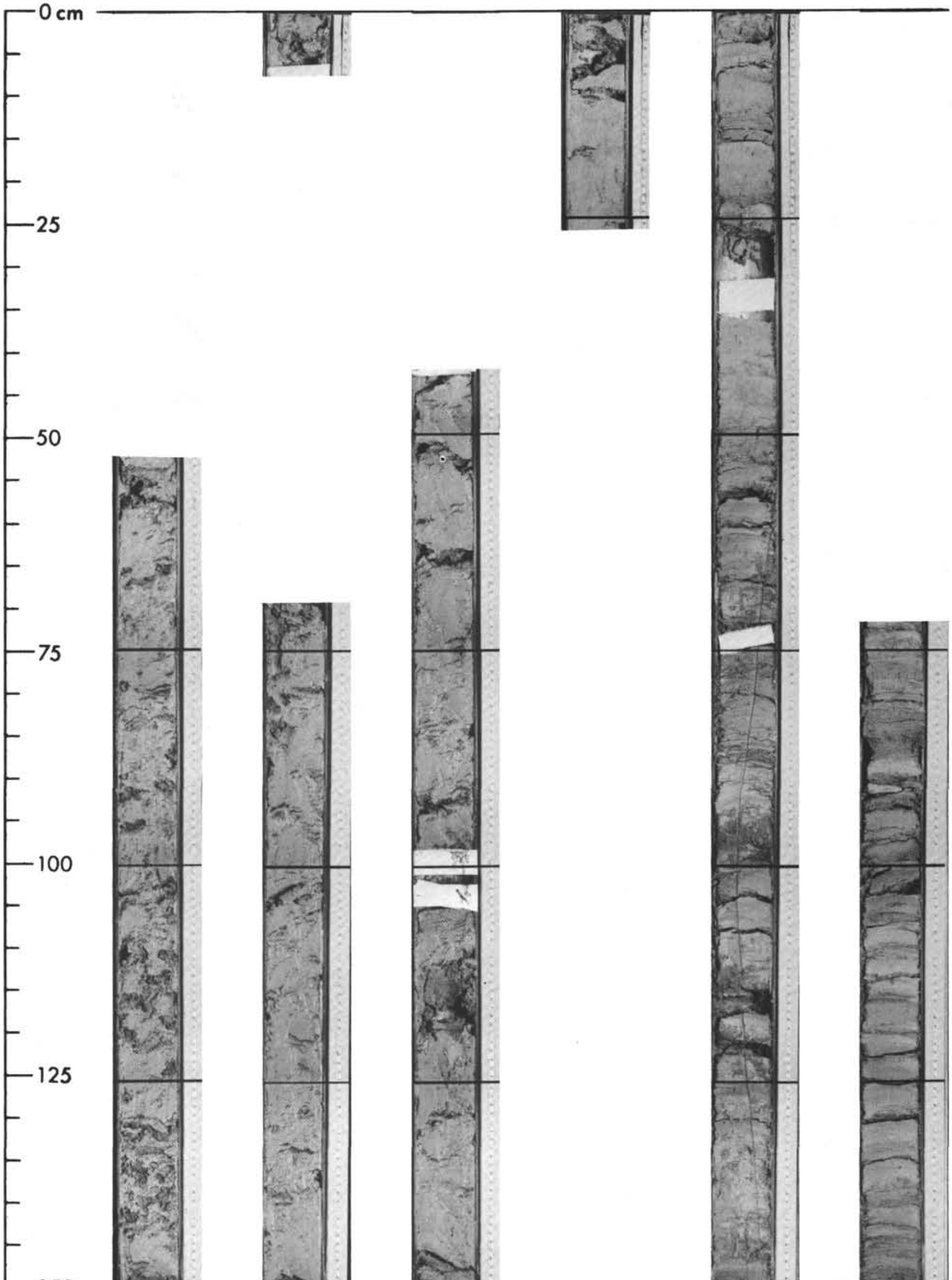

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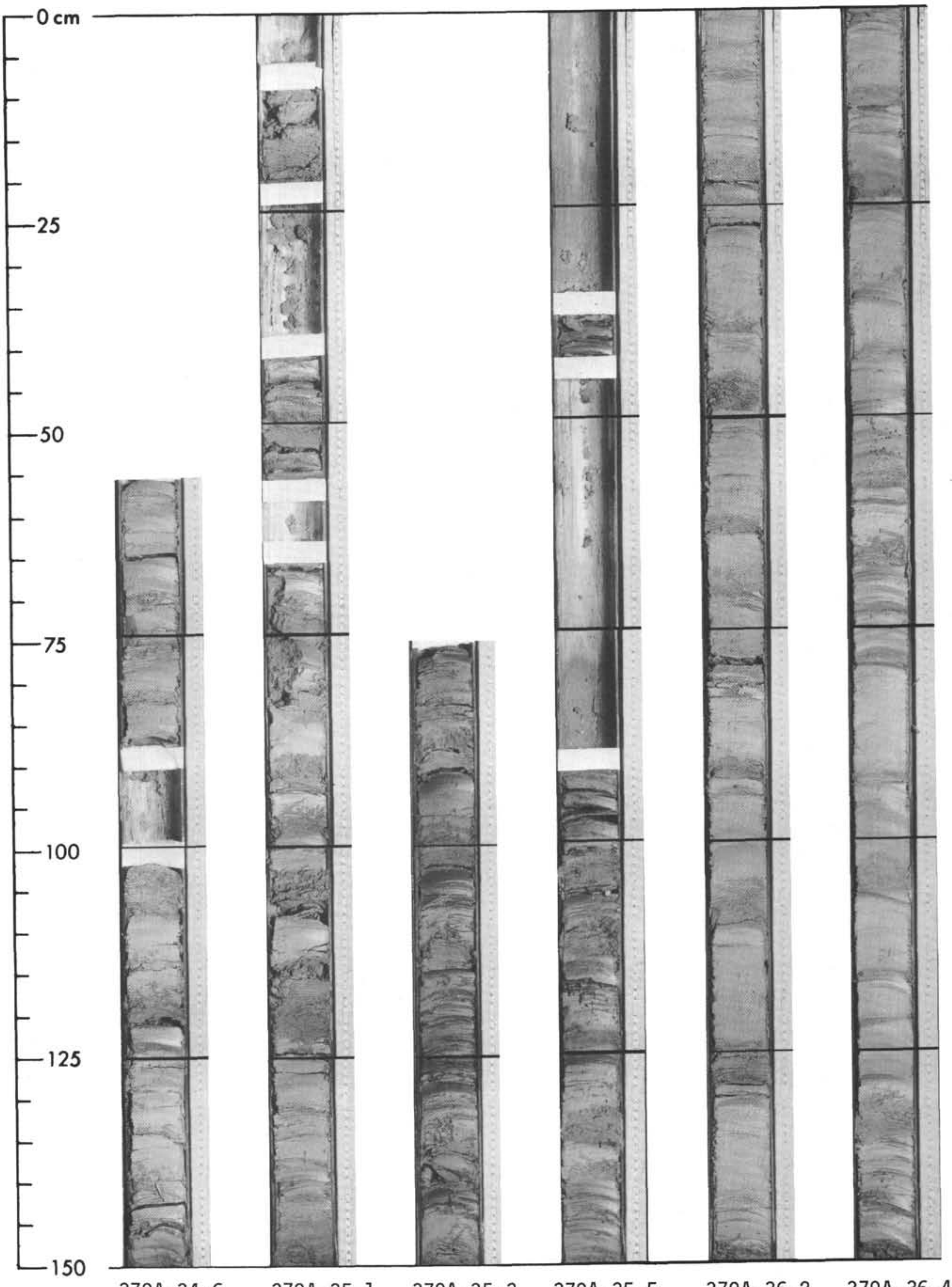
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