7. MEDITERRANEAN RIDGE, IONIAN SEA – SITE 125

The Shipboard Scientific Party[1]

Occupied: September 1-4, 1970

Position: In an area of gentle hummocky relief and uniform sediment thickness on the Mediterranean Ridge in the central Ionian Basin.
Latitude: 34° 37.49′N;
Longitude: 20° 25.76′E

Holes Drilled: Two holes (125 and 125A)

Water Depth: Both holes at 2782 meters.

Cores Taken: Eleven cores each.

Total Penetration: 97 and 121 meters respectively.

Deepest Unit Recovered: Albastrine secondary gypsum, gypsum-chip conglomerate, and dolomitic marls of an Upper Miocene (Messinian) evaporite series. A broken flapper-valve above the bit orifice required the termination of the first hole drilled. Further penetration in Hole 125A was halted when the bit plugged into sulfur bearing gypsiferous marls following an attempt to dry core for better recovery.

MAIN RESULTS

An excellent section of biogenic, pelagic sediments was obtained. It covered a time span of about 0.4 to 3.8 my BP. A major hiatus exists between the middle of the Lower Pliocene and the top of an evaporite series of Late Miocene (Messinian) age. Layers of dark sapropel indicate intermittent brief stagnations of the Ionian Basin from the Upper Pliocene to the Recent (confirmed by piston coring). Gypsum-chip conglomerates in the evaporites point to depositional cycles during an Upper Miocene salinity crisis involving both sub-aerial erosion and shallow-water, clastic accumulation at the Mediterranean Ridge drill site.

BACKGROUND

Numerous proposals were submitted to the Mediterranean Advisory Panel recommending the recovery of at least one continuously cored section from the Mediterranean. It was anticipated that a more or less complete succession of Quaternary and Pliocene strata from a province dominated by carbonate-rich pelagic deposition would provide extremely useful biostratigraphic, paleoclimatic, and paleo-oceanographic data. The lithostratigraphic record previously obtained from piston cores had revealed numerous oscillations between oxygenated and euxinic conditions in the deep-water mass of eastern basins (Kullenberg, 1952; Olausson, 1961). However, the piston core record extends back only a few hundred thousand years.

Objectives

It was considered of paramount interest to see if the periodic stagnations of the eastern Mediterranean were directly linked to glacioeustatic sea level changes, or whether they predate the classical Pleistocene glaciations. Perhaps a chronology of the entire Quaternary could be worked out by correlation of climatic variations in the Mediterranean regions with those already established in the equatorial Atlantic (Ruddiman, 1971) and Pacific (Hays *et al.*, 1969), which have been related to the new paleomagnetic time scale. Faunal variability in surface cores from the Mediterranean has been recognized, and several avenues of research indicate that specialized ecological adaptations, particularly of the foraminifera (Parker, 1958; Olausson, 1965), can be used, along with variations in mineralogy (Chamley 1967, 1969; Emelyanov, 1968) and trace elements (Sevastyanov, 1966), to determine sedimentary cycles. The chronology of sedimentary cycles and their relationship to regional climatic changes have awaited the recovery of a long and continuous record of pelagic deposition.

Strategy

The location of Site 125 required finding a sedimentary province where interruptions in the continuous rain of biogenous sediments would have been minimal. The sediment sections already penetrated at Sites 121, 122, 123 and 124 in the western Mediterranean basins had contained several significant hiatuses and had intercalations at numerous levels of resedimented materials (i.e., terrigenous material and displaced faunas in turbidites and other reworked deposits).

It was desirable to choose a site where there appeared to be a reasonable chance of penetrating the M-Reflectors so as to be able to sample deeper levels in the evaporite formation, and particularly the pre-evaporite strata. Since drilling in the basins had encountered indurated rocks, it was reasoned that the best opportunity for piercing the evaporite formation might be realized by drilling in shallower regions where a different and less lithified evaporite facies might be encountered (e.g., carbonates instead of sulfates). If a direct frontal approach failed again, an alternate target should be sufficiently close at hand to allow the drill string to spud it as a sub-crop of the pre-evaporite layers and continue the section as best possible.

As a consequence of the above considerations, a location for Site 125 was selected along a *Robert D. Conrad* 9

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[1] W. B. F. Ryan, Lamont-Doherty Geological Observatory; K. J. Hsü, Eidg. Technische Hochschule; M. B. Cita, Universita degli Studi di Milano; Paulian Dumitrica, Geological Institute, Bucharest; Jennifer Lort, University of Cambridge; Wolf Maync, Geological Consulting Service, Berne, Switzerland; W. D. Nesteroff, Université de Paris; Guy Pautot, Centre Océanologique de Bretagne; Herbert Stradner, Geologische Bundesanstalt, Vienna; F. C. Wezel, Universita di Catania.

reflection profile near the crest of the Mediterranean Ridge in the central Ionian Basin (Figure 1). The ridge is well above the levels of the Messina and Sirte abyssal plains; this has effectively isolated it from terrigenous deposition. Piston core RC9-185 (Figure 2) consists of only pelagic and aeolian sedimentary components and is highly fossiliferous (Ryan, 1971).

Although the ridge has hummocky relief (of as yet an unknown, and much disputed origin; Hersey, 1965; Emery *et al.*, 1965, Giermann, 1966, 1968; Ryan *et al.*, 1971; and Wong *et al.*, 1971), a small section was found along the reflection profile with subdued local relief (Figure 3). Furthermore, at this vicinity the thickness of transparent sediment above the ubiquitous M-Horizon is markedly uniform, suggesting that hiatuses due to slumping or winnowing are unlikely, or if present, that they are of regional importance. Finally, if the M-Reflectors were again to halt drilling, a small cleft just to the northeast of the ridge crest seemed to be a choice target for relocating the vessel in order to bypass the upper hundred meters of the M-Reflectors.

Since the site did not require pinpoint positioning (anywhere in the smooth area was satisfactory), and in order to save time, the *Glomar Challenger* was directed to intersect the *Conrad* profile in the smooth zone, where the likelihood of slumping would be minimal.

Challenger Site Approach

The *Glomar Challenger* entered the Ionian Sea through the Straits of Sicily, the shortest route from Site 124, and steering a course of 104° proceeded directly towards the Mediterranean Ridge (Figure 4). A satellite fix at 1920 hours, September 1, 1970, placed the vessel along a track that would take her to the north of the *Robert D. Conrad* intercept (at 0423 hours, July 21, 1965). At 1959 hours the *Challenger* altered course to 137°, and at 2012 hours the bathymetric profile on the ship's fathometer (Figure 5) indicated that the zone of gentle relief had indeed been reached. A free-floating surface buoy was launched to mark that spot, and the vessel was slowed to 4 knots in order to retrieve the towed geophysical gear. The course was maintained during the reception of the 2028 hours satellite message, which, when computed, showed that we had not quite reached the target (Figure 6). At 2040 hours the *Challenger* commenced to reverse course to the right to 315°. By this time the speed had dropped to 2.5 knots. The command to heave to came at 2053 hours after passing a very gentle depression on the echo-gram. The acoustic positioning beacon was dropped in 2772 meters corrected water depth at 2102 hours, with the *Challenger* in an excellent position, judging from the on board echo-sounding profile. An average of fifteen satellite fixes taken while drilling gave the site position as 34° 37.49'N and 20° 25.76'E; less than 500 meters from the planned target.

OPERATIONS

The *Challenger* stayed on location for 2½ days, between 2100 hours, September 1st, and 0430 hours, September 4th. Two holes were drilled, and both were terminated because of mechanical failures. Eleven cores were attempted from each hole; the core inventory is included in Tables 1 and 2.

Hole 125 was slated as a stratigraphic test and continuous coring was undertaken. In the hope of achieving full recovery, we refrained from using the tooth bit, which so far had proven unsuitable for obtaining undisturbed sediments. Instead, a Varel diamond bit was used. The initial coring operations proceeded rapidly and the recovery was generally satisfactory. The drilling-rate curve for Hole 125 is shown in Figure 7. We first noticed poor recovery when Core 5 arrived on deck at 0930 hours September 2nd. Various causes were suggested and different remedies were

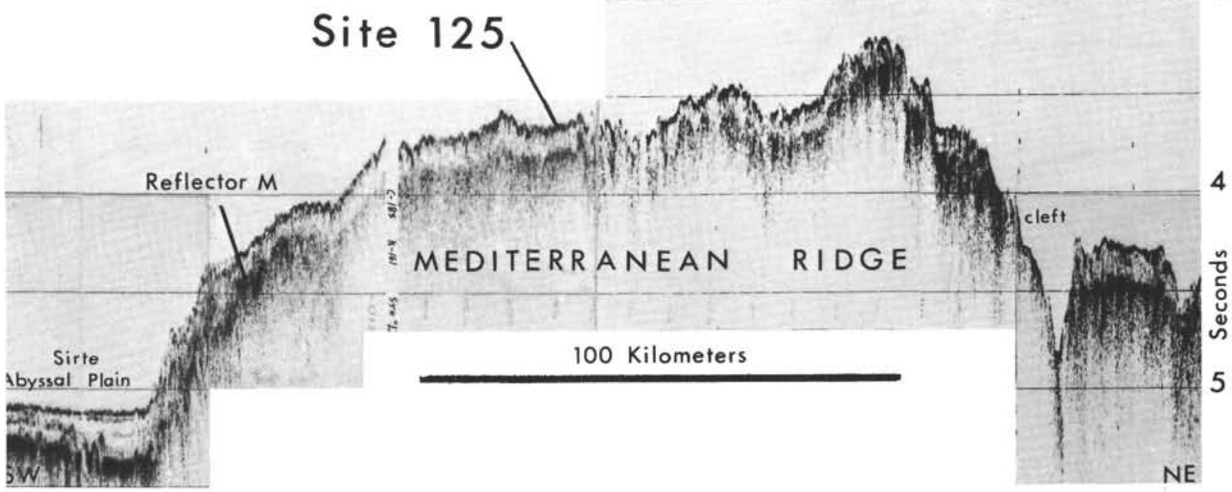

Figure 1. *A continuous reflection profile (airgun sound source) across the Mediterranean Ridge in the Ionian Basin of the eastern Mediterranean. This record, made by the R/V* Robert D. Conrad *of the Lamont-Doherty Geological Observatory of Columbia University in 1965, illustrates the blanketing effect of the transparent sediment layer above Reflector M across the ridge. Shown are the location of Site 125 and a narrow cleft to the Northeast which cuts through the M-Reflector down into older strata. Vertical scale is in seconds two-way travel time; vertical exaggeration is approximately 50:1.*

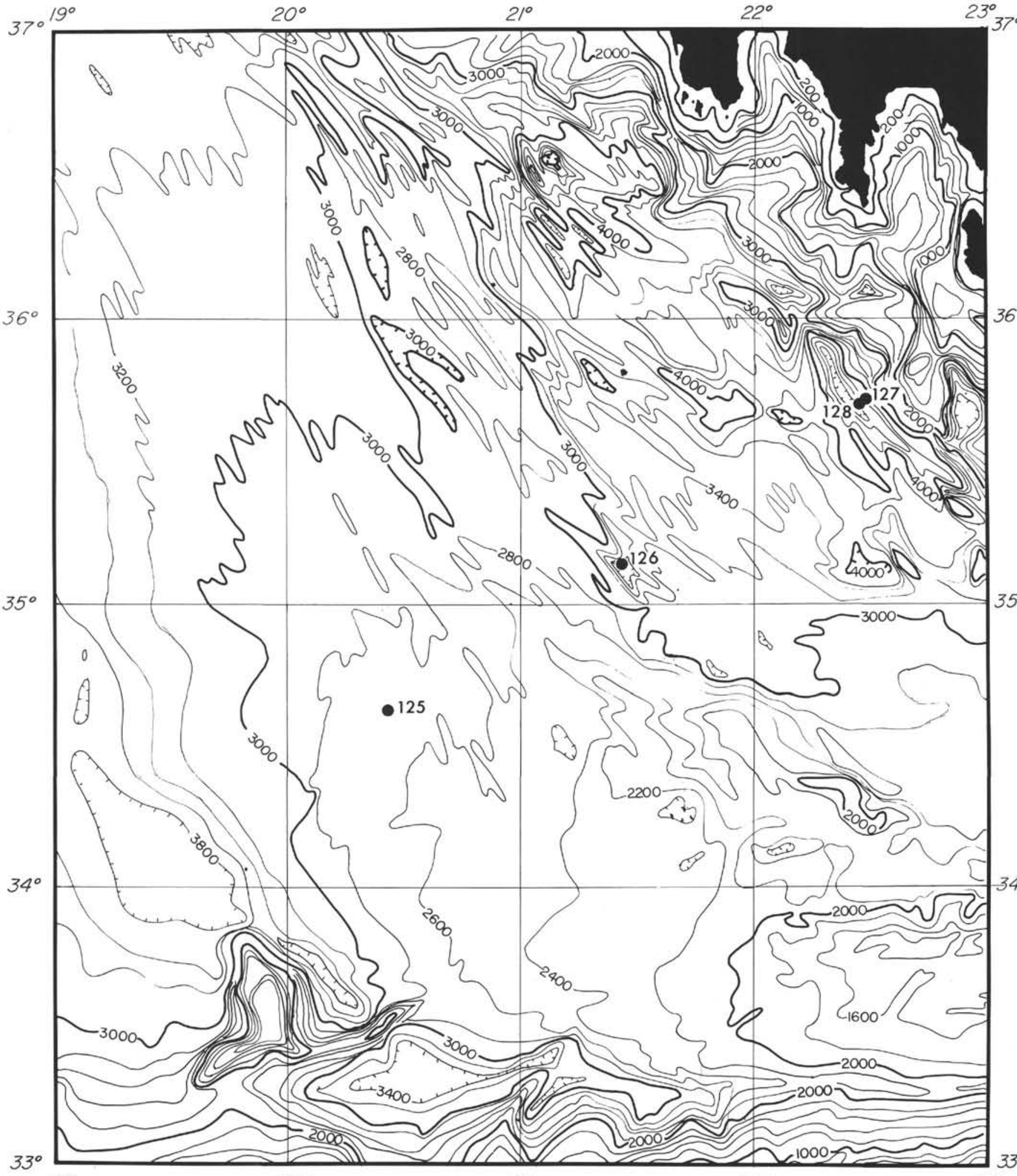

Figure 2. *Environs of Site 125 on the Mediterranean Ridge. Contours in meters, adapted from Chart 310 Defense Mapping Agency Hydrographic Center.*

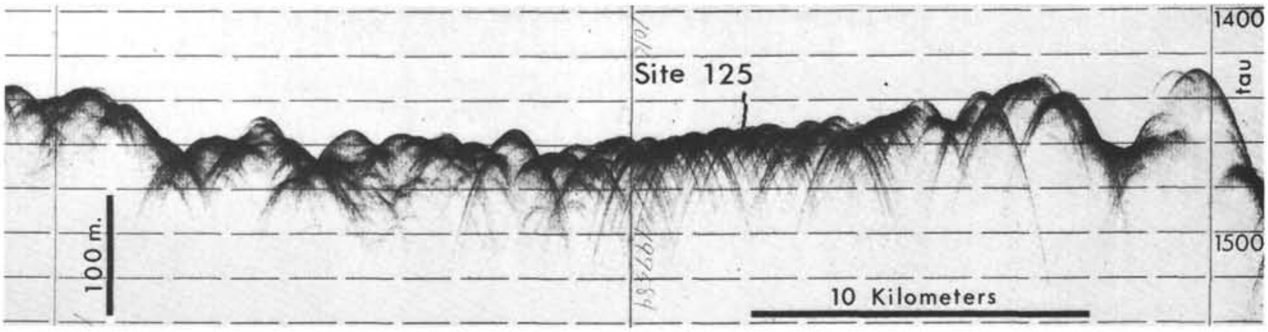

Figure 3. *Precision echogram along the* Robert D. Conrad *track showing the precise location of the Site 125 drilling target in an area of subdued local hummocky relief (characteristic of the Mediterranean Ridge province). Depths are shown in units of travel time, where 400 tau equals one second.*

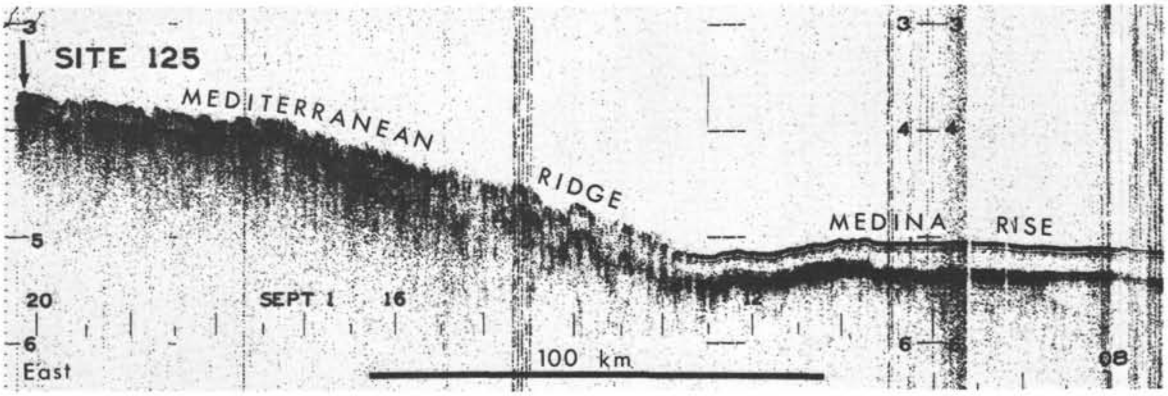

Figure 4. *Continuous reflection profile along the* Challenger *track from the Malta Escarpment south of Sicily to the site near the crest of the Mediterranean Ridge. Note the smoothness of Reflector M across the Medina Rise and its broken-up nature beneath both the ridge and the Messina Cone. The progressive thickening of the superficial transparent layer towards the escarpment is attributed to selective deposition from geostrophic boundary currents (Heezen* et al., *1966; and Ryan* et al., *1967). Vertical exaggeration is approximately 30:1.*

taken and core recovery was increasingly worse, it became attempted. Some 7 hours later, after five more cores were apparent that the culprit was a broken flapper-valve above the drill bit orifice which was plugging the entrance into the mouth of the core barrel, thus preventing the inner barrel from properly seating. At 1900 hours, when Section 4 of Core 5 was cut open, a small piece of Happer-Spring from the broken valve was found embedded in sediments, confirming the suspicion of valve failure. We had no alternative but to pull out of the hole, to haul the empty barrel of Core 11 on deck, and remove the defective valve.

A major drilling break was noticed at 82 meters below bottom while cutting Core 10. At this horizon, the torque suddenly changed from very steady to erratic and stayed that way for about ten meters. By the time the hole was terminated, at 97 meters, the level of torque had more than doubled and the penetration rate had dropped dramatically to less than ten meters per hours. Unfortunately, both cores were empty except for smear samples from the core catcher, which are highly susceptible to downhole contamination.

Since the Quaternary section, represented by the first four cores in Hole 125, had nearly full recovery, a second "offset" hole (125A) was planned about 100 meters to the west where the Pliocene and older sections could be re-cored and deeper penetration achieved. In the hope of penetrating more rapidly the harder interval below 80 meters, we decided to change the core bit for Hole 125A to a Smith Type 9-C button bit. This choice, however, proved unwise because it led to highly unsatisfactory core recovery.

It was inferred that Horizon M was encountered in Hole 125A at 77 meters on the basis of a drilling break identical to that recorded at 82 meters in Hole 125. The horizon was clearly recognizable in Core 6 by an abrupt change from soft nanno oozes to partly-lithified dolostone in the bottom of Section 1. As was also the case for Hole 125, the next core was cut very rapidly–some 9 meters in less than 5 minutes. Because the recovery was poor, the pump pressure was reduced when Core 8 was cut. Still the recovery was not much better. A very hard layer was encountered at 102 meters, when Core 9 was cut, which included the same dolomitic material barren of fossils. Nothing was recovered in the next two cores. When circulation was momentarily stopped with the aim of gaining better recovery, the drill string became stuck. Although the string was eventually worked free, the core barrel was firmly jammed within the drill collar. All attempts to retrieve the core barrel proved futile and the wire on which the retrieval mechanism was sent down, parted.

At 0400 hours, September 4th, the core barrel and the drill bit reached the deck. Aside from soft dolomitic sediments rich in sulfur, fragments of gypsum rock and detrital gypsum conglomerate were found. This mixture of sticky "mud" and brittle chips was apparently effective in preventing further penetration by the drill.