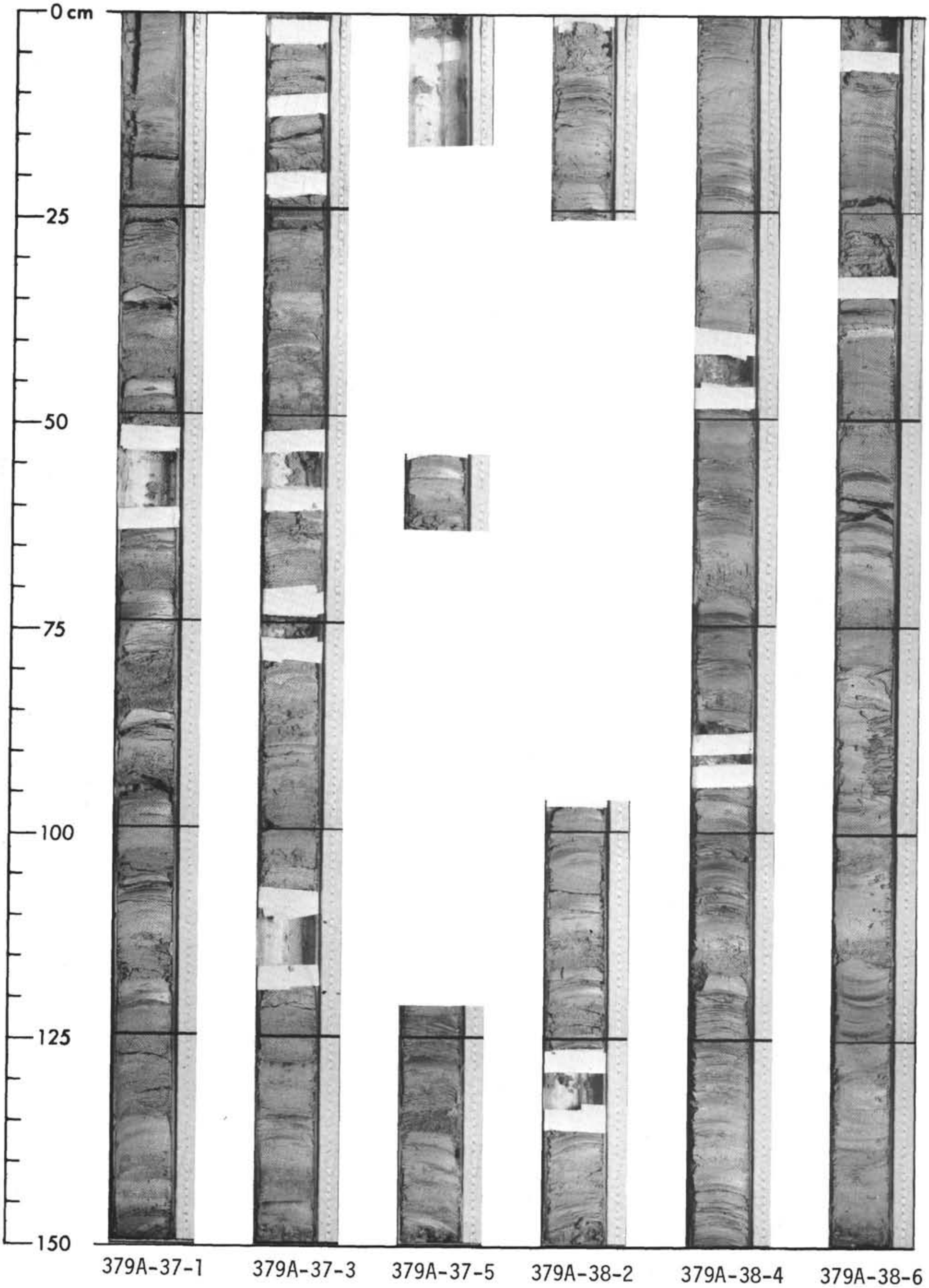
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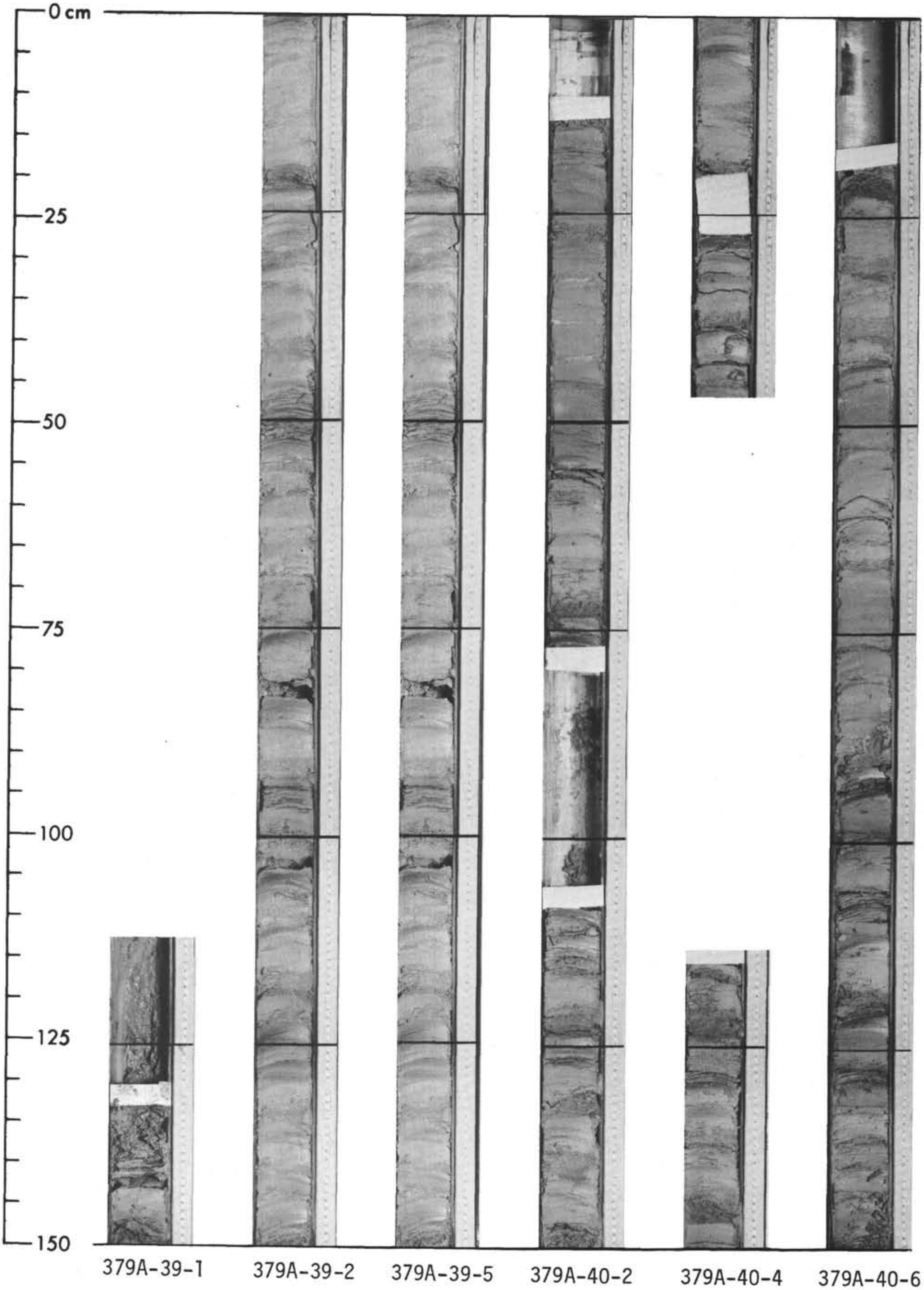
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