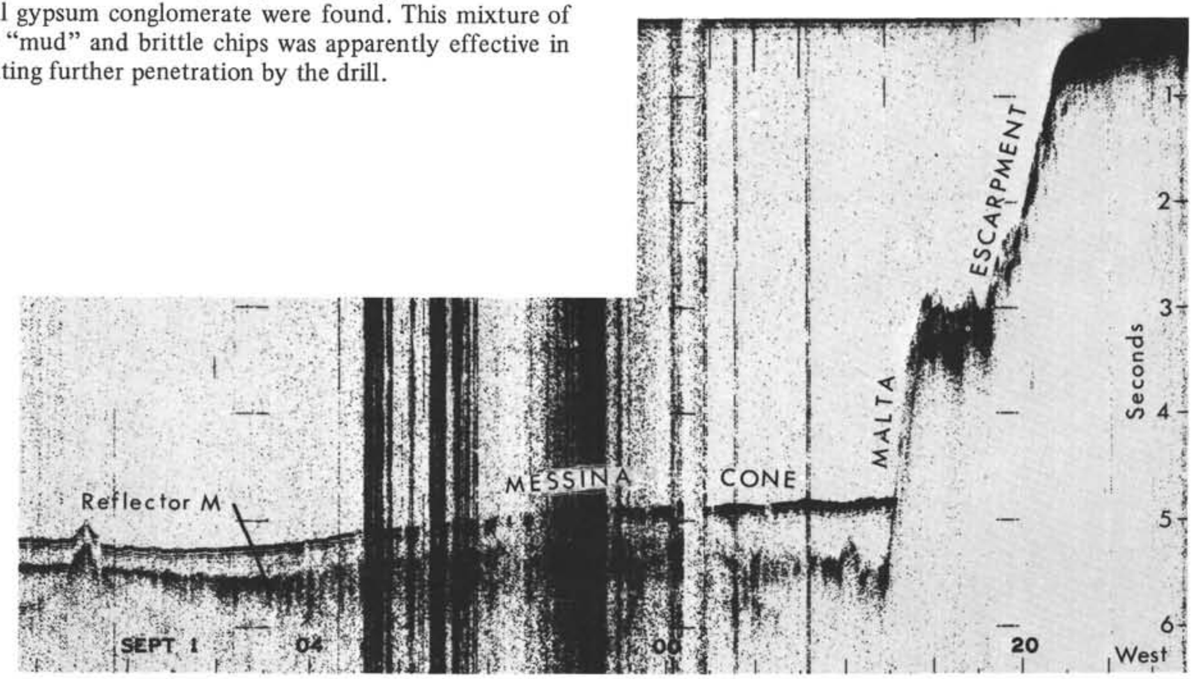

Figure 4. *(Continued)*

BIOSTRATIGRAPHY

The principal goals at this location in the Ionian Sea, were to reconstruct the history of the basin in post-Horizon M time and to core the horizon itself. Calcareous microfossils and nannofossils are very abundant and well preserved in the Pliocene and Quaternary sections of both holes, whereas they are scanty or absent in the dolomitic (evaporite) sequence below approximately 82 and 77 meters in Holes 125 and 125A respectively. Benthonic foraminifera are sparse in most of the samples investigated.

Siliceous microfossils are apparently absent in most of the section penetrated, including the sapropelitic layers. Siliceous microfossils are not discussed in detail for this site. However, a sample recovered from the drill bit at Hole 125A yielded an assemblage of diatoms which shows a certain affinity with the assemblage found in the Balearic Basin at Site 124. The core catcher sample of 125A, which belongs to the topmost part of the evaporitic sequence, yielded spores of terrestrial plants.

Pteropods are common to abundant in Core 1, Hole 125, to which they appear to be limited.[2]

Other fossil remains include otoliths, ostracods, echinoid spines, organic matter, fish teeth, and so forth; they are plotted on a range chart showing the distribution of planktonic foraminifera for the Quaternary of Site 125 (see Figure 7 of Chapter 46, this volume).

An excellent stratigraphic section of the Quaternary was recovered in the first four cores of Hole 125 despite appreciable physical disturbances at certain levels in the calcareous oozes. Hole 125A was cored continuously from about 30 meters to 121 meters below bottom so that the fossiliferous Pliocene section has been cored twice—an ideal situation for detailed biostratigraphic investigations. In Hole 125A, the core recovery was again rather good for the Pliocene interval, characterized by calcareous oozes, but was poorer, with evidence of downhole contamination, in the underlying Miocene section. Core catcher samples were usually the only samples recovered here.

The Pliocene section is the key to the new foraminiferal zonation proposed for the Mediterranean deep-sea deposits, and to the nannofossil zonation as well. The consistency of the zonal boundaries in the two parallel sections is considered a fundamental check.

Isotopic analysis on shells of *Orbulina universa* from nine different levels in Hole 125A and from eight levels in Hole 125, in conjunction with paleontological evaluation of climatic changes during the Pliocene, leads to the conclusion that changes in the isotopic compositions are unrelated to climatic changes, but rather, are controlled by changes in oceanic water masses and circulation (see Chapter 47.4).

Detailed investigations on some 200 samples from the Pleistocene section recovered at Site 125 permitted a reconstruction of the paleoclimatic history of the eastern Mediterranean and a correlation with the Tyrrhenian record (Chapter 46).

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[2] Pteropods, likely as downhole contaminants, have been found in Core 125-9, CC and are discussed as a group in Chapter 36.2.

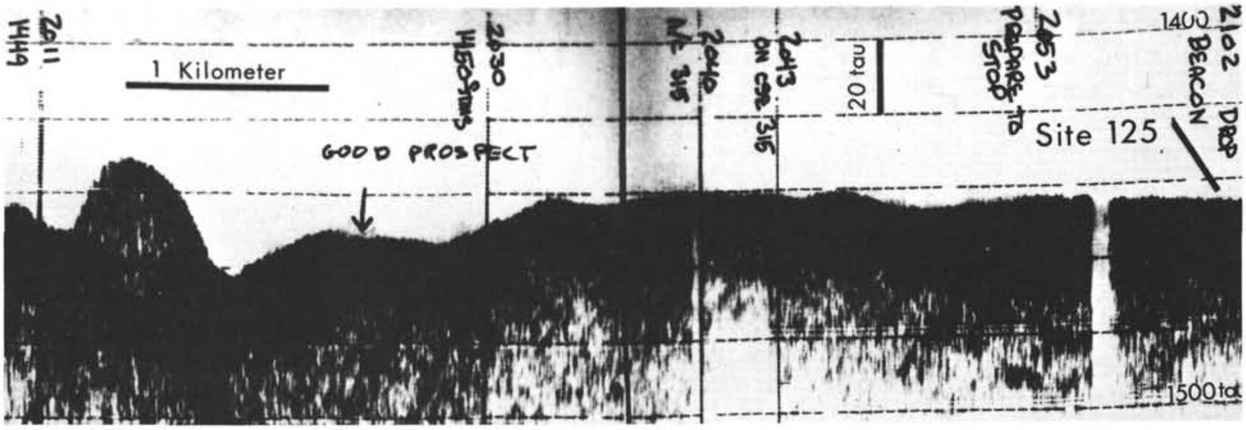

Figure 5. Glomar Challenger *fathogram illustrating details of the site approach on September 1, 1970. The vessel slowed at 2012 hours to retrieve the streamed geophysical gear and then proceeded at 4 knots until an area of relatively smooth relief was reached. Upon arriving there she stopped and the acoustical positioning beacon was dropped.*

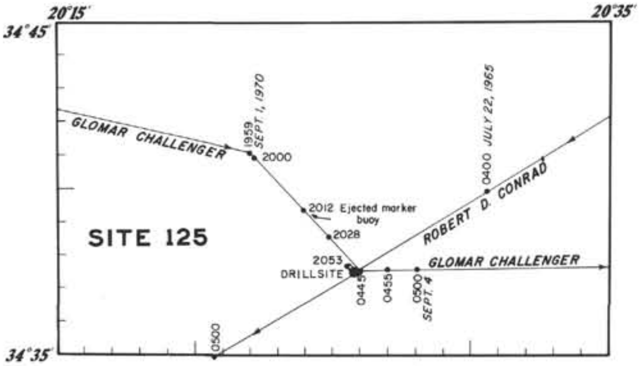

Figure 6. *Details of the* Challenger's *survey track in the vicinity of Site 125, originally targeted at 0430 hours on the pre-existing* Robert D. Conrad *reflection profile.*

Moreover, the paleomagnetic investigations on the Tyrrhenian cores (Chapter 19, this volume) have allowed a chronological evaluation of the Quaternary record of the Ionian Basin and also a correlation with the reference section of the continental Pleistocene of Europe.

Comments on the Age of Horizon M (M.B.C.)

Horizon M (as defined by Ryan *et al.*, 1971) has been sampled in an outcrop area situated on the southwest flank of the Mediterranean Ridge (Core RC9-188), where a microbreccia composed of indurated fragments of varicolored foraminiferal lutite of lowermost Pliocene age has been recovered (see Biscaye, *et al.*, 1971). Taking into account this age determination, and the sedimentation rates extrapolated from 10-meter-long piston cores on the Mediterranean Ridge, the age of the top of the M-Reflectors had been estimated to be about 4.3 my. These results were obtained prior to our drilling in the Mediterranean Ridge during DSDP Leg 13.

In our cores, the extinction horizon of *Globorotalia margaritae*, correlatable with the Gauss/Gilbert boundary of the paleomagnetic stratigraphy, which is dated at 3.32 my, was recorded at about 67 meters below bottom in Hole 125A, and probably lies around 71[3] meters below bottom in Hole 125. Horizon M, as the upper surface of the M-Reflectors, seems logically correlatable with a marked change in acoustic impedance noted at the lithologic boundary between nanno ooze and dolostone in Section 1, Core 6, Hole 125A. This level fits ideally the first occurrence of erratic torquing (77 meters below bottom).

Evidence of an Hiatus

The oldest Pliocene layers overlying the evaporites cored at Holes 125 and 125A are distinctly younger than those recovered at other drilling sites (132 and 134) of the western Mediterranean. They belong to the *Globorotalia margaritae evoluta* Lineage-zone and to the *Ceratolithus rugosus* nannofossil Zone. By correlation with the Lower Pliocene section penetrated in the Tyrrhenian Basin (Site 132), we conclude that more than one half of the Lower Pliocene record is missing at the Mediterranean Ridge drill site. This corresponds to a duration of perhaps 1½ my.

Therefore, the earlier estimate of the age of Horizon M is more or less correct, with reference to the oldest Pliocene sediments. However, according to our drilling results, it is not the Lower Pliocene sediment layers which generate the marked reflectivity, but the immediately underlying late Miocene evaporites.

Paleoenvironment (M.B.C.)

The sediments penetrated at Site 125 correspond to the following two major sedimentary environments:

1) pelagic, characteristic of the Pliocene and Pleistocene, resulting in a sequence of highly fossiliferous calcareous oozes, and

2) evaporitic, characterized by dolomitic deposits, yielding as autochthonous fossils diatoms and spores, and a few shallow-water benthonic foraminifera.

The pelagic oozes are intercalated with sapropelitic layers, as found in Sections 3 and 4 of Core 1 (Hole 125),

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[3] Unfortunately, we cannot be more precise since only the core catcher samples were recovered from Cores 8 and 9.

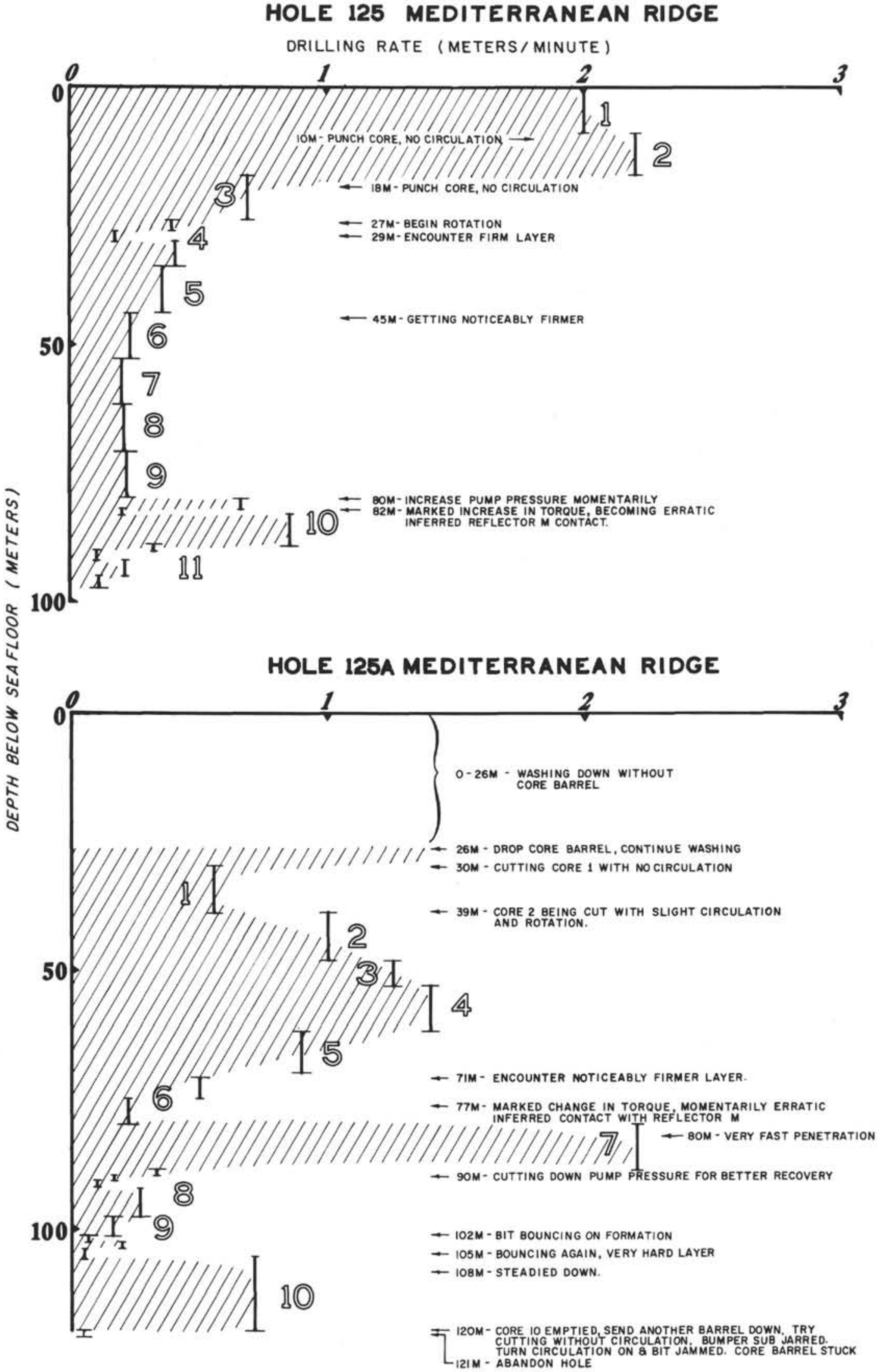

Figure 7. *Drilling rate curves for Holes 125 and 125A. The Horizon M contact is placed at 82 and 77 meters respectively, as judged by an abrupt change in penetration rates simultaneous with the first occurrence of erratic fluctuations in drillstem torquing. A definite increase in the firmness of the overlying pelagic oozes is noted at about 17 meters separating Cores 2 and 3 from Hole 125.*

TABLE 1
Core Inventory – Hole 125

Core	No. Sections	Date	Time	Cored[a] Interval (m)	Cored	Recovered	Subbottom Penetration (m)		Lithology	Age
							Top	Bottom		
1	5	9/2	0425	2792-2800	8.0	6.4	0.0	8.0	Nanno oozes, sapropels and tephra	Quaternary
2	5	9/2	0520	2800-2809	9.0	6.7	8.0	17.0	Nanno oozes	Quaternary
3	6	9/2	0635	2809-2818	9.0	8.7	17.0	26.0	Nanno oozes and sapropels	Quaternary
4	6	9/2	0805	2818-2827	9.0	9.2	26.0	35.0	Nanno oozes	Quaternary
5	6	9/2	0930	2827-2836	9.0	3.5	35.0	44.0	Nanno oozes	U. Pliocene
6	3	9/2	1107	2836-2845	9.0	4.8	44.0	53.0	Nanno oozes and sapropels	U. Pliocene
7	3	9/2	1240	2845-2854	9.0	7.5	53.0	62.0	Nanno oozes	U. Pliocene
8	CC	9/2	1425	2854-2863	9.0	0.4	62.0	71.0	Nanno oozes	L. Pliocene
9	CC	9/2	1605	2863-2872.2	9.2	Trace	71.0	80.2	Dolomite, nanno oozes (contaminants?)	U. Miocene
10	CC	9/2	1723	2872.2-2881.5	9.2	Trace	80.3	89.5	Dolomitic marl	U. Miocene
11	CC	9/2	1945	2881.5-2889	7.5	0.5	89.5	97.0	Dolomitic marl	U. Miocene
Total					96.9	47.3		97.0		
% Cored					100%					
% Recovered						48.8%				

[a] Drill pipe measurements from derrick floor.

TABLE 2
Core Inventory – Hole 125A

Core	No. Sections	Date	Time	Cored[a] Interval (m)	Cored (m)	Recovered (m)	Subbottom Penetration (m)		Lithology	Age
							Top	Bottom		
1	2	9/3	0830	2822-2831.2	9.2	2.5	30.0	39.2	Nanno ooze	U. Pliocene
2	2	9/3	0950	2831.2-2840	8.8	2.0	39.2	48.0	Nanno ooze, sapropels	U. Pliocene
3	1	9/3	1100	2840-2845	5.0	1.2	48.0	53.0	Nanno ooze	U. Pliocene
4	2	9/3	1142	2845-2854	9.0	2.3	53.0	62.0	Nanno ooze, sapropels	U. Pliocene
5	4	9/3	1330	2854-2863	9.0	5.0	62.0	71.0	Nanno ooze	L. Pliocene
6	1	9/3	1450	2863-2872	9.0	1.6	71.0	80.0	Nanno ooze, dolomite	L. Pliocene U. Miocene
7	CC	9/3	1540	2872-2881	9.0	0.5	80.0	89.0	Dolomite	Barren
8	1	9/3	1715	2881-2890	9.0	0.8	89.0	98.0	Dolomite	Barren
9	1	9/3	1850	2890-2894	4.0	0.8	98.0	102.0	Dolomite	Barren
10	0	9/3	2130	2903-2912	9.0	0.0	111.0	120.0	(No Recovery)	–
11	0	9/3	2230	2912-2913	1.0	0.0	120.0	121.0	(No Recovery)	–
DB[b]	0	9/4	0400	2912			?	121.0	Dolomite, gypsum	U. Miocene
Total					82.0	16.7		121.0		
% Cored					67.7%					
% Recovered						20.3%				

[a] Drill pipe measurement from derrick floor.

[b] Drill bit sample.

Sections 1, 4, and 5 of Core 3 (Hole 125), and Section 2 of Core 2 (Hole 125A). Sapropelitic layers occur in sediments sampled by piston coring in the eastern Mediterranean. Eight sapropelitic layers have been recorded and correlated in the most complete cores (Olausson, 1961; Ryan, 1971), but none of them seems to be correlatable with the layers found in our Core 1 (125). Furthermore, ten distinct tephra horizons are found in the interval between 3,000 and 180,000 years BP, and none of these occur in Core 1 or subsequent cores. Therefore, it is believed that the topmost layers were somehow bypassed either by the spudding in, drilling, and/or coring operations, since the first core, if it represents the top 10 meters below the sea floor, should be correlatable. The paleoclimatic investigations carried out on the Pleistocene succession (Figure 12 of Chapter 46, this volume) strongly support this conclusion.

The sapropelitic layers are interpreted as having been deposited during times of stagnation. From preliminary analysis, these conditions apparently occurred, in most cases, during the warming intervals of the climatic cycle, near temperature highs. They are believed to be related to a circulation system between the Mediterranean Sea, the Atlantic Ocean, and the Black Sea, which underwent significant changes and even reversals during glacioeustatically controlled perturbations of sea level.

The discovery of sapropelitic layers in the lower Pleistocene (Core 125-3), where no marked cold intervals are recorded, and in pelagic sediments of Upper Pliocene age (Core 125A-2), indicates that similar stagnation phenomena occurred before the onset of extensive continental glaciation in the circum-Mediterranean area.

Reference is made to Chapter 46, for a summary of Olausson's model for stagnant cycles in the eastern Mediterranean, for a discussion on the Pliocene-Pleistocene boundary, and for the climatic fluctuations recorded in our cores.

Chapter 47 discusses six discrete Pliocene climatic episodes, which can be correlated between two or more holes, and which are internally consistent using both foraminiferal and nannofossil indicators.

Part 2, point 5 of Chapter 40 includes a discussion of the fossil contents of the sapropelitic layers and their implications.

Rates of Sedimentation (M.B.C.)

Estimates of the rate of sediment accumulation at Site 125 take into account the following marker points:

For Hole 125:

1) Pliocene-Pleistocene boundary (1.85 m) in Section 5 of Core 4.