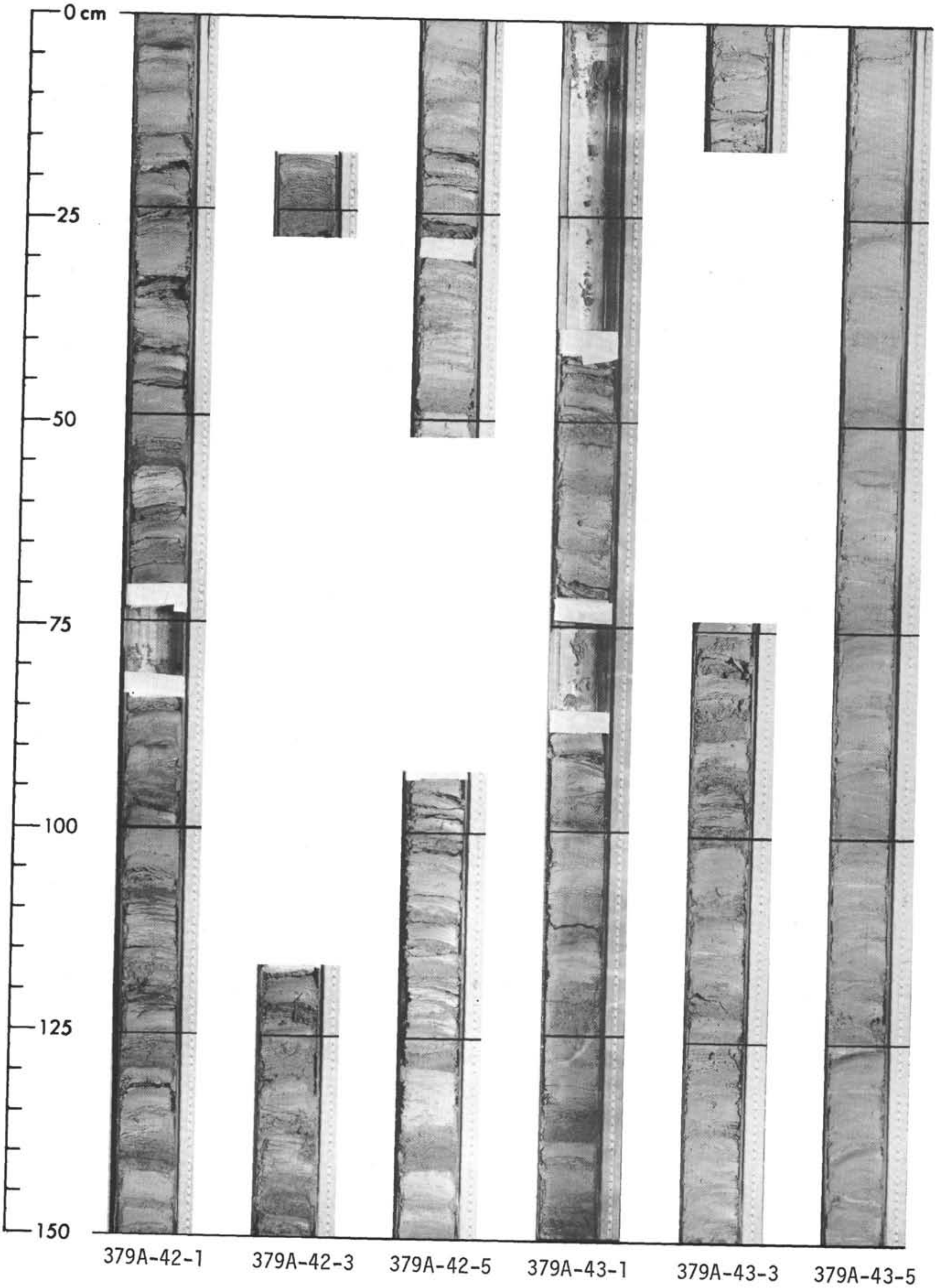
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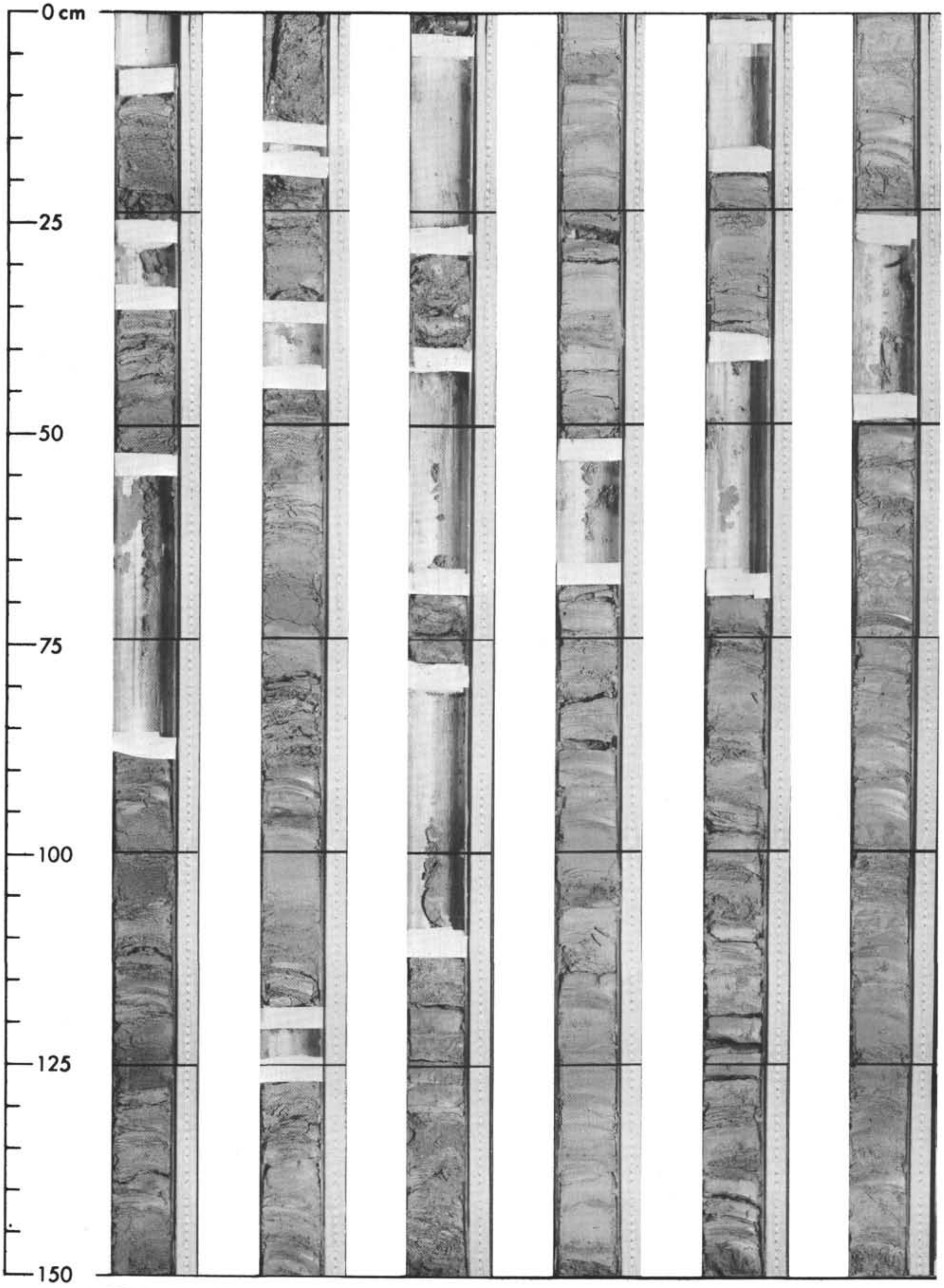