2) Extinction horizon of *Globorotalia margaritae* (3.32 my) in Core 8, CC.

3) Zero depth of the core at about 0.4 my by correlation to nearby piston core RC9-185 (see Chapter 46 for discussion of this point).

For Hole 125A:

1) Top of Section 1 of Core 1, Pliocene in age (*Discoaster brouweri* Zone) ≈ 2 my.

2) Extinction horizon of *Sphaeroidinellopsis* spp. (2.9 my) in Section 1 of Core 4.

3) Extinction horizon of *G. margaritae* (3.32 my) in Section 3 of Core 5.

4) Top of the evaporite (≈5.4 my) in Section 1 of Core 6.

These datum levels are plotted in Figure 8 as separate curves for the two holes and give mean rates that range from 2.3 to 2.8 cm/10^3y. Of particular interest is the observation that both curves, when extrapolated downward to the below bottom level at which the drilling break was observed (erratic torquing believed to be the top of the evaporite, as shown in Section 1 of Core 6), place this horizon at an identical age of 3.75 my. The two curves are displaced by about five meters, suggesting that the sea floor depth readings were probably in error.[4]

The degree of accuracy of the above estimates concerning the below bottom depths of the biohorizons is not very high, since none of the core barrels had full recovery (six sections) and the real position of individual sediment layers in the cored interval is thus unknown. However, good consistency is found between the foraminiferal biohorizons under discussion and the nannoplankton zonation. In fact, in both Holes 125 and 125A the extinction horizon of *Sphaeroidinellopsis* ssp. falls within the *Reticulofenestra pseudoumbilica* Zone, and the extinction horizon of *Globorotalia margaritae* falls within the *Discoaster asymmetricus* Zone.

The variation in sedimentation rates calculated for the different parts of the section are moderate, and the resulting values agree well with the concept of a purely pelagic sedimentary regime without significant terrigenous influx. The decrease in the sedimentation rates from the Pliocene to the Quaternary is as yet unexplained and may not be real because of underestimation of the amount of sediment bypassed. However, it has to be pointed out that the calculated rate of sedimentation of 2.3 cm/10^3y for the Quaternary is smaller by an order of magnitude than that found in the Alboran Basin and in the Hellenic Trench, and is less than a third of the value estimated for the Balearic Basin.

Planktonic Foraminifera (M.B.C.)

Planktonic foraminifera are abundant in the pelagic sediments of Pleistocene and Pliocene age recovered at Holes 125 (Cores 1 to 8 inclusive) and 125A (Cores 1 to 6 inclusive) on the Mediterranean Ridge.

The assemblages contained in the lowermost levels penetrated are contaminated by downhole infiltration of tests. Core 10 of Hole 125 and Core 7 of 125A (core catcher samples) include a poor fauna which is not age diagnostic. Core 125A-6-1, which contains the Miocene-Pliocene boundary (= boundary between the evaporitic succession and the pelagic oozes), yielded strongly different assemblages at various levels. Reference is made to Chapter 47.1 where this core is described in detail along with other Mediterranean cores containing this important boundary.

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[4] Originally measured by recording the drill string length at the time of its initial contact with the seabed, which in this case was extremely difficult to ascertain, and thus accounts for the fact that the surface sediments were bypassed before coring was commenced.

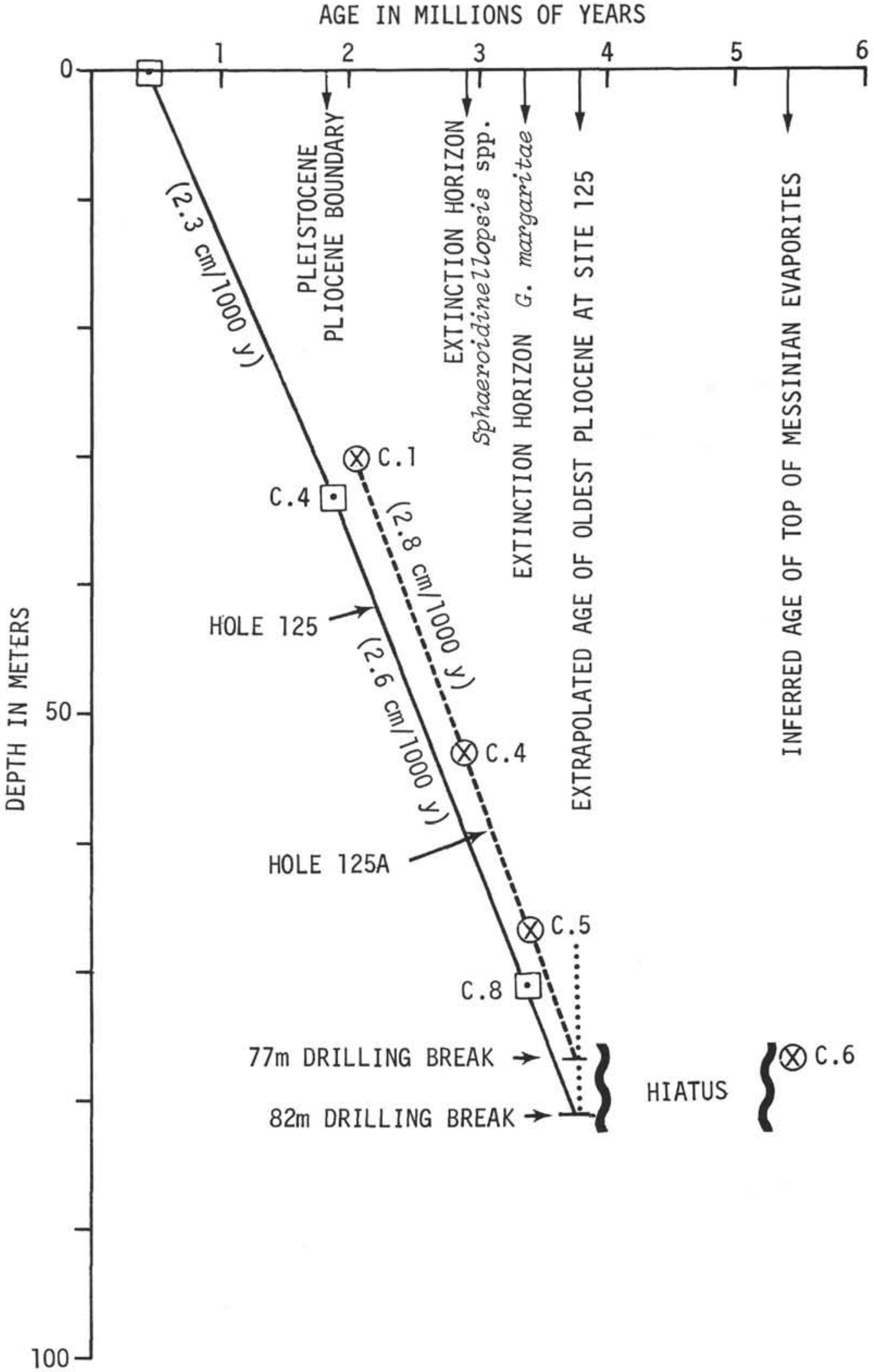

Figure 8. *Interpolated sedimentation rates for the Quaternary and Pliocene intervals of sedimentation. The two holes are plotted separately. It is interesting that both holes encountered the evaporite at an extrapolated age of 3.75 my, independently confirming the presence of a gap in sedimentation of approximately 1-1/2 million years duration, first suggested from missing biohorizons within the Lower Pliocene. The data points used here are discussed in the text.*

Samples from the core catchers (the only material available) 125-9, CC, 125-11, CC, 125A-7, CC, and 125A-8, CC include downhole contaminants of Quaternary age (e.g., *Globorotalia truncatulinoides* and *G. inflata*). The core catcher of 125A-9, CC was completely barren. Two samples have been examined from the drill bit (125A). One, processed on the ship, is very rich in planktonic foraminifera which include *Globigerinoides conglobatus, G. sacculifer, Sphaeroidinellopsis seminulina, Globorotalia inflata, G. margaritae, G. puncticulata, G. truncatulinoides,* and so forth. These fossils, which include mutually exclusive species ranging in age from Lower Pliocene to the Pleistocene, are considered downhole contaminants. The other, labeled 125A, drill bit, box 3, yielded a very limited number of planktonic foraminifera (contaminants?) mixed with gypsum crystals and saccharoidal dolomite.

No assemblages indicating an age definitely older than early Pliocene were found in any of the cores investigated.

Quaternary

Reference is made to Chapter 46, where this section (Site 125, Cores 1-4) is analyzed in detail, and is discussed, interpreted, and correlated with other Quaternary sections. A range chart as well as a number of faunal curves, is attached to that report. Only the following few schematic notes are included here:

1) The upper sapropelitic interval (Core 125-1) corresponds to the Glacial Pleistocene, which is characterized by important climatic fluctuations, including marked cold intervals.

2) The lower sapropelitic interval (Core 125-3) was deposited prior to the onset of glaciation in the circum-Mediterranean area. Important changes in the foraminiferal assemblages are observed in the layers underlying and overlaying the sapropels, and in the sapropels themselves; however, they do not indicate important temperature changes in the photic zone.

3) The Pleistocene succession cannot be subdivided biostratigraphically by means of planktonic foraminifera, and is referred entirely to the *Globorotalia truncatulinoides* Total-range-zone. Important changes in foraminiferal assemblages are recorded; however, they are cyclically repeated and appear to be controlled by ecologic factors more than by time.

4) At this site, unlike other Mediterranean drilling sites, we have good foraminiferal indication for this boundary (the *Globorotalia tosaensis-G. truncatulinoides* lineage). The first representatives of *G. truncatulinoides* are recorded in Core 125-4-5 (94 cm).

Pliocene

Of the six foraminiferal zones recognized in the Mediterranean deep-sea Pliocene (Chapter 47), four were identified in the Pliocene section penetrated at this site (Holes 125 and 125A). The missing zones are the Lower Pliocene *Globorotalia margaritae margaritae* Lineage-zone and the *Sphaeroidinellopsis* Acme-zone. From top to bottom, the recorded zones are as follows:

Globorotalia inflata Interval-zone:

It was recorded in Cores 125-4-4 to 125-5-2 and 125A-1-1 to 125A-1, CC with a thickness of about 6 meters: that is more than 2.5 m in Hole 125, but less than 9 meters in Hole 125A.[5]

Globigerinoides obliquus extremus Interval-zone:

It was recorded in Cores 125-5-3 to 125-6-2 and 125A-2-1 to 125A-3, CC with a thickness of at least 9 meters and 14 meters respectively.

Sphaeroidinellopsis subdehiscens Interval-zone:

It was recorded in Cores 125-6-3 to 125-7, CC and 125A-4-1 to 125A-5-3 with a thickness of at least 10.5 meters and probably more than 10 meters respectively.

Globorotalia margaritae evoluta Lineage-zone:

It was recorded in Cores 125-8, CC and 125A-5-4 to 125A-6-1 with a thickness of possibly 10 meters or less.

The zonal boundaries are consistent in both holes with the nannofossil zones as identified by H. Stradner, using Martini and Worsley's (1970) zonation. The relative thickness of the zones is comparable with that recorded at Site 132, and at other western Mediterranean drilling sites. Also, the correlation with nannofossil zones is consistent in all the Mediterranean drilling sites without any important contradiction.

Reference is made to Chapters 47.1 and 47.3, where the foraminiferal zonation is defined and discussed along with the evaluation of ecological response of the foraminiferal assemblages to fluctuating climates. Range charts showing the distribution of planktonic foraminifera in Holes 125 and 125A in the Quaternary are in Chapter 46. Range charts showing their distribution during the Pliocene are given in Tables 3 and 4.

Benthonic Foraminifera (W.M.)

The range distributions of benthonic foraminifera in Holes 125 and 125A are illustrated in Tables 5 and 6, respectively. In the post-evaporitic column of nanno ooze, the benthonic faunas are nowhere common and in the individual layers of sapropelitic sediments, they are completely lacking. Where found, the benthonic foraminifera generally indicate deposition in a deep pelagic environment well beyond the reach of detritus from the near shore province. Evidence of shallow water faunas in the Quaternary and Pliocene ooze was found in the lower part of the sediment column in Sections 3 and 5 of Core 7 of Hole 125 and Sections 1 and 2 of Hole 125A. This consisted of the presences of *Elphidium (E.* cf. *advenum* and *E.* cf. *advenum* and *E.* cf. *complanatum* at these levels, the shallow-water fauna was not associated with other coarser-grained terrigenous components.

Dolomitic marls from the evaporite unit (Core 7, CC, Hole 125A) contain very rare tests of *Pyrgo depressa* (d'Orb.) and *Plectofrondicularia raricosta* (Karrer). A Messinian form, *Uvigerina gaudryinoides siphogenerinoides* was found as a single specimen in the gray dolomite of Core 8, CC of the same hole.

Nannoplankton (H.S.)

The nannofossils at this site can be assigned to two series: the Quaternary, only cored at Hole 125; and the late and early Pliocene, penetrated in both holes.

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[5] The uncertainties in the thickness of the zones are due to the poor core recovery (slightly less than 50 percent in both holes).

TABLE 3
Range Chart of Planktonic Foraminifera for the Pliocene of Hole 125

Depth Below Sea Floor (m)	Recovery (m)	Core Number	Section Number	Sample Interval (cm from top)	PLANKTONIC FORAMINIFERA																																														Zone
					Globorotalia															*Globigerina*										*Globigerinoides*											Others										
					acostaensis	*aemiliana*	*crassaformis*	*crassula*	*crassaformis viola*	*inflata*	*margaritae evoluta*	*margaritae margaritae*	*margaritae primitiva*	*obesa*	*puncticulata*	*cf. puncticulata*	*scitula*	*tosaensis*	*truncatulinoides*	*apertura*	*bulbosa*	*bulloides*	*eggeri*	*falconensis*	*microstoma*	*pachyderma*	*praedigitata*	*quinqueloba*	*rubescens*	*bollii*	*conglobatus*	*elongatus*	*fistulosus*	*helicinus*	*obliquus extremus*	*pyramidalis*	*quadrilobatus*	*ruber*	*sacculifer*	*trilobus*	*Globigerinita glutinata*	*Globigerinita uvula*	*Globoquadrina altispira*	*Hastigerina siphonifera*	*Orbulina bilobata*	*Orbulina suturalis*	*Orbulina universa*	*Sphaeroidinella dehiscens*	*Sphaeroidinellopsis subdehiscens*	*Sphaeroidinellopsis seminulina*	
26	9.2	4	1	80-82	•												•				•	•		•	•	•		•				•					•	•	•	•	•	•		•			•				*Globorotalia truncatulinoides* Total-range-zone
			2	70-72	•					•				•			•				•	•		•		•		•			•	•	•			•		•	•	•				•	•		•				
			3	73-75	•									•			•					•		•	•	•		•				•				•	•	•	•	•				•	•		•				
			4	6-5	•												•	•	•			•		•	•	•	•	•			•					•		•	•	•				•	•		•				
				69-71	•												•	•	•			•	•			•		•				•				•		•	•	•				•			•				
				121-123	•												•	x				•		•	•		•	•			•					•	•	•	•	•				•			•				
				133-135	•					•							•	x	•			•		•	•	•		•			•	•				•		•	•						•		•				
			5	82-85	•												•			•		•		•		•	•	•			•	•				•		•						•			•	•			
				105-107			•										•	x													•					•	•	•	•	•				•	•		•				*Globorotalia inflata* Interval-zone
			6	72-74	•		•										•	x				•	•	•	•						•					•	•	•	•	•				•	•		•				
				114-116	•		•							•								•	•					•		•	•					•		•	•	•				•			•				
				146-148	•		•							•			•			•		•	•	•	•	•	•	•				•		•		•		•						•			•				
35				CC	•												•					•	•	•	•						•	•		•	•	•	•	•	•	•				•			•				
35	3.5	5	1	1-4	•		•							•		•	•	x		•	•	•		•	•		•	•			•	•	•	•	•	•	•	•	•					•	•	•	•	•			
				12-15												•	•	x		•		•	•	•	•	•		•	•			•	•	•		•	•	•	•		•	•		•			•				
				78-80			•	x						•	•	•	•	•		•		•				•		•				•		•		•	•	•			•	•		•	•		•				
			2	76-79	•		•									•	•	•			•					•		•				•		•		•	•	•		•	•	•		•	•		•				
				125-128			•																												•																
			3	75-78	•	•	•	x	•											•	•	•					•	•	•	•	•				•		•		•	•	•	•		•			•				*Globigerinoides obliquus extremus* Interval-zone
				129-131		•	•							•			•			•			•		•	•		•				•	•		•	•	•				•	•		•			•				
44			CC	CC			•							•	•		•						•		•	•		•	•			•		•	•		•	•	•	•							•				

44	4.8	6	1	37-40		•	•		•					•	•					•		•	•	•	•	•		•	•			•			•		•	•			•	•			•		•				*Globigerinoides obliquus extremus* Interval-zone
				99-102		•	•	•	•						•		•								•	•						•	•		•		•	•	•	•		•		•			•				
			2	50-53	•		•							•			•			•	•	•		•		•		•			•	•		•	•	•	•		•	•		•		•			•				
				99-102	•	•	•	x	•					•	•						•	•			•	•		•	•		•	•		•	•	•	•	•	•	•	•			•	•		•				
			3	61-64			•	x						•			•	x		•	•	•		•			•	•		•		•			•				•	•	•			•			•	•	•		*Sphaeroidinellopsis subdehiscens* Interval-zone
				109-112	•										•		•			•	•	•		•	•			•				•			•	•	•		•		•		•	•	•	•	•			•	
53			CC	CC	•										•		•			•	•			•	•			•				•		•	•	•		•	•	•		•	•				•		•	•	
53	7.5	7	2	100-103	•		•	x									•			•		•		•	•		•							•		•	•	•	•		•		•	•	•		•		•	•	
			3	45-48	•										•		•			•		•		•			•					•	•		•		•	•	•					•	•		•		•	•	
				100-103	•			x							•		•			•	•	•		•	•	•						•			•			•	•	•	•	•	•	•			•		•	•	
			4	41-44	•									•	•					•		•		•			•								•		•	•	•	•			•	•			•		•	•	
				78-81	•		•								•					•		•		•	•		•	•							•	•		•	•	•				•			•		•	•	
			5	41-44	•										•		•			•		•		•				•							•		•	•	•	•			•	•			•		•	•	
				106-109	•									•	•					•		•		•				•							•	•	•	•	•	•	•			•	•		•			
62			CC	CC	•										•		•			•		•		•						•		•			•	•	•	•	•	•	•	•		•	•		•		•		
62 71		8	CC	CC	•						•	•	•		•		•			•		•		•	•		•	•							•		•				•			•	•		•		•	•	*Globorotalia margaritae evoluta* Lineage-zone
71 80		9	CC	CC																																										No foraminiferal zones
80 89		10	CC	CC																																										
89 98		11	CC	CC																																										

Legend: • Occurrence
x Conforms frequently

TABLE 4
Range Chart of Planktonic Foraminifera for the Pliocene of Hole 125A

Depth Below Sea Floor	Recovery (m)	Core Number	Section Number	Sample Interval (cm from top)	PLANKTONIC FORAMINIFERA																																														Zone
					Globorotalia																*Globigerina*										*Globigerinoides*											Others										
					acostaensis	*aemiliana*	*bononiensis*	*crassaformis*	*crassaformis viola*	*crassula*	*inflata*	*margaritae evoluta*	*margaritae margaritae*	*margaritae primitiva*	*menardii*	*obesa*	*puncticulata*	cf. *puncticulata*	*scitula*	cf. *tosaensis*	*apertura*	*bulbosa*	*bulloides*	*eggeri*	*falconensis*	*microstoma*	*pachyderma*	*praedigitata*	*quinqueloba*	*rubescens*	*bollii*	*conglobatus*	*elongatus*	cf. *fistulosus*	*helicinus*	*obliquus extremus*	*pyramidalis*	*quadrilobatus*	*ruber*	*sacculifer*	*trilobus*	*Globigerinita glutinata*	*Globigerinita uvula*	*Globoquadrina altispira*	*Hastigerina pelagica*	*Hastigerina siphonifera*	*Orbulina bilobata*	*Orbulina suturalis*	*Orbulina universa*	*Sphaeroidinellopsis subdehiscens*	*Sphaeroidinellopsis seminulina*	
30	2.5	1	1	71-74							•								•					•				•	•			•					•	•	•	•	•	•	•			•			•			*Globorotalia inflata* Interval-zone
				128-131	•														•		•		•	•	•	•		•	•			•					•	•	•	•	•	•				•	•		•			
	2.5		2	40-42	•						•					•			•				•	•		•	•	•				•	•	•	•		•	•	•	•	•	•	•			•	•		•			
				118-120	•		•	•											•	•	•		•		•	•	•			•			•		•		•		•			•	•			•			•			
39.2			CC	CC	•		•	•			•					•					•	•	•		•			•	•			•	•				•		•			•				•	•		•			
39.2	2.0	2	1	72-74	•		•	•								•		•		•	•		•	•	•			•	•				•	•	•	•	•		•		•	•				•			•			*Globigerinoides obliquus extremus* Interval-zone
				114-116	•		•	•		•									•				•	•	•				•				•				•	•	•	•	•	•				•	•		•			
				146-148	•											•			•				•	•	•			•	•				•	•			•	•	•			•				•	•		•			
			2	25-28												•		•					•	•							•	•	•		•	•	•	•	•	•	•	•					•		•			
				97-100	•		•	•		•						•	•		•	•		•	•		•			•					•		•	•	•	•	•	•	•	•			•	•	•		•			
48			CC	CC	•	•	•	•		•						•	•		•		•		•	•				•					•			•	•	•	•	•	•					•	•		•		•	
48	1.2	3	1	35-38			•									•	•				•	•	•		•		•		•				•			•	•	•	•	•	•	•	•			•			•			
				112-115			•										•				•	•	•		•				•			•	•			•	•	•	•	•		•	•			•			•			
53			CC	CC	•														•				•		•	•	•		•							•		•	•	•	•	•				•			•			
53	2.3	4	1	25-28	•											•			•		•		•		•		•		•							•		•	•	•		•	•			•			•	•	•	*Sphaeroidinellopsis subdehiscens* Interval-zone
				120-123															•				•		•	•			•				•			•		•	•	•	•	•		•		•			•	•	•	
			2	92-94												•			•		•		•		•	•			•				•		•	•		•	•	•	•	•							•	•	•	
				140-143	•												•		•		•		•		•			•	•							•		•	•	•	•	•				•	•		•		•	
62			CC	CC	•												•		•		•		•		•								•			•		•	•	•	•	•		•						•	•	

TABLE 4 – Continued

62	0.5	5	1	108-111	•			•						•		•				•	•	•	•	•		•				•	•			•	•	•	•	•	•	•	•		•	•	•	•		•	•	•	*Sphaeroidinellopsis subdehiscens* Interval-zone
				134-137	•										•	•		•		•		•		•		•							•		•	•	•	•	•	•	•		•	•	•	•		•	•	•	
			2	99-102	•										•	•		•		•					•	•				•				•	•	•	•	•	•	•	•		•	•		•		•	•	•	
			3	118-121	•							•	•		•	•				•		•			•			•						•	•	•	•	•	•		•	•		•	•	•	•		•			*Globorotalia margaritae evoluta* Lineage-zone
			4	30-33	•							•	•		•	•				•	•	•	•	•		•		•			•	•			•		•	•	•	•	•		•	•		•		•	•		
				122-124	•			•				•				•		•			•	•	•	•	•	•		•		•	•	•	•		•		•		•		•			•	•	•		•		•	
71			CC	CC	•							•	•		•	•		•				•			•		•	•						•	•		•	•	•	•	•			•	•	•		•			
71	1.6	6	1	31-34	•							•				•		•				•		•		•		•							•	•		•	•	•				•		•		•	•		
				102-105														•		•		•		•	•	•	•	•							•	•	•	•	•	•				•		•		•			
				116-119	•															•		•		•		•		•							•			•	•	•						•		•		•	
				120-122	•										•					•		•						•							•		•		•	•	•					•		•		•	
				139-192																																															
89			CC	CC																																															
89 98	0.5		CC	CC														•																																	No Foraminiferal Zone (No planktonic foraminifera present)
	0.8		CC	CC																																															
98 102	0.8		CC	CC																																															

Quaternary

The nannoplankton above the *Discoaster brouweri*[6] extinction, which in Hole 125 lies between Core 4-1-120 cm and 4-1-90 cm, can be divided into three zones. The youngest sediments from sea floor down to Core 2-2-100 cm contain *Emiliania huxleyi*, which is characteristic for NN 21, Upper Quaternary. The lower part of Core 2, and all of Core 3, contain *Gephyrocapsa oceanica* as well as *Pseudoemiliania lacunosa* (NN19-NN20). As *Pseudoemiliania lacunosa* does not disappear from the record below the first occurrence of *Emiliania huxleyi*, the boundary between NN19 and NN20, which is based on the last occurrence of *P. lacunosa*, cannot be drawn. Judging from the standard nannoplankton range charts (Martini and Worsley, 1970), Zone NN19 is longer than Zone NN20. Thus the whole of Core 3 and the uppermost part of Core 4, down to 90 cm of Section 1, may be assigned to the *Pseudoemiliania lacunosa* Zone (NN19).

Pliocene

The nannoplankton of this series are very abundant and well preserved, especially the discoasters. The *Discoaster brouweri* Zone is more than 8 meters thick and extends from 125-4-1, 120 cm down to 125-5-1 cm (top). The sample from 125-5-1, 49 cm contains rather abundant *Discoaster pentaradiatus*, so that the boundary between the *Discoaster brouweri* Zone (NN18) and the *Discoaster pentaradiatus* Zone (NN17) lies between 1 and 49 cm of 125-5-1. In Hole 125A, where the Quaternary was not cored, the whole of Core 1, and also Core 2 down to 75 cm of Section 1, contain nannoplankton of the *Discoaster brouweri* Zone (NN18). There, the highest occurrence of *Discoaster pentaradiatus* is in 125A-2-1, 140 cm, as far as can be judged from the available samples. With closer sampling a more precise position of the boundary might be achieved. The thickness of the *Discoaster pentaradiatus* Zone in Hole 125 is only about 2 meters, a fact which is in full agreement with the range charts of Martini and Worsley (1971), based on Pacific DSDP samples. The lower boundary of the *D. pentaradiatus* Zone lies above Core Sample 125-5-2-79 cm, which contains the highest occurrence of *Discoaster surculus*. The *Discoaster surculus* Zone (NN16) comprises the lower part of Core 125-5, from 79 cm in Section 2 down, and most of Core 125-6, down to 120 cm in Section 3. In Hole 125A, the boundary between Zones NN17 and NN16 apparently was not cored. By correlation with Hole 125 this boundary, that is, the highest occurrence of *Discoaster surculus*, ought to lie just below 125A-2, CC. Core 125A-3 contains nannoplankton of the *Discoaster surculus* Zone (NN16). The boundary between Zone NN16 and the older Zone NN15 which is considered as the Lower/Upper Pliocene boundary by Martini (1971), is at this site higher than was expected. This boundary, which is based on the last occurrence of *Reticulofenestra pseudoumbilica*, occurs in Core 6 of Hole 125 between Section 3-120 cm and 6, CC; in Hole 125A, it apparently was not cored and can be expected to lie in the

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[6] The reviewer notes that there is an apparent inconsistency between the observations reported here and those of Bukry in Chapter 33 of this volume concerning the recognition of an *Emiliania huxleyi* zone and the level of the *Discoaster brouweri* extinction.

TABLE 5
Range Chart of the Benthonic Foraminifera in Hole 125 – Mediterranean Ridge

Age	Depth Below Sea Floor (m)	Cores	*Bolivina catanensis* Seg.	*Siphonina reticulata* (Czjzek)	*Eponides* cf. *schreibersii* (d'Orb.)	*Eponides umbonatus* (Reuss)	*Cibicides* cf. *floridanus* (Cush.)	*Nodophtalmidium* cf. *tibia* (Jones & Parker)	*Pyrgo serrata* (Bailey)	*Bulimina aculeata* d'Orb.	*Gyroidina laevigata* d'Orb.	*Articulina tubulosa* (Seg.)	*Bulimina* cf. *fusiformis* Will.	*Cassidulinoides bradyi* (Norman)	*Bulimina elegans* d'Orb.	*Pleurostomella alternans* Schwager	*Cassidulina subglobosa* Brady	*Karreriella bradyi* (Cush.)	*Cibicides pseudoungerianus* (Cush.)	*Sigmoilina schlumbergeri* (Silv.)	*Lagena marginata* (Montagu)	*Lagena laevis* (Montagu)	*Fursenkoina davisi-complanata*	*Planulina wuellerstorfi* (Schwag.)	*Pullenia quinqueloba* (Reuss)	*Eponides umbonatus stellatus* (Silv.)	*Nodosaria raphanus* (Linn.)	*Cibicides robertsonianus* (Brady)	*Bigenerina nodosaria* d'Orb.	*Cibicides* cf. *acknerianus* (d'Orb.)	*Spiroplectammina wrighti* (Silv.)	*Pyrgo depressa* (d'Orb.)	*Dentalina leguminiformis* (Batsch)	*Plectofrondicularia semicosta* (Karrer)	*Bolivina dilatata* Reuss	*Uvigerina peregrina-mediterranea*	*Asterigerina planorbis* (d'Orb.)	*Elphidium* cf. *advenum* (Cush.)	*Planulina ariminensis* (d'Orb.)	*Anomalina helicina* (Costa)	*Bolivina alata* Seg.	*Bulimina marginata* d'Orb.	*Siphonodosaria monilis* (Silv.)	*Uvigerina gaudryinoides siphogenerinoides* Lipp.	*Elphidium* cf. *complanatum* (d'Orb.)	*Cassidulina carinata* Silv.	*Nonion* cf. *depressulum* (Walk. & Jac.)
	Sea Floor 2782 m																																														
Quaternary	0.0-0.8	1 ▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮																																			
	8.0-17.0	2 ▮						▮	▮	▮			▮	▮	▮	▮																															
	17.0-26.0	3 ▮									▮	▮				▮	▮																														
	26.0-35.0	4 ▮	▮			▮					▮							▮	▮	▮	▮	▮	▮	▮	▮																						
Pliocene	35.0-44.0	5 ▮				▮										▮		▮					▮			▮																					
	44.0-53.0	6 ▮	▮	▮		▮												▮				▮				▮	▮	▮	▮	▮																	
	53.0-62.0	7 ▮	▮	▮	▮	▮												▮										▮	▮		▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮
	62.0-71.0	8 ▮		▮		▮												▮										▮																			
	71.0-80.2	9 ▮																																													
	80.3-89.5	10 ▮																																													
	89.5-97.0	11 ▮																																													

TABLE 6
Range Chart of the Benthonic Foraminifera in Hole 125A – Mediterranean Ridge

Age	Depth Below Sea Floor (m)	Cores	*Karreriella bradyi* (Cush.)	*Lagena bradyana* Forn.	*Eponides umbonatus* (Reuss)	*Sigmoilina celata* (Costa)	*Dentalina leguminiformis* (Batsch)	*Lagena* cf. *acuticosta* Reuss	*Planulina wuellerstorfi* (Schwag.)	*Fursenkoina davisi-complanata*	*Cassidulina subglobosa* Brady	*Lagena longirostris* (Seg.)	*Eponides umbonatus stellatus* (Silv.)	*Cibicides* cf. *floridanus* (Cush.)	*Nonion* cf. *limbato-striata* Cush.	*Bigenerina nodosaria* d'Orb.
	Sea floor –2782m															
Pliocene	30.0-39.2	1	▮	▮	▮	▮	▮	▮	▮	▮	▮					
	39.2-48.0	2	▮	▮	▮					▮		▮	▮	▮	▮	
	48.0-53.0	3	▮		▮											▮
	53.0-62.0	4	▮		▮					▮			▮		▮	
	62.0-71.0	5	▮	▮	▮					▮			▮		▮	▮
	71.0-80.0	6			▮											▮
Miocene	80.0-89.0	7														
	89.0-98.0	8														
	98.0-102.0	9														
	111.0-120.0	10														
	120.0-121.0	11														

Age	Depth Below Sea Floor (m)	Cores	*Pullenia quinqueloba* (Reuss)	*Pullenia salisburyi* Stew.	*Lagena* cf. *laevis* (Montagu)	*Siphonina reticulata* (Czjzek)	*Eponides* cf. *schreibersii* (d'Orb.)	*Cibicides robertsonianus* (Brady)	*Cibicides ungerianus* (d'Orb.)	*Lagena marginata* (Montagu)	*Nonion* cf. *depressulum* (Walk. & Jac.)	*Bolivina subspinescens* Cush.	*Chrysalogonium obliquatum* (Batsch)	*Robulus curvisepta* (Seg.)	*Orthomorphina tenuicostata* (Costa)	*Bolivina aenariensis* (Costa)
	Sea floor –2782m															
Pliocene	30.0-39.2	1														
	39.2-48.0	2														
	48.0-53.0	3		▮	▮											
	53.0-62.0	4		▮		▮	▮	▮	▮	▮	▮	▮	▮			
	62.0-71.0	5				▮	▮		▮					▮	▮	▮
	71.0-80.0	6					▮							▮		
Miocene	80.0-89.0	7														
	89.0-98.0	8														
	98.0-102.0	9														
	111.0-120.0	10														
	120.0-121.0	11														

Age	Depth Below Sea Floor (m)	Cores	*Bolivina catanensis* Seg.	*Bolivina dilatata* Reuss	*Bolivina punctata* d'Orb.	*Bolivina spathulata* (Will.)	*Cassidulinoides bradyi* (Norman)	*Reussella spinulosa* (Reuss)	*Siphonodosaria monilis* (Silv.)	*Siphonodosaria consobrina* (d'Orb.)	*Uvigerina gaudryinoides siphogenerinoides* Lipp.	*Uvigerina peregrina-mediterranea*	*Cancris oblongus* (d'Orb.)	*Asterigerina planorbis* (d'Orb.)	*Cibicides refulgens* (Montf.)	*Nonion pompilioides* (F. & M.)
	Sea floor –2782m															
Pliocene	30.0-39.2	1														
	39.2-48.0	2														
	48.0-53.0	3														
	53.0-62.0	4														
	62.0-71.0	5	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮	▮
	71.0-80.0	6			▮							▮		▮	▮	
Miocene	80.0-89.0	7														
	89.0-98.0	8									▮					
	98.0-102.0	9														
	111.0-120.0	10														
	120.0-121.0	11														

Age	Depth Below Sea Floor (m)	Cores	*Elphidium macellum* (F. & M.)	*Anomalina* cf. *helicina* (Costa)	*Bolivina subspinescens* Cush.	*Angulogerina angulosa* (Will.)	*Sigmoilina schlumbergeri* (Silv.)	*Parafrondicularia* cf. *advena* (Cush.)	*Uvigerina* cf. *flinti* Cush.	*Elphidium crispum* (Linn.)	*Planulina ariminensis* (d'Orb.)	*Cibicides boueanus* (d'Orb.)	*Cibicides pseudoungerianus* (Cush.)	*Nonion padanum* Perconig	*Pyrgo depressa* (d'Orb.)	*Plectofrondicularia raricosta* (Karrer)
	Sea floor –2782m															
Pliocene	30.0-39.2	1														
	39.2-48.0	2														
	48.0-53.0	3														
	53.0-62.0	4														
	62.0-71.0	5	▮	▮												
	71.0-80.0	6	▮		▮	▮	▮	▮	▮	▮	▮	▮	▮			▮
Miocene	80.0-89.0	7												▮	▮	
	89.0-98.0	8														
	98.0-102.0	9														
	111.0-120.0	10														
	120.0-121.0	11														

gap between 125A-3, CC and 125A-4-1-top. This zone has numerous *Discoaster asymmetricus* and also representative specimens of *Ceratolithus rugosus.* The lower boundary of Zone NN15 is marked by the last occurrence of *Ceratolithus tricorniculatus.* In Hole 125, this boundary lies above Core 8. This core is already in Zone NN14, the *Discoaster asymmetricus* Zone with the characteristic *Ceratolithus tricorniculatus,* the so-called "dark" ceratoliths because they do not show birefringence under crossed nicols. In Hole 125A, the highest occurrence of *Ceratolithus tricorniculatus* was registered in 125A-5-4, 40 cm so that with the samples at hand the NN14/NN15 boundary can be drawn between 125A-5-3, 40 cm and 125A-5-4, 40 cm. Both Cores 125-8 and the lower part of 125A-5, from Section 4-40 cm down to 125A-5, are considered to be in the *Discoaster asymmetricus* Zone (NN14), with asymmetric five-rayed discoasters which are, however, rather rare and not very convincing. As each discoaster species to a certain degree produces asymmetrical forms (teratologies), the use of asymmetry as a species-diagnostic feature remains risky. The main bulk of discoasters in these deepest nannofossiliferous cores of Site 125 are *Discoaster challengeri, D. pentaradiatus, D. surculus* and *D. variabilus*. There are also *D. pansus* and even *D. calcaris* (reworked?) as rare specimens and *Ceratolitus tricorniculatus. Ceratolithus rugosus*, the zone marker of Zone NN13 (Lower Pliocene) was not found in Core 125-8. Correlating with the standard nannoplankton range chart of Martini and Worsley (1970), and assuming no drastic changes in sedimentation rate, the deepest nannofossiliferous cores of Site 125, that is, Cores 125-8 and 125A-6 should not be below the NN12/NN13 boundary. Indeed, *Ceratolithus rugosus,* the zone-fossil of the NN13 zone, which has its first occurrence slightly below the Miocene/Pliocene boundary and slightly below the N18/N19 foraminiferal zone[7] boundary, was found in 125A-6-1, 122 cm, the first nannofossiliferous sample above the evaporitic sequence. Thus the NN12 Zone, the *Ceratolithus tricorniculatus* Zone, can be excluded. The oldest Pliocene section from this site, Core 125A-6, is nannofossiliferous from 125A-6-1, 15 cm to 6-1-122 cm and has a rich discoaster assemblage with *Discoaster challengeri, D. pentaradiatus, D. surculus* and *D. variabilis.* There is also *Ceratolithus rugosus* and *C. tricorniculatus.* As *Discoaster asymmetricus* could not be proven to occur, the age assignment for this core is NN13: *Ceratolithus rugosus* Zone (Lower Pliocene).

The age-diagnostic nannofossil assemblages are shown below.

Quaternary

Samples: 13-125-1-1, 122-123 cm; 125-1-1, 125-130 cm; 125-1-1, 148-149 cm; 125-1-2, 60 cm; 125-1-3, 114 cm; 125-1-4, 94-95 cm; 125-1-5, 47 cm; 125-1, CC; also: 13-125-2-1, 130 cm: 125-2-2, 100 cm:

Ceratolithus cristatus
Ceratolithus telesmus
Coccolithus pelagicus
Cyclococcolithus leptoporus
Discoaster perplexus
Emiliania huxley
Gephyrocapsa oceanica
Helicosphaera carteri
Micrascidites sp.
Oolithothus antillarum
Pontosphaera scutellum
Rhabdosphaera clavigera
Rhabdosphaera stylifera
Scapholithus fossilis
Syracosphaera pulchra
Thoracosphaera heimi

Upper Quaternary NN 21

Samples: 13-125-2-3, 120 cm; 125-2-4, 120 cm; 125-2-5, 80 cm; 125-2, CC; 125-3-1, 45 cm:

Ceratolithus cristatus
Coccolithus pelagicus
Discoaster perplexus (125-2-3, 120 cm lowest occurrence)
Discolithina macropora
Gephyrocapsa oceanica
Helicosphaera carteri
Oolithothus antillarum (125-3-1, 45 cm lowest occurrence)
Pontosphaera scutellum
Pseudoemiliania lacunosa
Rhabdosphaera clavigera
Rhabdosphaera stylifera
Syracosphaera pulchra

Emiliania huxley Zone

Middle Quaternary NN 20

Samples: 13-125-3-2, 11 cm; 125-3-3, 32 cm; 125-3-4, 30 cm; 125-3-5, 32 cm; 125-3-5, 80 cm; 125-3-5, 120 cm; 125-3-6, 85 cm; 125-3-6, 145 cm; 125-3, CC; 125-4-1, 1 cm; 125-4-1, 30 cm; 125-4-1, 60 cm; 125-4-1, 90 cm:

Ceratolithus cristatus
Coccolithus pelagicus
Cyclococcolithus leptoporus
Discolithina macropora
Gephyrocapsa oceanica
Helicosphaera carteri
Lithostromation perdurum
Pontosphaera scutellum
Pseudoemiliania lacunosa
Rhabdosphaera clavigera
Rhabdosphaera stylifera
Scapholithus fossilis

Gephyrocapsa oceanica Zone

Lower Quaternary NN 18
Pseudoemiliania lacunosa Zone

Remarks: As the zone-marker *pseudoemiliania lacunosa* was found ranging up beyond the NN19/NN20 boundary (which it is not supposed to do) the first occurrence of *Oolithothus antillarum* in 25-3-1, 45 cm is used as approximate datum-line. Correlating with Martini's range charts of Atlantic and Pacific occurrences, this should come close to his boundary of the NN19/NN20 nannoplankton zones.

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[7] According to Martini (1971).