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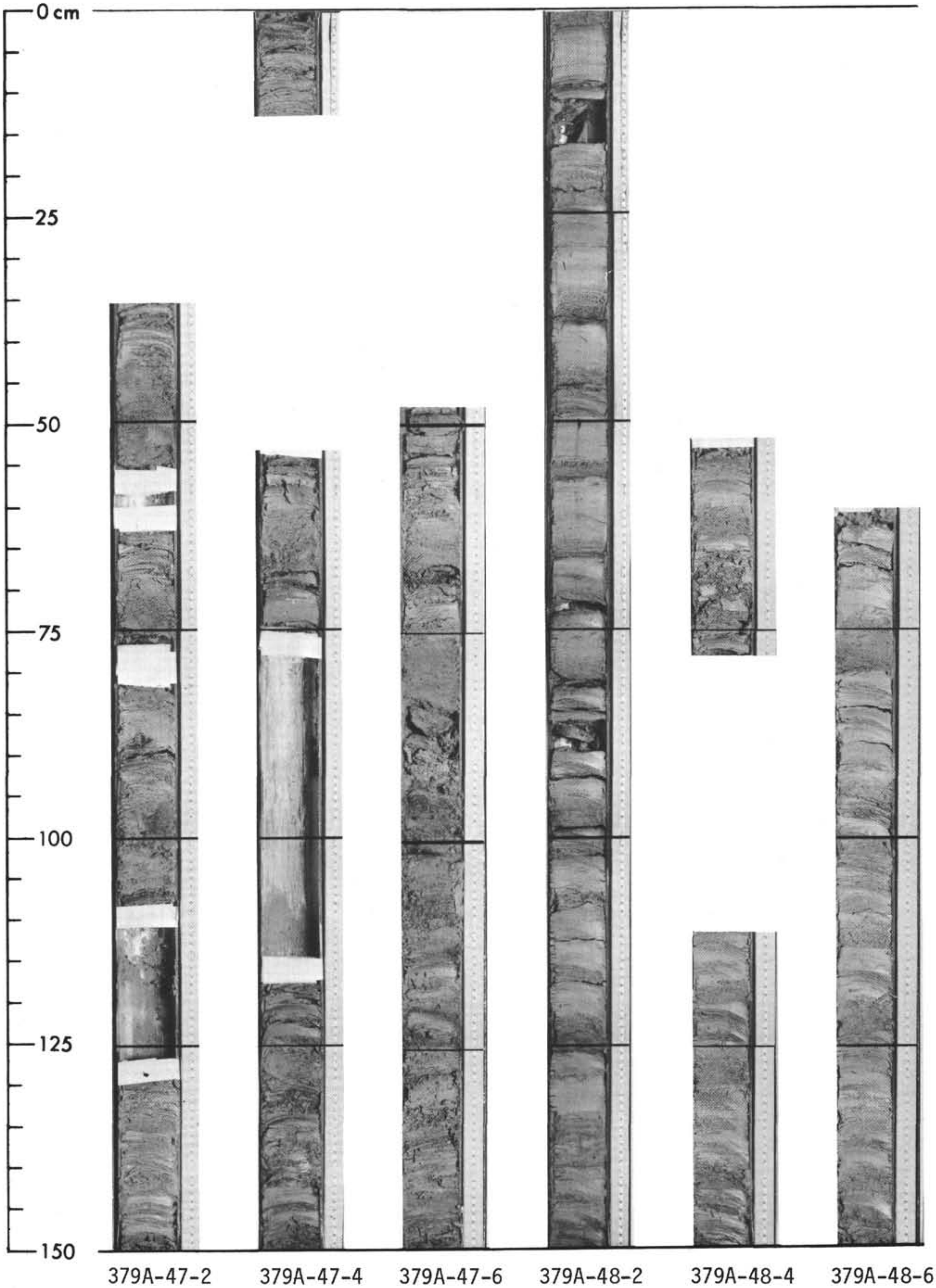
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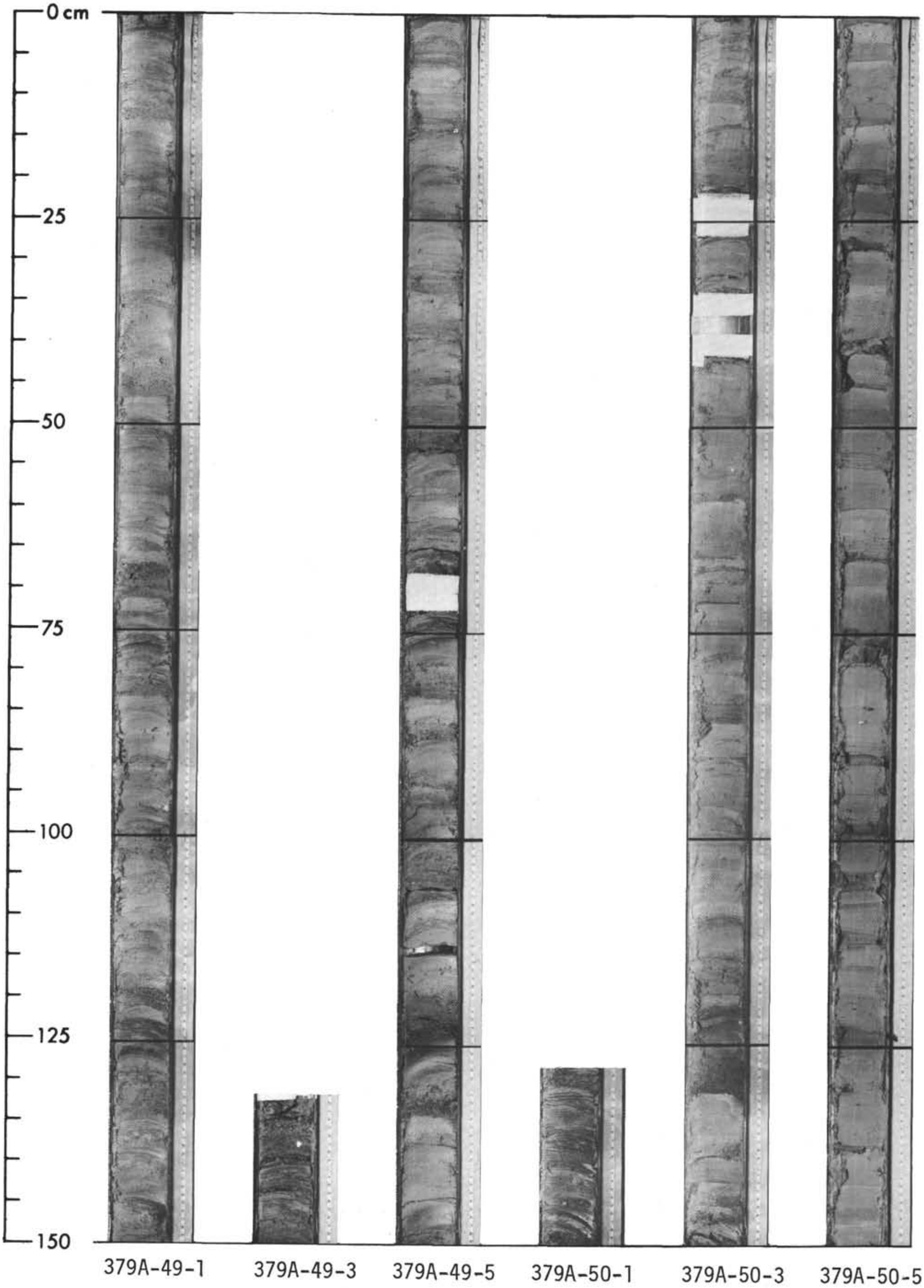