Pliocene

Samples: 13-125-4-1, 120 cm; 125-4-1, 150 cm; 125-4-2, 1 cm; 125-4-1, 30 cm; 125-4-2, 60 cm; 125-4-2, 90 cm; 125-4-2, 120 cm; 125-4-3, 60 cm; 125-4-4, 120 cm; 125-4-5, 20 cm; 125-4-5, 120 cm; 125-4-5, 140 cm; 125-4-6, 75 cm; 125-4, CC; 125-5-1, 1 cm:

125A-1-1, 70 cm; 125A-1-2, 100 cm; 125-1, CC; 125A-2-1, 75 cm:

Ceratolithus cristatus
Coccolithus pelagicus
Cyclococcolithus leptoporus
Discoaster brouweri
Helicosphaera carteri
Lithostromation perdurum
Pseudoemiliania lacunosa
Rhabdosphaera stylifera
Scyphosphaera apsteini
Scyphosphaera pulcherrima
Scapholithus fossilis

Upper Pliocene NN18

Samples: 13-125-5-1, 49-50 cm; 125A-2-1, 140 cm; 125A-2-2, 85 cm; 125A-2 CC:

Coccolithus pelagicus
Cyclococcolithus leptoporus
Discoaster brouweri
Discoaster pentaradiatus
Helicosphaera carteri
Pseudoemiliania lacunosa
Rhabdosphaera stylifera
Scyphosphaera apsteini
Scyphosphaera intermedia
Scyphosphaera pulcherrima
Scapholithus fossilis

Discoaster brouweri Zone

Upper Pliocene NN17

Samples: 13-125-5-2, 79-80 cm; 125-5, CC; 125-6-1, 36 cm; 125-6-2, 54 cm; 125-6-3, 120 cm; 125A-3-1, 34-35 cm; 125A-3, CC:

Ceratolithus rugosus
Coccolithus pelagicus
Cyclococcolithus leptoporus
Discoaster asymmetricus
Discoaster brouweri
Discoaster pentaradiatus
Discoaster surculus
Discolithina macropora
Helicosphaera carteri
Pontosphaera scutellum
Pseudoemiliania lacunosa
Scyphosphaera apsteini
Scyphosphaera intermedia
Scyphosphaera pulcherrima

Discoaster pentaradiatus Zone

Upper Pliocene NN16

Samples: 13-125-6, CC; 125-7-2, 120 cm; 125-7-3, 40 cm; 125-7-4, 10 cm; 125-7-5, 25 cm; 125-7, CC; 125A-4-1, 60 cm; 125A-4-2, 87 cm; 125A-4, CC; 125A-5-1, 100 cm; 125A-5-2, 66 cm; 125A-5-3, 40 cm:

Ceratolithus rugosus
Coccolithus pelagicus
Cyclococcolithus leptoporus
Discoaster asymmetricus
Discoaster brouweri
Discoaster pentaradiatus
Discoaster surculus
Discoaster variabilis
Helicosphaera carteri
Lithostromation perdurum
Rhabdosphaera stylifera
Reticulofenestra pseudoumbilica
Scapholithus fossilis
Scyphosphaera apsteini
Scyphosphaera intermedia
Scyphosphaera pulcherrima
Thoracosphaera imperforata

Discoaster surculis Zone

Lower Pliocene NN 15

Samples: 13-125-8, CC; 125A-5-4, 40 cm; 125A-5, CC:

Ceratolithus tricorniculatus
Coccolithus pelagicus
Discoaster asymmetricus
Discoaster brouweri
Discoaster challengeri
Discoaster pentaradiatus
Discoaster pansus
Discoaster surculus
Helicosphaera carteri
Lithostromation perdurum
Pontosphaera multipora
Reticulofenestra pseudoumbilica
Scyphosphaera apsteini
Scyphosphaera intermedia
Scyphosphaera pulcherrima
Sphenolithus abies
Syracosphaera pulchra

Reticulofenestra pseudoumbilica Zone

Lower Pliocene NN 14

Samples: 13-125A-6-1, 15 cm; 125A-6-1, 122 cm:

Ceratolithus rugosus
Ceratolithus tricorniculatus
Coccolithus pelagicus
Cyclococcolithus leptoporus
Discoaster challengeri
Discoaster calcaris (rare)
Discoaster pentaradiatus
Discoaster surculus
Reticulofenestra pseudoumbilica
Sphenolithus abies

Discoaster asymmetricus Zone

Lower Pliocene NN 13
Ceratolithus rugosus Zone

Remark: The rare nannofossils found below 125-8, CC and 125A-6-1, 120 cm are not age-diagnostic and are probably downhole-contaminants.

LITHOSTRATIGRAPHY

Three lithological units were distinguished at Site 125. They are, from top to bottom: (1) Quaternary plastic marl oozes with beds of sapropel and ash, (2) Pliocene foraminiferal nanno oozes and sapropels, and (3) Messinian dolomitic marls and gypsum.

TABLE 7
Lithologic Units – Site 125

Unit	Lithology	Age
1	Plastic marl oozes, sapropels, and ash	Quaternary
≈17m		
2	Foraminiferal nanno oozes and sapropels	Early Pliocene to Quaternary
77m (125A) 82m (125)		
3	Evaporites	Late Miocene
121 m		

Unit 1 – Plastic Marl Oozes, Sapropels and Ash

Plastic marl oozes, occasionally interrupted by sapropel beds, were encountered between the surface and 17 meters (Cores 1 and 2 of Hole 125). They range in age from Glacial to Pre-Glacial Quaternary. Their calcium carbonate content is high, 50 to 70 per cent, mainly consisting of nannoplankton with minor amounts of foraminifera (Figure 9). The silt-size mineral fraction is dominated by quartz, micas, glass shards, and authigenic minerals such as limonite, hematite, and goethite. Beside the usual carbonate skeletal components, pyrite, dolomite, and some siderite were found.

Cyclic bedding, reflected primarily in colors evidently controlled by levels of oxidation and reduction on the paleoseabed, is characteristic of this unit. The darkest layers are the sapropels most conspicuously developed in Sections 3 and 4 of Core 1. These layers are generally unburrowed (except at their very tops), finely laminated, very porous, and have sharp upper and lower boundaries. They are thought to represent phases of deep-water stagnation. Marked color changes are also observed in the light-colored layers, and individual beds range from 10 to 50 cm in thickness. Brown (70%) and gray (20%) hues are dominant in the deposits which represent phases of oxygen renewal, and the rarer greenish and yellowish colors possibly reflect periods of transition or weak ventilation. In the cyclically repeated deposits, the upper part of an individual layer is often of a darker shade than the remainder.

Almost all the beds are composed of a plastic, homogeneous ooze with rare foraminifera (2-3%) which are not evident on the surface of the split cores. This distinguishes it from Unit 2, in which the dominant lithology is a stiffer, more calcareous and more heterogeneous nanno ooze with

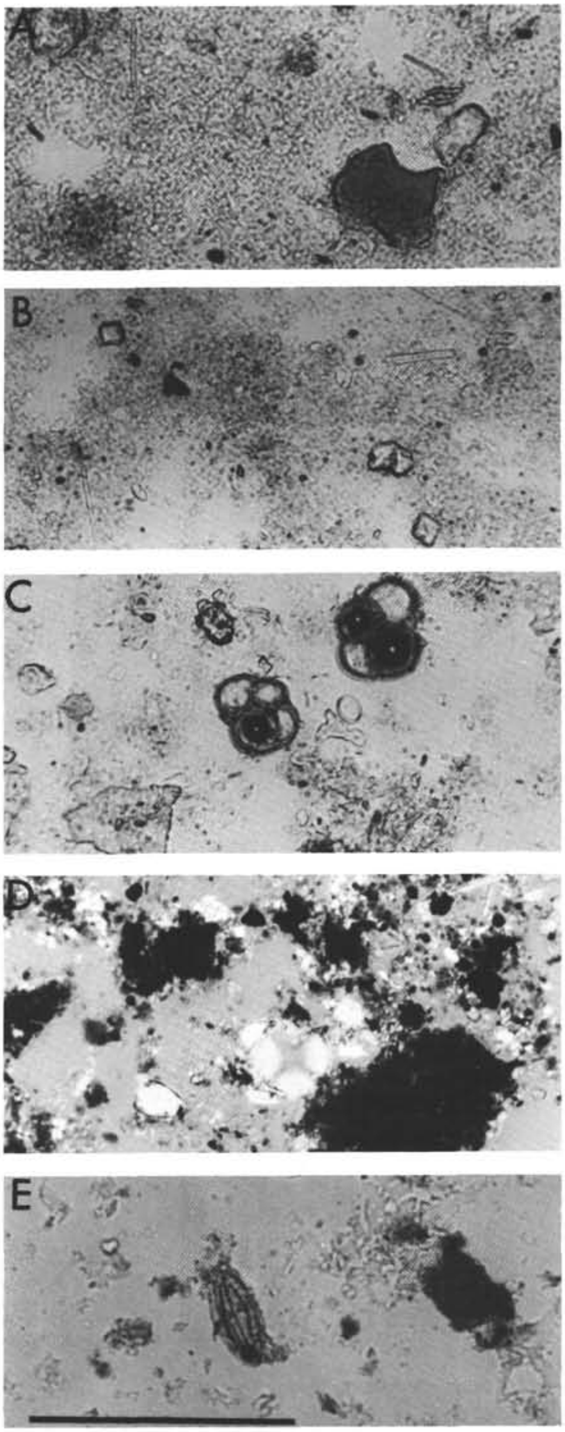

Figure 9. *Smear slide microphotographs of the pelagic sedimentary facies of Unit 1. (A) shows the typical coccolith rich nanno ooze (generally without discoasters because of its Quaternary age). Note the silt-sized grains of quartz and mica. Other coarse-grain components include dolomite rhombs (B), planktonic foraminifera (whole or fragmented) (C), aggregates of pyrite encrusted organic matter (D), and individual grains of pollen (E). Scale bar represents 100 microns. A = 1-3-96 cm; B = 1-3-64 cm; C = 1-4-101 cm; D = 1-3-67 cm; E = 3-1-133 cm.*

a moderate amount of foraminifera (up to 16%) which are easily seen on the surface of freshly split cores.

A discrete layer of volcanic tephra occurs at 80 cm in Section 4 of Core 1. It consists of sand and silt-size shards of colorless glass, angular and generally without inclusions (Figure 10A). Although this was the only layer of pure ash found at Site 125, glass shards are present as a minor component in smear slides from lower levels (Figure 10B) and indicate older, if not as violent, volcanic eruptions in the circum-Mediterranean area.

Beds of sapropel occur in Cores 1 and 3 of Hole 125, and Core 2 of Hole 125A. Twelve individual layers were covered, though chunks from these units were found as downhole contaminants in very disturbed sections of Cores 6 and 7 of Hole 125 and were recognized on shipboard as scattered pieces of carbon. The organic carbon content of regular nanno ooze is generally less than a few tenths of a per cent, but ranges in the sapropels up to 4.4 per cent (125A-2-2, 55 cm). Similarly, in a typical oxidized ooze, manganese occurs primarily in the tetravalent form with all the mobile ion in the trivalent form; in the sapropels the Mn^{+4} disappears and iron is found in as Fe^{+2}, much of it in the form of pyrite. The pyrite can be readily seen in smear slides as spherules, cubes, irregular intergrowths, and as fillings in the chambers of tests of foraminifera (Figure 11). The spheres, as seen with the scanning electron microscope, are built of tiny cubes, and many of the pyrite grains are in the shape of casts of the inside walls of foraminiferal tests. Iron hydroxides, where present, consist of spherical aggregates in foraminiferal tests and may be pseudomorphs after pyrite as a result of post-depositional oxidation (Emelyanov, 1968). The growth of pyrite in the sapropels appears to be the consequence of diffusion of hydrogen sulfide (barely detectable by smell on freshly split cores) and its reaction with iron. The absence of pure sulfur in the sapropels suggests that the hydrogen sulfide originates from the reduction of sulfates normally associated with pelagic sedimentation.

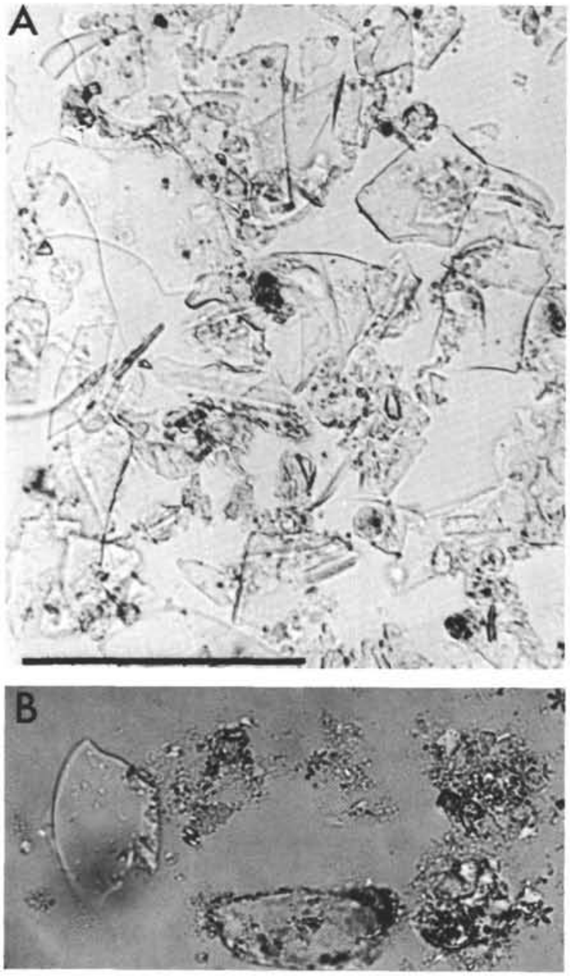

Figure 10. *Volcanic glass shards: Samples from discrete layers of tephra (A = 125-1-4-80 cm) and intervals of finely dispersed volcanic components (B = 125A-5-3-149 cm). The shards are dominantly colorless, clear, and without appreciable inclusions. Scale bar represents 100 microns.*

The sapropels also contain some fine quartz, clay minerals, and occasional trace amounts of dolomite. The color is always dark black or grades upward from dark olive gray to black. The sapropel beds are interbedded with gray, plastic oozes devoid of foraminifera. Generally, the sapropel beds are defined above and below by thin layers, a few centimeters thick, of this ooze with the darker than normal color (N3 of the Munsell chart).

Unit 2 – Foraminiferal Nanno Oozes

Lower Pliocene to Quaternary nanno oozes with fair amounts of foraminifera were recovered between 17 meters and the drilling break observed at 77 and 82 meters in Holes 125A and 125 respectively. As mentioned above, they differ in composition and texture from Unit 1 by having a much higher percentage of foraminifera (8 to 16%), which mark the surface of the split cores like scattered sand grains. Their calcium carbonate content is higher, ranging from 65 to 87 per cent, with an average of 75 per cent. Nannoplankton (60 to 75%) still make up the bulk of the sediment. Fine terrigenous debris includes quartz, illite, interstratified clays, kaolinite, and chlorite.

The oozes of Unit 2 are stiffer and more heterogeneous than the overlying Unit 1 sediments. They display a great variety of generally lighter colors: yellow, brown, reddish, greenish, gray, and black, separated by sharp boundaries.

Unit 2 is well bedded, the individual beds being generally 10 to 20 cm, but occasionally reaching one meter in thickness.

Unit 3 – Evaporites

At 77 meters in Hole 125A, the drill string cut across an abrupt contact between nanno ooze and dolostone. Dolomitic marls were recovered from this point down to 121 meters, where the hole was abandoned with a plugged bit. Penetration rates from 102 to 106 meters and from 120 to 121 were very slow, and when the bit was brought to the surface, fragments of solid gypsum and indurated gypsum-chip conglomerate were found wedged between the roller cones and in the bit orifice. The bit samples smelled strongly of sulfur.

The sharp upper boundary of Unit 3 (recovered in Section 1 of Core 6, Hole 125A, at 130 cm) is an apparent unconformity with a possible hiatus of 1½ my between the termination of evaporite deposition and the first permanent accumulation of deep-sea pelagic sediments. The indurated dolostone at the contact was found, broken into small, angular pieces (3-5 mm) and embedded in a matrix of watery clay (Figure 12). The freshness of the fractures suggests that an original layer of solid dolomite had been crushed during drilling. The absence of displaced pieces of dolomite above and below this interval is interpreted to indicate that the original layer was not noticeably different in thickness from that recovered.

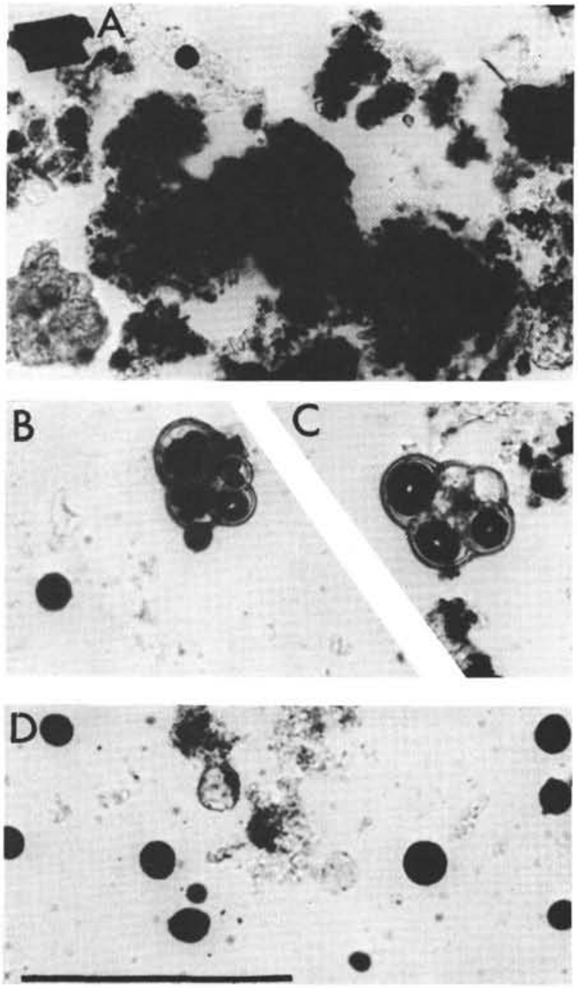

Figure 11. *Examples of iron sulfides from sapropelitic intervals in the sediment column. (A) shows pyritic growth around organic matter and mineral aggregates (125-3-4-38 cm). (B) and (C) illustrate typical in-filling of chambers in the tests of foraminifera (125-3-4-55 cm and 3-1-133 cm). Isolated spherules in (D) are in some cases casts freed from broken tests; however, the truly circular ones are probably primarily authigenic deposits. Scale bar represents 100 microns.*

This thin dolomitic crust overlies about forty meters of dark gray, finely laminated, calcite-poor (20 to 25 per cent) dolomitic marls. They are composed of quartz, minute anhedral dolomite crystals (Figure 13), and clays. The latter comprise illite, interstratified clays, montmorillonite, kaolinite, and chlorite. They are faintly to well bedded and plastic to brittle.

These marls are generally unfossiliferous except in their upper and lower parts. An unusual fauna is present at the top, immediately below the dolomite. This includes a poor assemblage of dwarfed planktonic and some benthonic foraminifera, the latter being shallow-water and littoral forms. Some of the benthonic foraminifera are abraded and suggest reworking in high energy environments. However, in the sand fraction there is no detritus from crystalline, metamorphic, or basaltic rocks, except for the usual trace amounts of quartz and an occasional mica flake. The only coarse material recognized was an interformational mud-chip conglomerate pried out from the clogged drill bit upon completion of Hole 125A. Pieces of the conglomerate, shown in Figure 14, contain both rounded and angular, gravel-size fragments of carbonate mud, dolostone, and selenite, set in a matrix of gypsum and carbonate silt. Occasional white gypsum nodules were recognized in the matrix along with patches of saccharoidal gypsum with ptygmatic displacement structures. Selenite crystals in the conglomerate are abraded and some pea-sized fragments of solid gypsum rock are exceptionally well rounded. Again, no rock fragments, either crystalline or metamorphic, were noted.

A single large (2 × 3 cm) piece of solid gypsum from the bit sample was sectioned and is illustrated in Figure 15. It has a saccharoidal texture of what Ogniben (1957) refers to as "alabastine" gypsum. Small anhydrite inclusions are sometimes present in fibrous patches which exhibit common polarization. Veins are seen which cut through the specimens and which are filled with intergrown plates, all showing the same optical orientation. Small residual laths of anhydrite are corroded, suggesting that the gypsiferous character of the rock may have been acquired through transformation from original anhydrite.

PHYSICAL PROPERTIES

The cores recovered from Holes 125 and 125A were largely disturbed. Some sections were void, due to loss of material during retrieval, others were "soupy" (Class 2); also, the high water content precluded measurement of *in situ* values. In the case of "flow-in" (Class 3), originally planar structures, such as laminae or color banding, were extended into long inverted U-shaped layers, and occasionally fragmented to pseudo-breccias.

Penetrometer measurements show great variation between 250.7 and 13.0 × 10^{-1} mm. The majority of readings lie between 80 and 160 × 10^{-1} mm in the upper 50 meters of the holes and between 30 and 80 × 10^{-1} in the lower 30 meters. Extreme values and high irregularity within sections may undoubtedly be attributed to disturbance in the cores; no readings were made on truly "soupy" sections. Thixotropy was recognized in some of the sediments, when the needle penetrated through to the core liner as it vibrated with the ship. A few detailed studies were

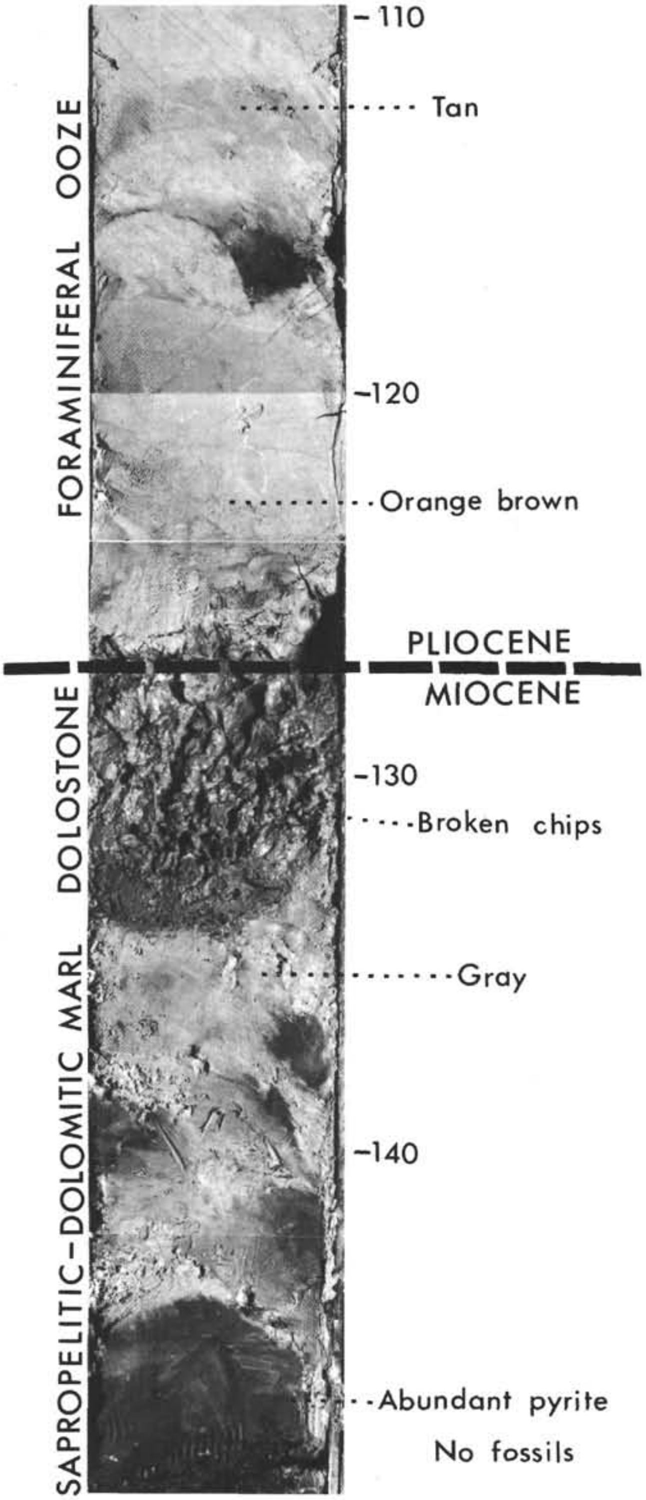

Figure 12. *The Miocene-Pliocene boundary in Section 1, Core 6 of Hole 125A. A brittle crust of dolostone, broken into fragments during the cutting of the core, marks a gap in sedimentation of perhaps 1-1/2 million years. Below we have a stiff dolomitic marl with abundant pyrite, gypsum, and pllen and also containing some quartz and mica. Benthonic foraminifera include shallow-water littoral species. This lithologic unit is tentatively correlated with the "marne argillose superiori" of the Messinian neostratotype (Selli, 1960). Above we have a purely biogenic sedimentation of the*

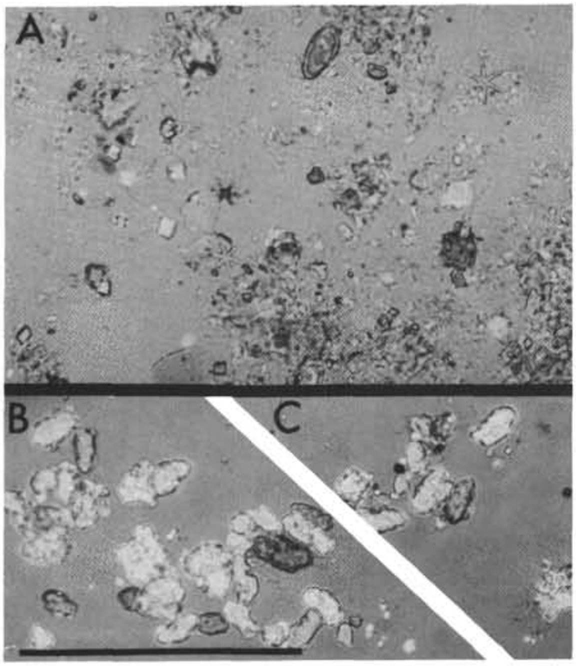

Figure 13. *Microphotographs of smear slide of the lithologies above (A) and below (B) and (C) the sedimentation gap in Section 1, Core 6 of Hole 125A (Figure 12). The Lower Pliocene biogenic sedimentation at 130 cm (from watery ooze mixed with crushed dolostone) contains calcareous nannoplankton (coccoliths and discoasters), some fine-grained mica and quartz and an appreciable number of dolomite rhombs. The carbonate content at 120 cm is 31.5 per cent. In contrast, the sample below at 136 cm is devoid of fossils, and consists almost entirely of anhedral dolomite. Scale bar represents 100 microns.*

made on board ship within sections where color sequences and lithological banding were noticed. In this case measurements were repeated in successive individual sediment cycles, for example in Core 1 of Hole 125, where brown oozes grading from a dark base upwards, are interbedded with yellow, green, and white clays. Similar lithologies often show consistent values, for example, in Core 2 of Hole 125A, where cycles of sedimentation are characterized by increasing penetrometer readings and thus a decrease in induration upward within each cycle.

The bulk densities have a small range of 1.61 to 1.75 gm/cm^3. There is no trend with depth, probably because of disturbance. Densities calculated from section weights appear to correspond reasonably well, except those in disturbed cores. Water content and porosity are a function of disturbance, values lying between 45.8 and 27.3 per cent and 67.2 and 44.6 per cent respectively, and varying inversely with penetrometer readings.

Natural gamma radiation readings fall mainly in the range 1900 to 3000 counts in the upper fifty meters of the sediment column. Most counts are around 1900 and 2000 in uniform nanno ooze, such as those of Core 2 of Hole 125. Sapropel beds gave count rates at peak values of 2800 to 3500 counts and could easily be distinguished from the oozes. These stagnant-water deposits contain considerable amounts of carbon, which has apparently absorbed radioactive materials. In Cores 6 and 7, carbon fragments are visible in the ooze and these produce peak counts of 2200 over a background count of 1700. Terrigenous sands and coarser deposits which are relatively depleted in calcium carbonate are registered at low count rates of around 1900. Measurements taken in the dolomitic marl from the evaporite series in Cores 6 and 9 of Hole 125A produce the highest rates at 3000 counts, indicating that this sedimentary unit would easily have been recognized by gamma-ray downhole logging.

SUMMARY AND CONCLUSIONS

The abandonment of Hole 125A with a plugged drillbit brought great disappointment to the shipboard staff. Gone were the hopes of recovering pre-evaporite sediments, and gone were the much sought after data which would tell us of the environmental setting of the Ionian Basin just prior to the Late Miocene crisis of salinity (Ruggieri, 1967). In fact nothing had been learned of the history of the eastern Mediterranean prior to about six million years ago. However, the *Glomar Challenger* had accomplished her primary goal of obtaining a continuous section of pelagic sediments down to the top of the evaporites, and the recovered materials were indeed fascinating.

The Sedimentary Hiatus – Regional or Local?

Much to our surprise, a single major hiatus was discovered and doubly confirmed by the drilling of two holes. This hiatus represents a complete gap in sedimentation of about 1½ my, from the termination of late Miocene evaporite deposition (125A-6-1, 136 cm), to the initiation of deposition of Lower Pliocene pelagic ooze.

That sediments accumulated in the Ionian Basin during the interval corresponding to this gap in sedimentation had already been shown by recovery of lowermost Pliocene foraminiferal limestone in piston core RC9-188 on the Mediterranean Ridge some 100 miles to the northwest of Site 125 (Biscaye *et al.,* 1971). Where was the missing sediment (that is, the interval of deposition from the *Sphaeroidinellopsis* Acme-zone to the *Globorotalia margaritae evoluta* Lineage-zone) beneath the track of the *Challenger*? We do not know. The seismic records of the *Challenger* and *Conrad* show 0.12 second of transparent sediments over Horizon M in the vicinity of the drill site. Assuming, conservatively, a compressional wave velocity in the soft Quaternary and Pliocene ooze of 1.6 km/sec, this would account for a sediment layer here approximately 96 meters thick. If we take the mean sedimentation rate of 2.5 $cm/10^3$ y (calculated for the recovered section), this accounts for precisely the 3.8 my extrapolated to in Figure 8 for the preserved sediment record at Site 125.

However, some ten miles west of Site 125, the post-Horizon M sediment thickness increases to 0.19 second, and across the Medina Rise (figure 4) it approaches 0.25 second. If more or less an equivalent rate of sediment accumulation had been in effect in these regions, then a complete Pliocene record could perhaps be found there.

In retrospect, the smooth relief of the Medina Rise–surface and subsurface–revealed along the *Challenger* approach line should have made this area more attractive for drilling. Nevertheless, the original committee-chosen site was drilled because it was not certain that the greater thickness across the Medina Rise did not merely represent unwanted intercalations of terrigenous detritus. This was suspected because of the marked wedging of the post-Horizon M transparent sedimentary layer against the Malta Escarpment, a phenomenon believed to be related to the action of deep geostrophic currents in the western Ionian Basin (Ryan *et al.,* 1967) and the presence of sand and silt layers in piston cores on the Messina Cone (Ryan and Heezen, 1965). Perhaps this caution led us to choose less than an ideal site for coring the entire Quaternary and Pliocene.

The Stratigraphic Record

The sections of ooze recovered from the two holes drilled contain a record without interruption through dozens of climatic cycles back into parts of the Pliocene hitherto completely unknown. The intermittent periods of stagnation are shown to extend well below the Glacial Pleistocene section. Siliceous microfossils were found to be virtually absent except in the evaporite section. For a preliminary discussion of the Quaternary and Pliocene history of the Mediterranean, as deduced from our first examination of the cores from this site, the reader is referred to Chapters 46 and 47, respectively, of this volume.

The Evaporite Facies

The dolomitic marls of Cores 6 through 9 of Hole 125A and samples from the drill bit of the same hole are remarkably similar to those recovered at Site 124 on the Balearic Rise in the western Mediterranean. They are generally barren of microfossils except in a few scattered lenses of silt-size debris, and along thin, dark, bituminous laminae where diatoms occur. The fauna, as also was the case for Site 124, consists of shallow-water littoral benthonic foraminifera and occasional dwarfed planktonic specimens. The diatoms include *Melosira granulata, Coscinodiscus* cf. *C. miocaenicus* and *Navicula* sp.[7] Besides being diagnostic of the Late Miocene, these forms prefer fresh- to brackish-water environments, and we may speculate that they co-existed in wide-spread alkaline lakes in the Ionian Basin with the well-known late Messinian *Melanopsis-Cyprides* fauna (Ruggieri, 1958) (see also Chapter 36.2 of this Volume).

The gypsum-chip conglomerate shown in Figure 14 signifies a high-energy clastic environment (Hardie and Eugster, 1971). The gravel components within the conglomerate, like those found at Site 122 in the Valencia Trough (see Chapter 4) are indigenous to the ridge province. This debris can be considered terrestrial *sensu stricto,* but we have noted no sialic or simatic source for it. Our only satisfactory explanation is sub-aerial erosion of a formerly marine, and then parched Mediterranean Ridge.

Cobblestone Topography

The exceedingly hummocky texture of the Mediterranean Ridge topography had been a subject of discussion for many years (Hersey, 1965; Emery *et al.,* 1966). This characteristic morphology had been coined "cobblestone" topography, a term Ryan *et al.* (1971) objected to as misleading because no cobbles, boulders, or rocks had ever been cored or photographed on the sea bed here. The latter authors interpreted the broken up relief to be the end product of extensive widespread tectonism. Maybe the criticism and alternate explanation are also unfounded.

The discovery of a conglomerate rock unit with components and matrix derived from the local deep sea bed is indeed unusual, particularly when individual pieces were clearly lithified before erosion and subsequent weathering and abrasion. In addition, the secondary "alabastine" gypsum from the drill bit sample of Hole 125A points to a replacement phase in the evaporites that may have required significant ground water activity and which generally is believed to be accompanied by large volume changes (Ogniben, 1956). We will discuss and defend later, in Chapter 43, an hypothesis that the so-called "cobblestone" topography is none other than a regional karst surface over an eroded and "metamorphized" evaporite formation widespread throughout the Mediterranean deep-sea basins.

We have no way of ascertaining from the core data or from the present geophysical measurements whether or not the gap in sedimentation in the Lower Pliocene is related to local faulting or sliding during a post-Miocene period of karst development. This may be a more reasonable explanation than calling upon vigorous deep-sea currents to prevent deposition there or, alternatively, to call upon activity of near-sea floor currents to remove already accumulated Lower Pliocene sediment. The only case that can be made for erosion is a very occasional upward-reworked benthonic foraminifer, and the presence of dolomite as a small, but consistent fine-grain component in the Lower Pliocene nanno oozes. However, on no occasion were "foraminifera pavements" or current bedding primary structures seen in the recovered cores, nor was any other property recognized that is indicative of erosion or traction-transport. All the various biohorizons and zones that should have been present, were. They were always in their right order, and

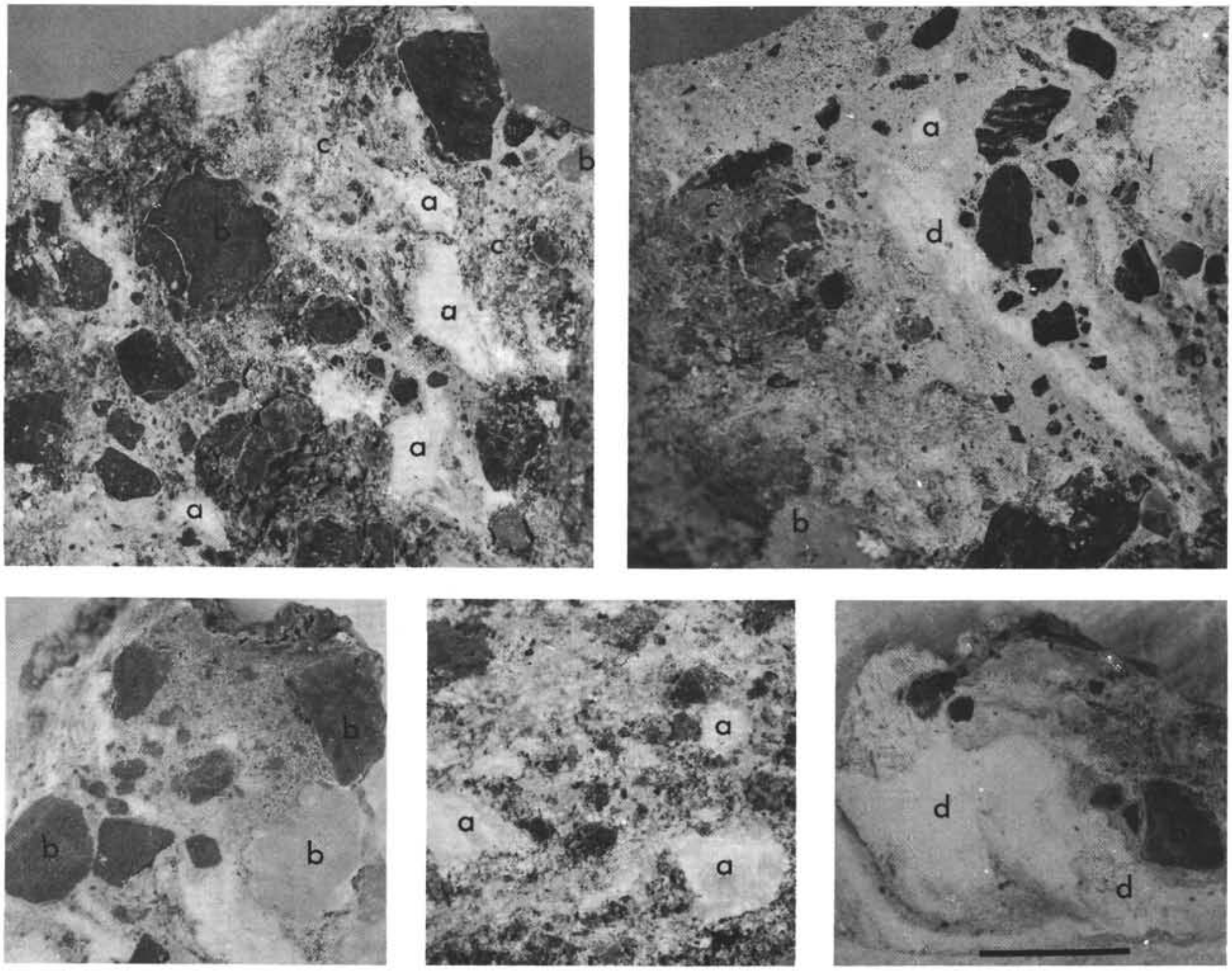

Figure 14. *Gypsum-chip conglomerate containing pebbles, occasionally rounded, of alabastrine gypsum (a) (saccharoidal in appearance), dolostone (b), partly lithified dolomitic shale (c), and minor amounts of quartz. Note the development of enterolithic folding (d) of white secondary gypsum in the host sediment in several of the conglomerate fragments. Samples from the drill bit of Hole 125A. Scale bar represents 1 cm.*

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[8] A study of diatoms from the drill bit samples of Hole 125A was undertaken by Lloyd H. Burckle, the Lamont-Doherty Geological Observatory of Columbia University, and his findings and conclusions have kindly been provided for discussion here.

their relative thicknesses were very close to those predicted from the study of an independent drill hole (Site 132) in a separate basin of the Mediterranean Sea (Tyrrhenian Basin).

Comments on the Ancient Depositional Environments

The first permanently deposited Lower Pliocene biogenic ooze at Site 125 (i.e., Core 6, Section 1, 130 cm of Hole 125A; Figures 12 and 13) is of a sedimentary facies not discernably different than that accumulating today. The site was deep, far removed from land, isolated from turbidity currents, tranquil, and well ventilated. Mottling in the ooze suggests that the sea bed was populated with bottom-dwellers. The benthonic foraminifera, though rare, are indicative of a bathyal realm.

The absence of psychrospheric ostracods in the Pliocene sediments here suggests that the Mediterranean Ridge at that time did not share the cold bottom waters of the western Mediterranean Basins (Benson, in press). The sporadic occurrences of sapropels, commencing about two and one half million years ago, provides proof that barriers existed between the eastern and western basins, permitting the former to occasionally become stagnant and anaerobic. Shards of glass, sometimes in discrete layers, attest to explosive volcanic eruptions along ancient tectonic belts (Ninkovich and Hays, in press).