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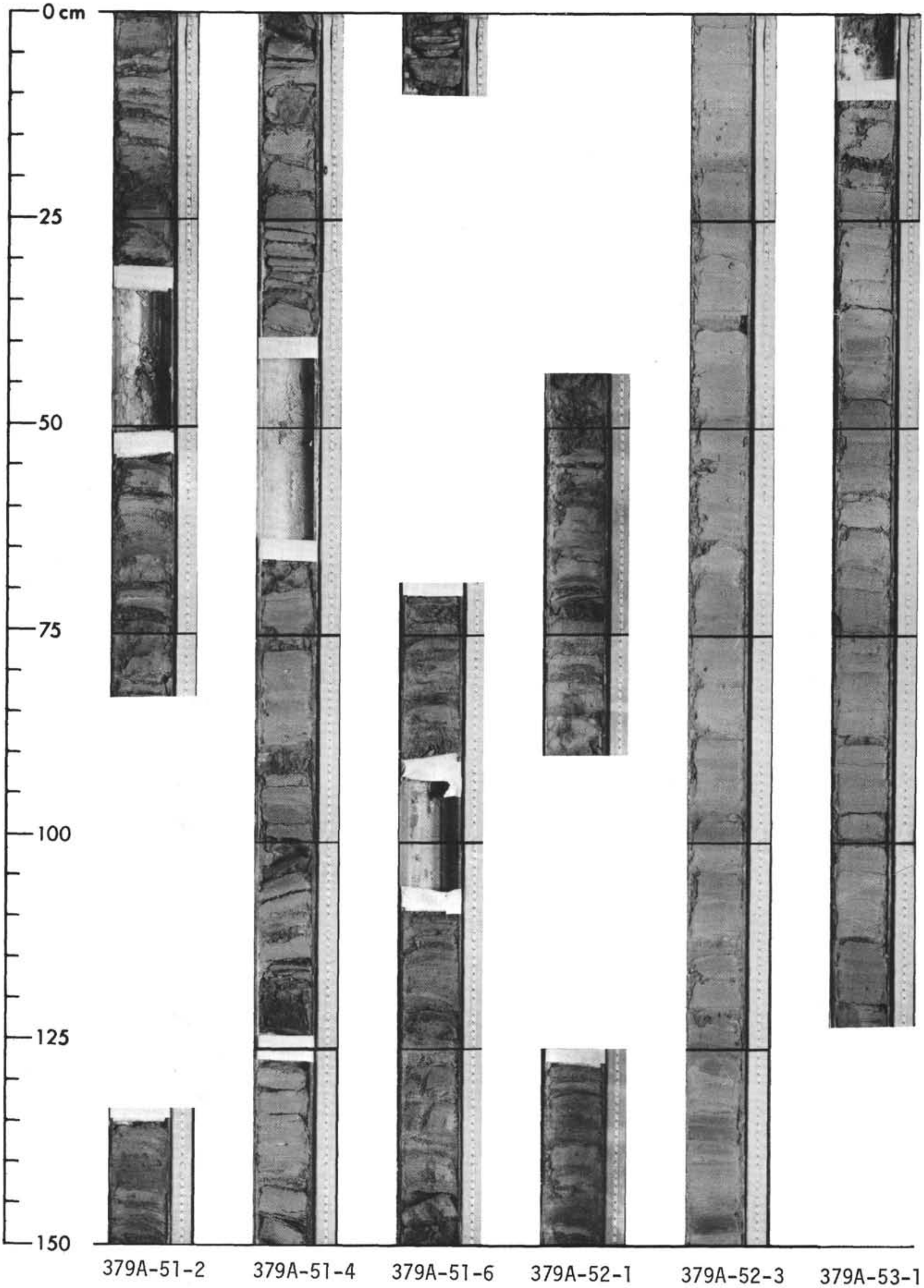
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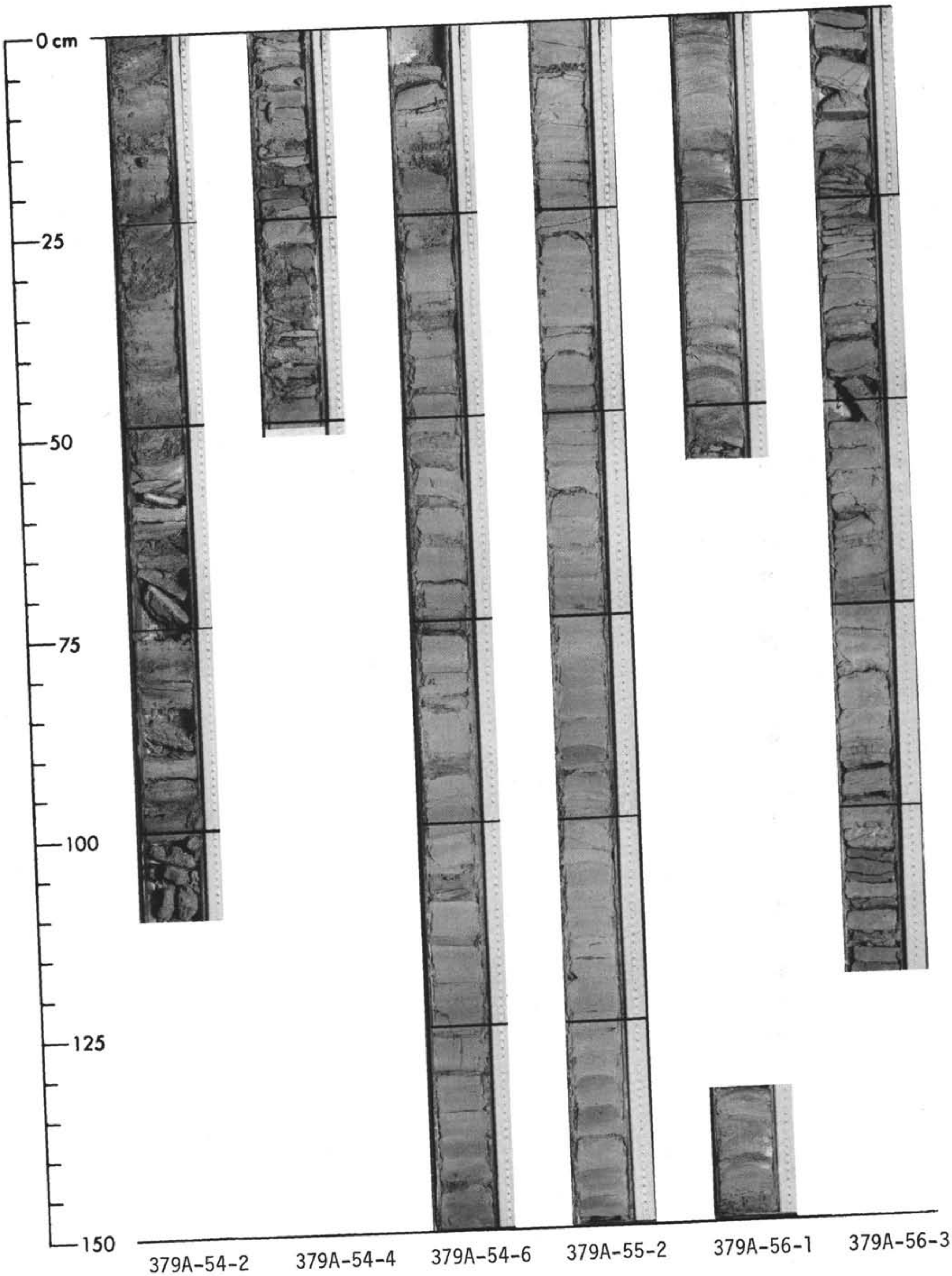