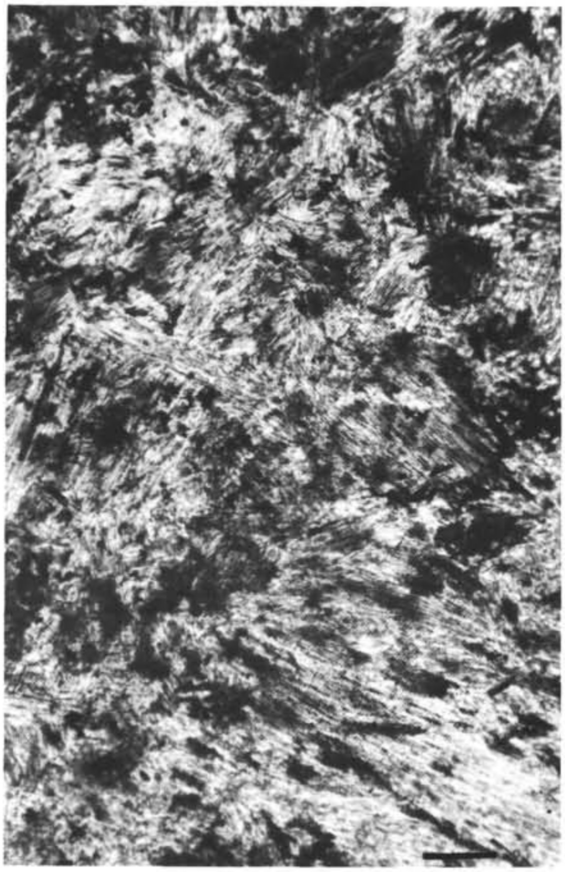

Figure 15. *Alabastrine secondary gypsum, crossed nicols. Scale bar represents 100 microns.*

The day-by-day rainfall of biogenous products from surface water productivity and accompanying finely-dispersed clay minerals and other components of wind-blown origin, contrasts markedly with whatever conditions we can imagine for the Late Miocene during the growth of enterolithic anhydrite in tidal flats and the sub-aerial erosion of the ridge itself, not to mention the precipitation of carbonates in alkaline lakes.

ACKNOWLEDGMENTS

Our conclusions were made possible only with the help of a number of collaborating scientists. We acknowledge here their much appreciated work, as well as their interest in the various investigations. The persons to whom we are particularly grateful include: M. A. Chierici, AGIP Mineraria, Milano; N. Ciaranfi, Institute of Geology, University of Bari; S. d'Onofrio, Institute of Geology, University of Bologna; J. Flood, Lamont-Doherty Geological Observatory of Columbia University; and A. Longinelli, Laboratory of Nuclear Geology, University of Pisa.

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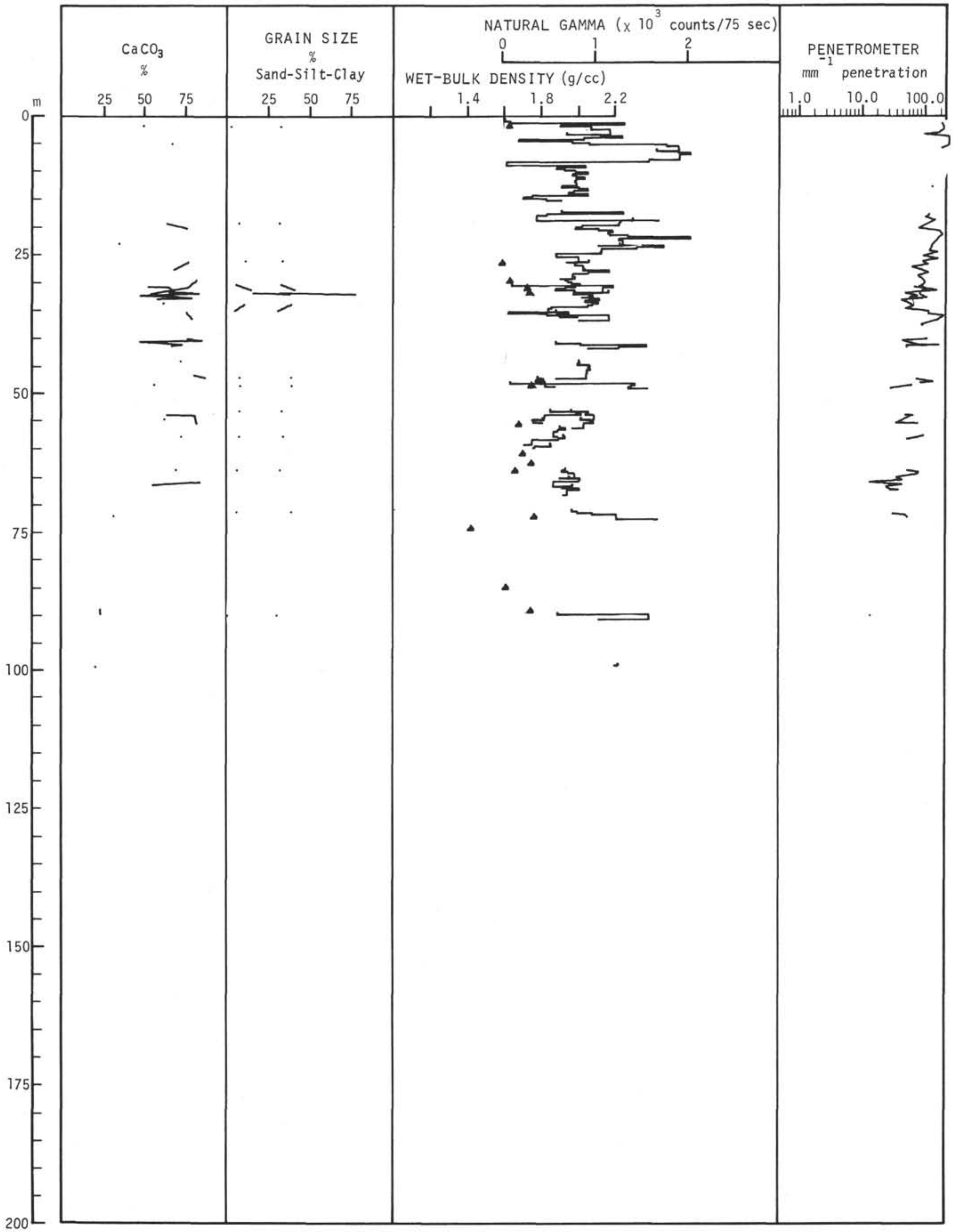
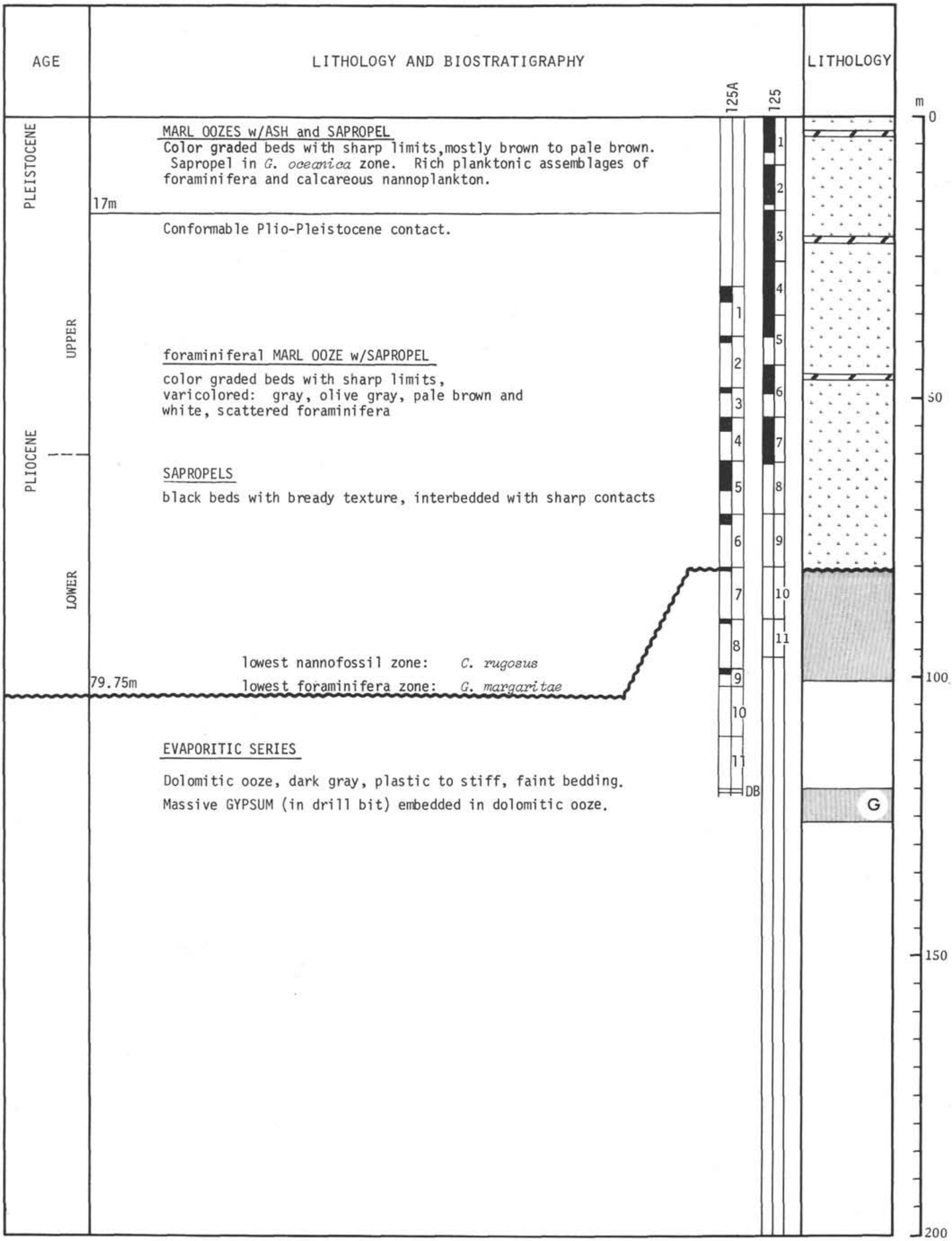
Site Summary 125





MARL OOZES w/ASH and SAPROPEL

Color graded beds with sharp limits, mostly brown to pale brown. Sapropel in *G. oceanica* zone. Rich planktonic assemblages of foraminifera and calcareous nannoplankton.

Conformable Plio-Pleistocene contact.

foraminiferal MARL OOZE w/SAPROPEL

color graded beds with sharp limits, varicolored: gray, olive gray, pale brown and white, scattered foraminifera

SAPROPELS

black beds with bready texture, interbedded with sharp contacts

lowest nannofossil zone: *C. rugosus*

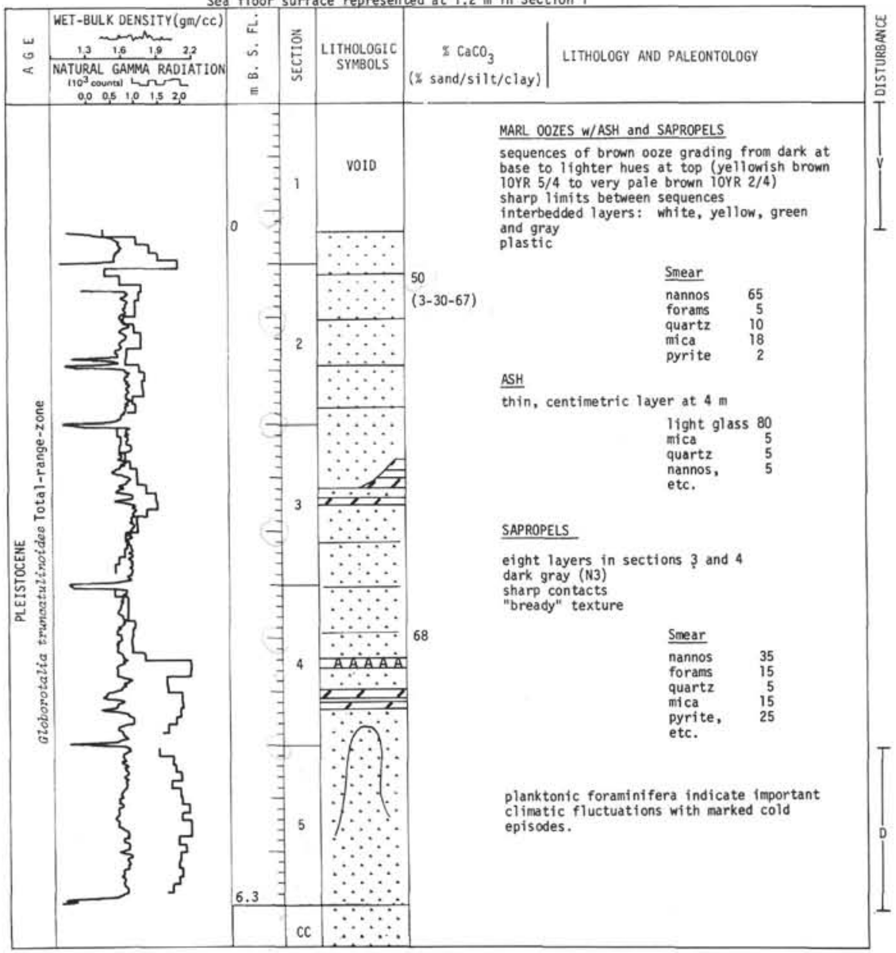
lowest foraminifera zone: *G. margaritae*

EVAPORITIC SERIES

Dolomitic ooze, dark gray, plastic to stiff, faint bedding.

Massive GYPSUM (in drill bit) embedded in dolomitic ooze.

SITE 125 CORE 1 Cored Interval 0-8 m
Sea floor surface represented at 1.2 m in Section 1



MARL OOZES w/ASH and SAPROPELS

sequences of brown ooze grading from dark at base to lighter hues at top (yellowish brown 10YR 5/4 to very pale brown 10YR 2/4)
sharp limits between sequences
interbedded layers: white, yellow, green and gray
plastic

Smear	
nannos	65
forams	5
quartz	10
mica	18
pyrite	2

ASH

thin, centimetric layer at 4 m

light glass	80
mica	5
quartz	5
nannos,	5
etc.	

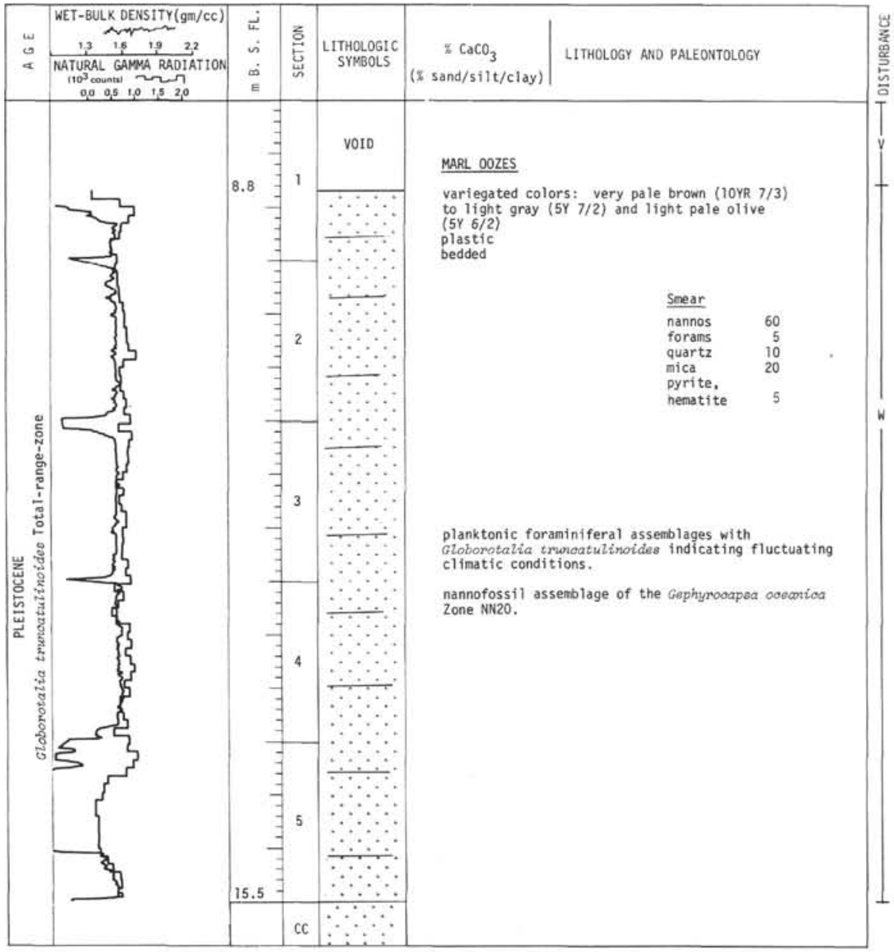
SAPROPELS

eight layers in sections 3 and 4
dark gray (N3)
sharp contacts
"bready" texture

Smear	
nannos	35
forams	15
quartz	5
mica	15
pyrite,	25
etc.	

planktonic foraminifera indicate important climatic fluctuations with marked cold episodes.

SITE 125 CORE 2 Cored Interval 8-17 m



MARL OOZES

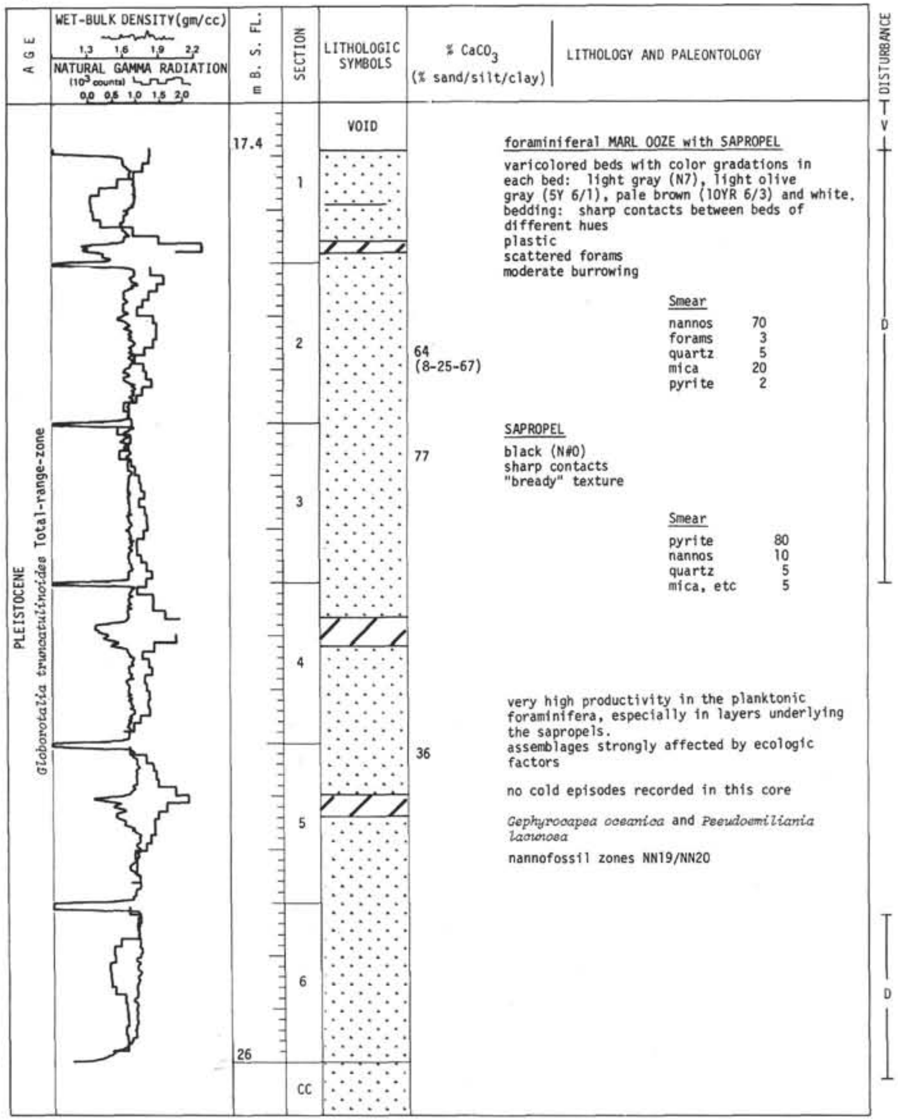
variegated colors: very pale brown (10YR 7/3) to light gray (5Y 7/2) and light pale olive (5Y 6/2)
plastic
bedded

Smear	
nannos	60
forams	5
quartz	10
mica	20
pyrite,	
hematite	5

planktonic foraminiferal assemblages with *Globorotalia truncatulinoides* indicating fluctuating climatic conditions.

nannofossil assemblage of the *Gephyrocapsa oceanica* Zone NN20.