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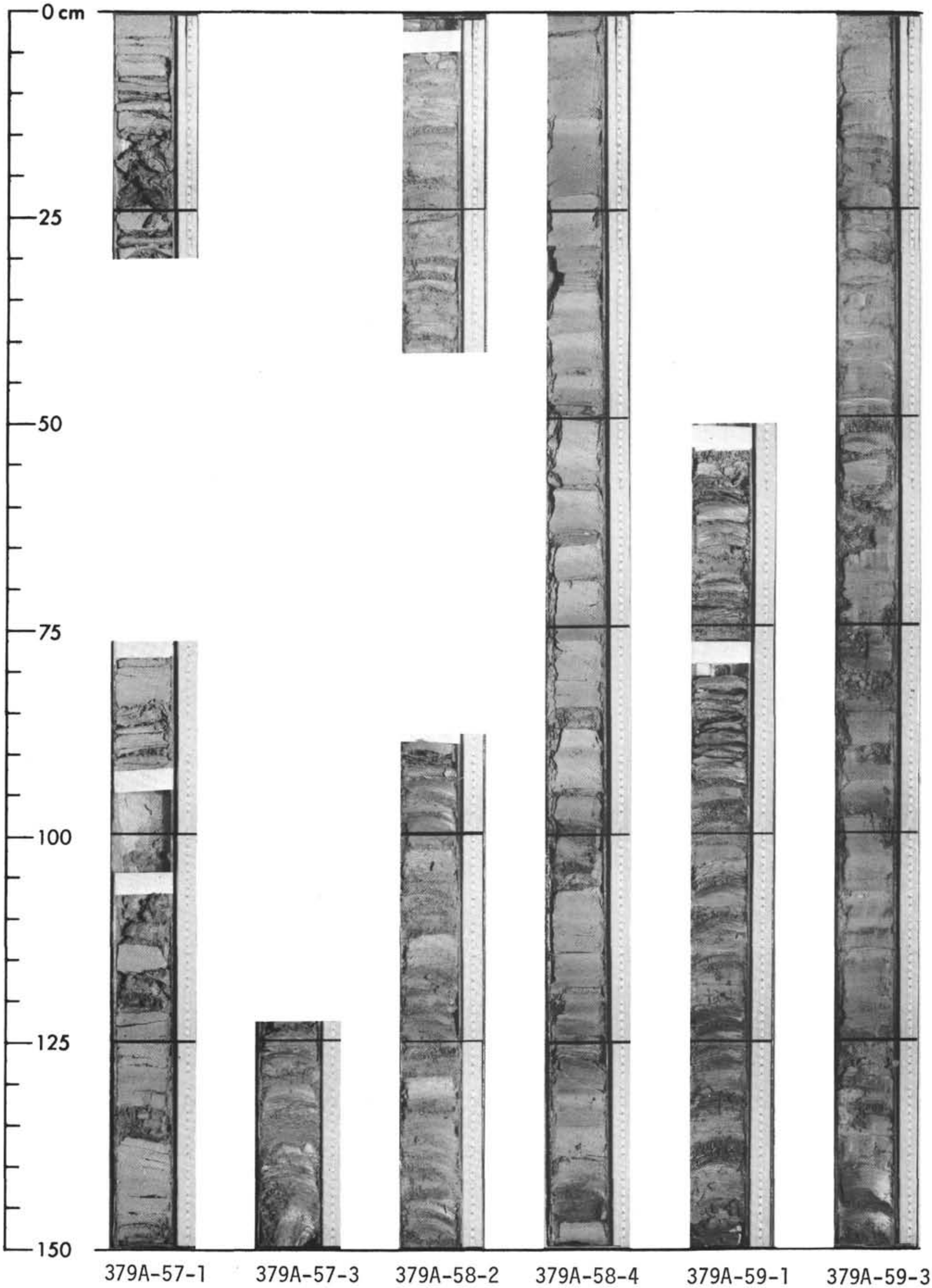
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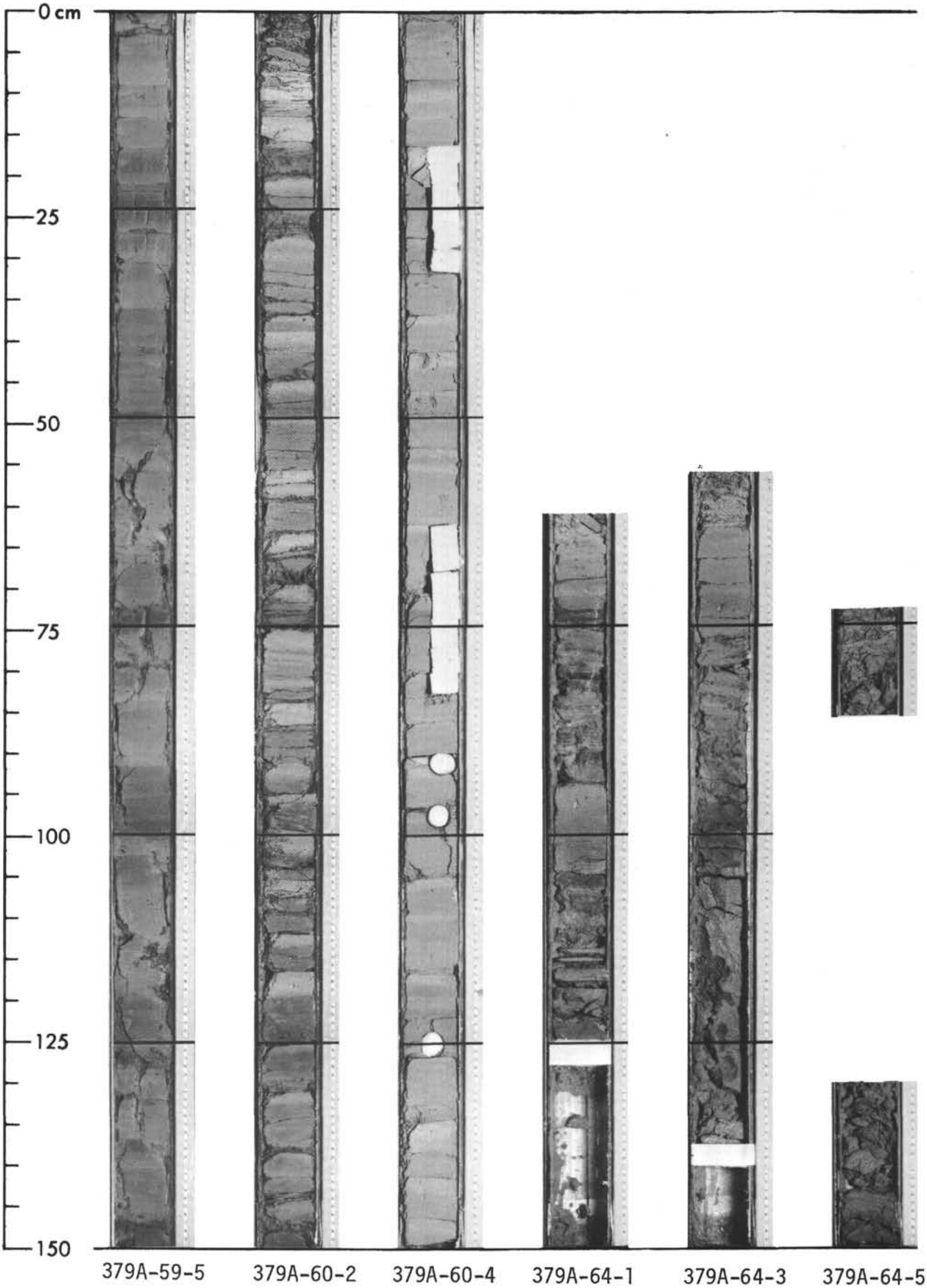
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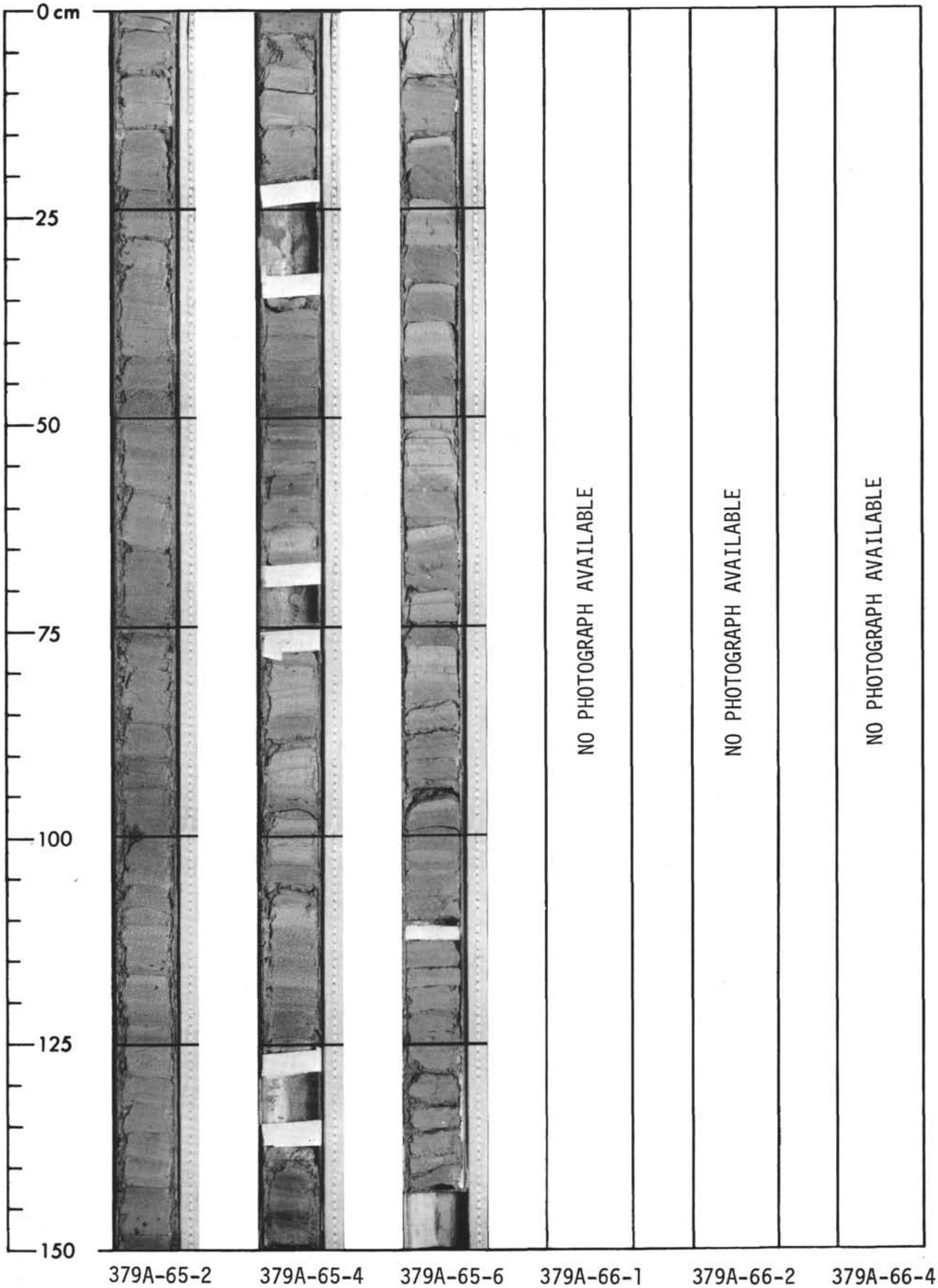
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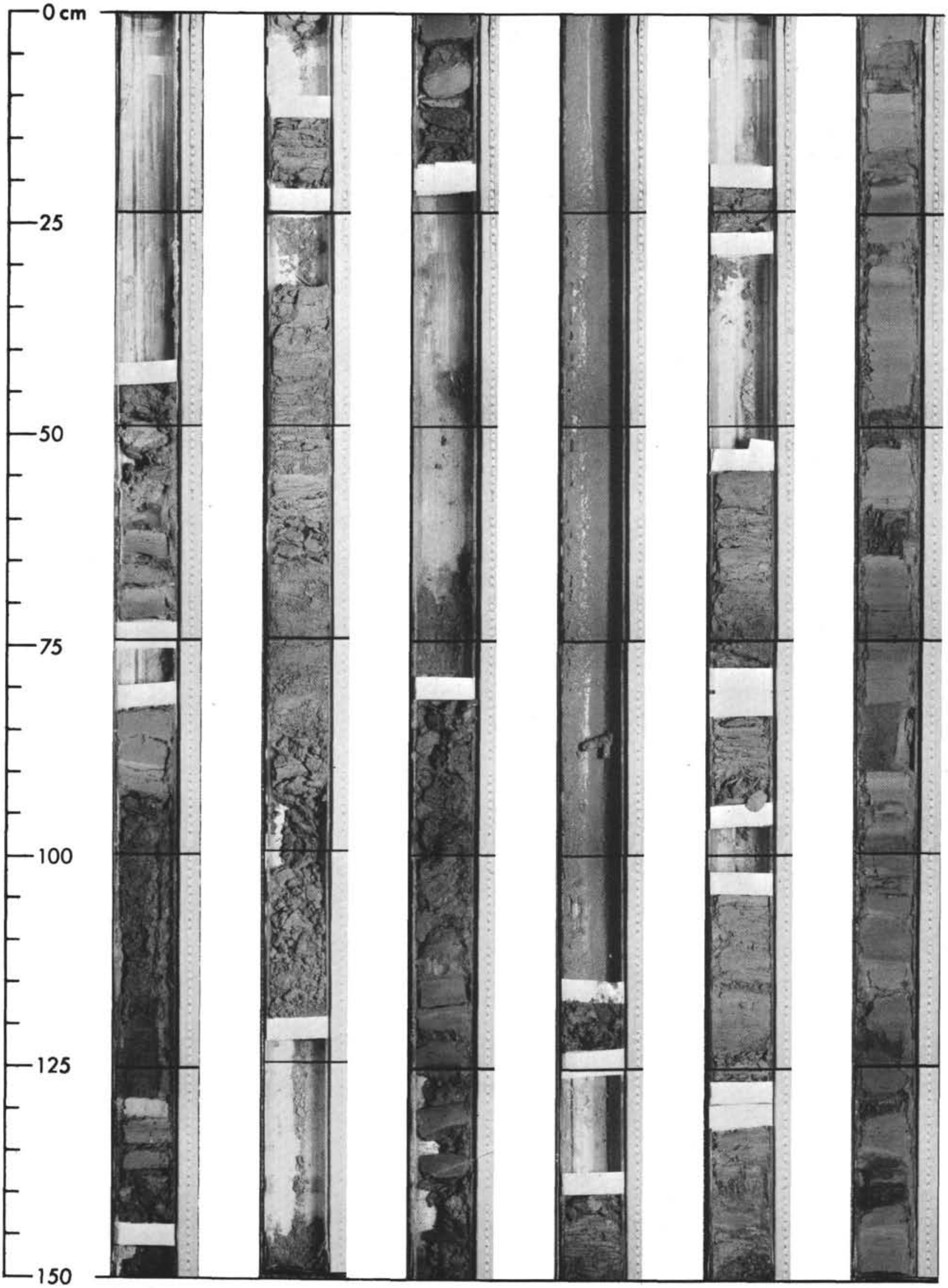

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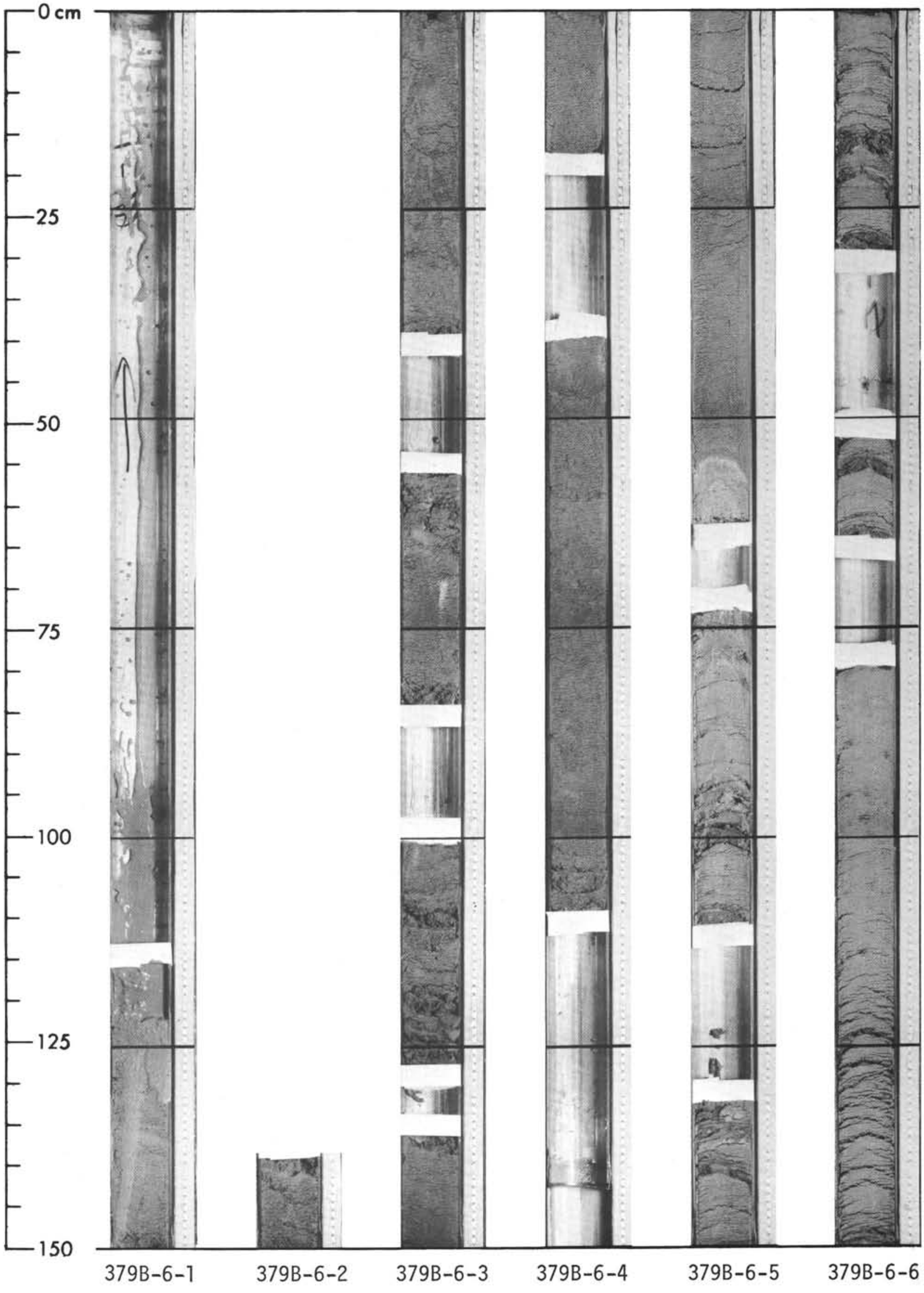
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