SITE 125 CORE 3 Cored Interval 17-26 m



<u>foraminiferal MARL OOZE with SAPROPEL</u>

varicolored beds with color gradations in each bed: light gray (N7), light olive gray (5Y 6/1), pale brown (10YR 6/3) and white.
bedding: sharp contacts between beds of different hues
plastic
scattered forams
moderate burrowing

<u>Smear</u>

nannos	70
forams	3
quartz	5
mica	20
pyrite	2

<u>SAPROPEL</u>

black (N#0)
sharp contacts
"bready" texture

<u>Smear</u>

pyrite	80
nannos	10
quartz	5
mica, etc	5

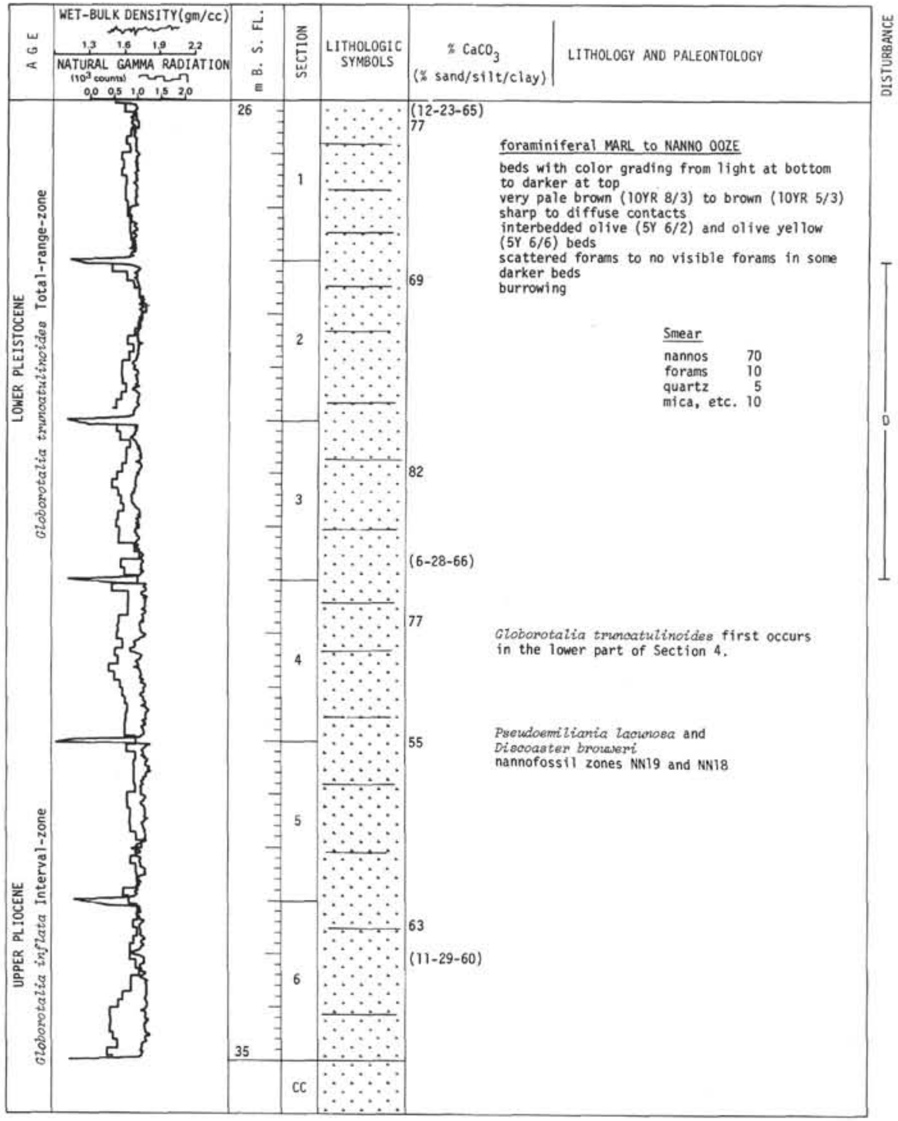
very high productivity in the planktonic foraminifera, especially in layers underlying the sapropels.
assemblages strongly affected by ecologic factors

no cold episodes recorded in this core

Gephyrocapsa oceanica and *Pseudoemiliania lacunosa*

nannofossil zones NN19/NN20

SITE 125 CORE 4 Cored Interval 26-35 m



<u>foraminiferal MARL to NANNO OOZE</u>

beds with color grading from light at bottom to darker at top
very pale brown (10YR 8/3) to brown (10YR 5/3)
sharp to diffuse contacts
interbedded olive (5Y 6/2) and olive yellow (5Y 6/6) beds
scattered forams to no visible forams in some darker beds
burrowing

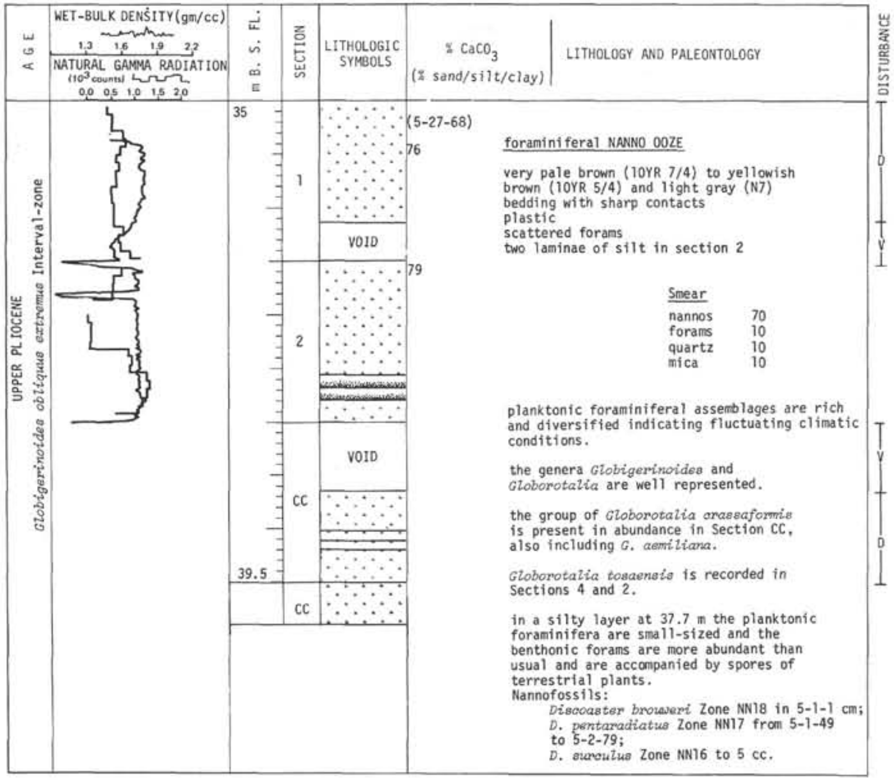
<u>Smear</u>

nannos	70
forams	10
quartz	5
mica, etc.	10

Globorotalia truncatulinoides first occurs in the lower part of Section 4.

Pseudoemiliania lacunosa and *Discoaster brouweri*
nannofossil zones NN19 and NN18

SITE 125 CORE 5 Cored Interval 35-44 m



(5-27-68)

76

79

foraminiferal NANNO OOZE

very pale brown (10YR 7/4) to yellowish brown (10YR 5/4) and light gray (N7)
bedding with sharp contacts
plastic
scattered forams
two laminae of silt in section 2

Smear	
nannos	70
forams	10
quartz	10
mica	10

planktonic foraminiferal assemblages are rich and diversified indicating fluctuating climatic conditions.

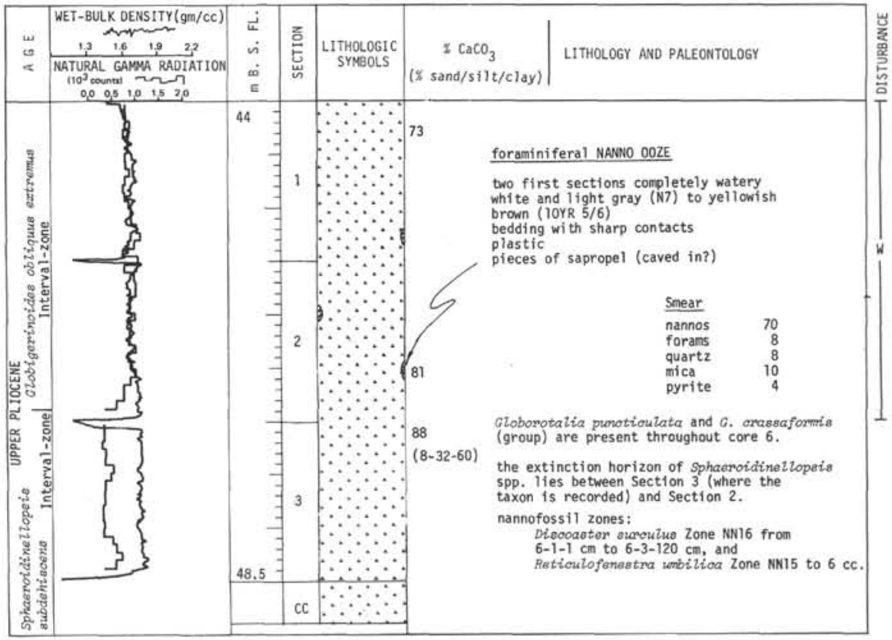
the genera *Globigerinoides* and *Globorotalia* are well represented.

the group of *Globorotalia crassaformis* is present in abundance in Section CC, also including *G. aemiliana*.

Globorotalia tosaensis is recorded in Sections 4 and 2.

in a silty layer at 37.7 m the planktonic foraminifera are small-sized and the benthonic forams are more abundant than usual and are accompanied by spores of terrestrial plants.
Nannofossils:
Discoaster browweri Zone NN18 in 5-1-1 cm;
D. pentaradiatus Zone NN17 from 5-1-49 to 5-2-79;
D. surculus Zone NN16 to 5 cc.

SITE 125 CORE 6 Cored Interval 44-53 m



73

81

88

(8-32-60)

foraminiferal NANNO OOZE

two first sections completely watery
white and light gray (N7) to yellowish brown (10YR 5/6)
bedding with sharp contacts
plastic
pieces of sapropel (caved in?)

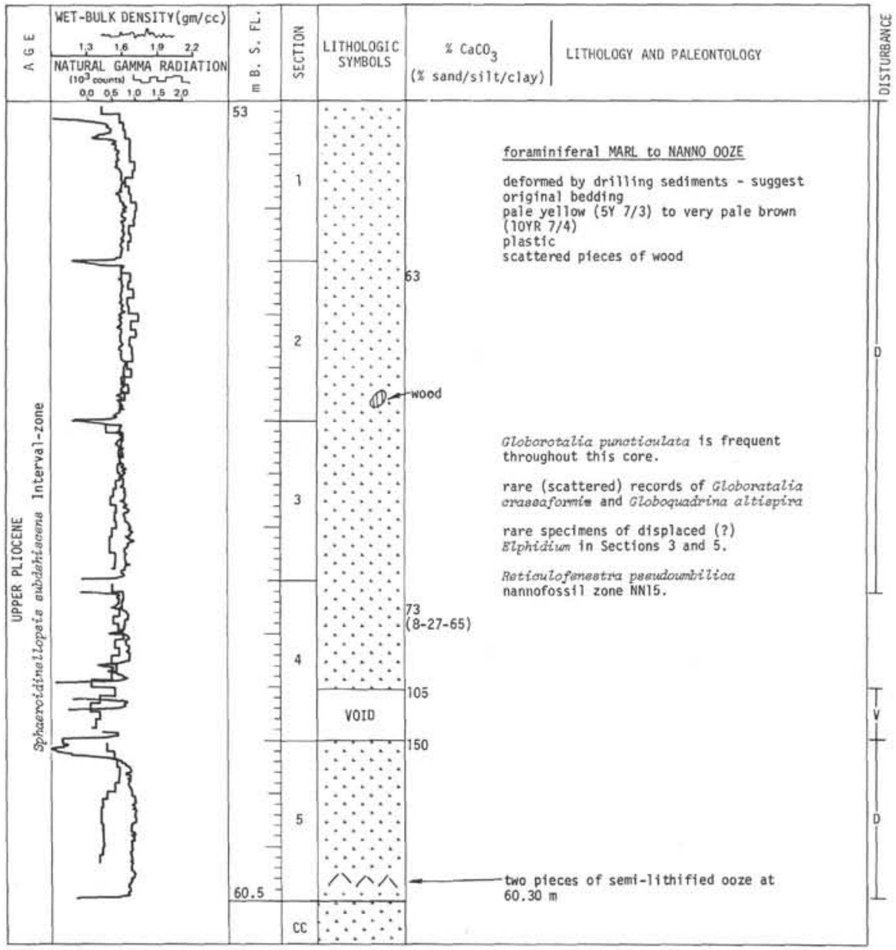
Smear	
nannos	70
forams	8
quartz	8
mica	10
pyrite	4

Globorotalia puncticulata and *G. crassaformis* (group) are present throughout core 6.

the extinction horizon of *Sphaeroidinellopsis* spp. lies between Section 3 (where the taxon is recorded) and Section 2.

nannofossil zones:
Discoaster surculus Zone NN16 from 6-1-1 cm to 6-3-120 cm, and
Reticulofenestra umbilica Zone NN15 to 6 cc.

SITE 125 CORE 7 Cored Interval 53-62 m



foraminiferal MARL to NANNO OOZE

deformed by drilling sediments - suggest original bedding
pale yellow (5Y 7/3) to very pale brown (10YR 7/4)
plastic
scattered pieces of wood

Globorotalia puncticulata is frequent throughout this core.

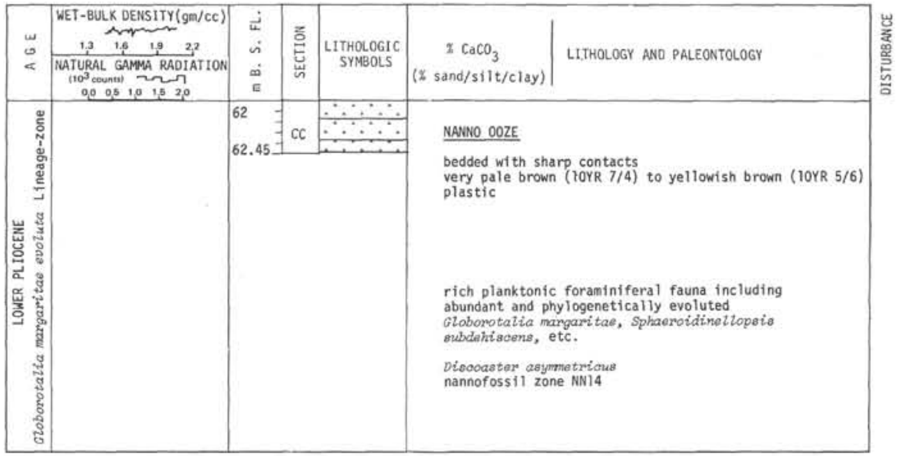
rare (scattered) records of *Globoratalia crassaformis* and *Globoquadrina altispira*

rare specimens of displaced (?) *Elphidium* in Sections 3 and 5.

Reticulofenestra pseudoumbilica
nannofossil zone NN15.

two pieces of semi-lithified ooze at 60.30 m

SITE 125 CORE 8 Cored Interval 62-71 m



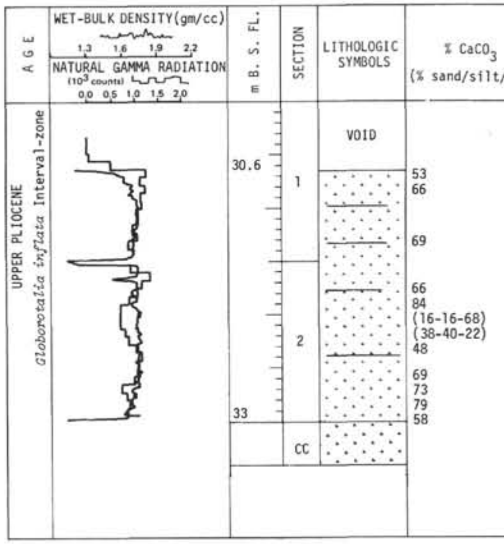
NANNO OOZE

bedded with sharp contacts
very pale brown (10YR 7/4) to yellowish brown (10YR 5/6)
plastic

rich planktonic foraminiferal fauna including abundant and phylogenetically evoluted *Globorotalia margaritae*, *Sphaeroidinellopsis subdehiscens*, etc.

Discoaster asymmetricus
nannofossil zone NN14

SITE 125 A CORE 1 Cored Interval 30-39.2 m



foraminiferal MARL to NANNO OOZE

beds of variegated colors
light gray (N7), greenish gray (5GY 6/1),
greenish purple (5P 4/2) to very pale brown (10YR 7/3)
sharp contacts between beds
plastic
burrowing
high $CaCO_3$: 60 to 80%

Smear

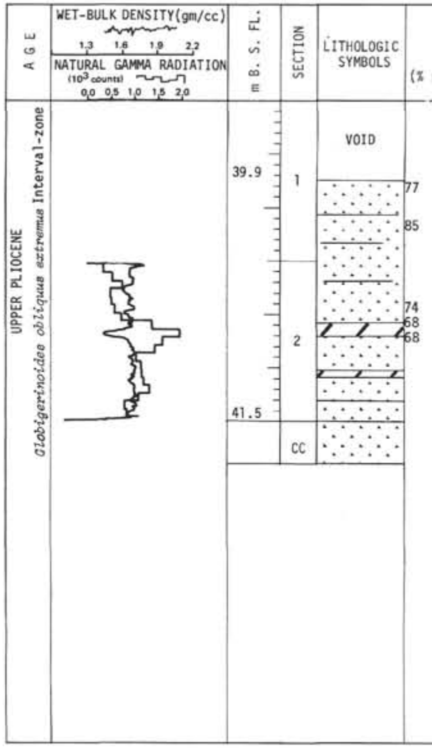
nannos	70
forams	2
quartz	5
micas	10
pyrite, etc.	5

Globigerinoides spp. very abundant, indicating climatic fluctuations.

Globorotalia crassaformis is recorded in the lower part of Section 2.

Discoaster brouweri nannofossil Zone NN18.

SITE 125A CORE 2 Cored Interval 39.2-48 m



foraminiferal NANNO OOZE w/SAPROPEL

beds of variegated colors separated by sharp contacts
color gradation in some beds: darker hues at bottom
brown (7.5YR 5/4) to very pale brown (10YR 8/3)
and light gray (N7)
plastic
mottling

SAPROPEL

two beds, 0.5 and 5 cm thick, in section 2
black, laminated
sharp contacts
burrowing

Smear (Sapropel)

nannos	45
forams	25
quartz	7
mica	10
pyrite	15
Fe oxides	8

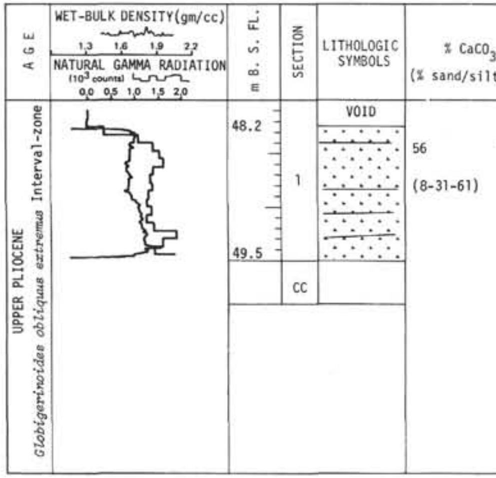
Globigerinoides spp., including tropical species, are present in variable amounts, indicating climatic fluctuations.

The sapropel layers of Section 2 are located along warming trends.

Globorotalia aemiliana is recorded as frequent in the core catcher sample.

Nannofossil zones:
Discoaster brouweri Zone NN18 from 2-1-1 cm to 2-1-140 cm.
Discoaster pentaradiatus Zone NN17 to 2-2-79 cm.

SITE 125A CORE 3 Cored Interval 48-53 m



foraminiferal MARL to NANNO OOZE

beds of variegated colors with sharp contacts
light olive gray (5Y 6/1), light brownish gray (5YR 6/1)
plastic
burrowing
foram loaded bed at bottom

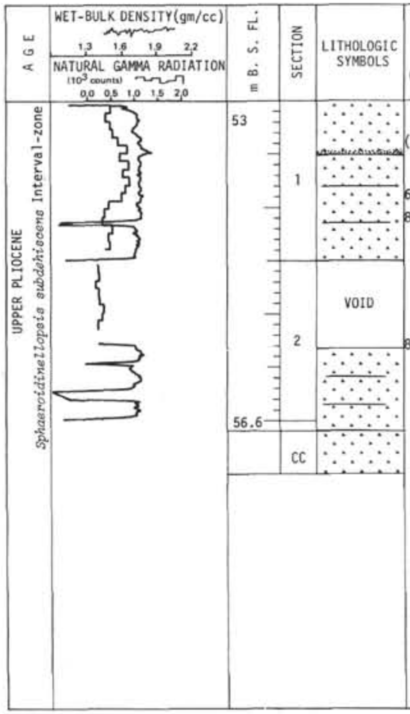
Smear

nannos	60
forams	8
quartz	10
mica	20
pyrite	2

Globorotalia puncticulata and *G. bononiensis* are recorded.

Discoaster surculus nannofossil zone NN16

SITE 125A CORE 4 Cored Interval 53-62 m



% $CaCO_3$ (% sand/silt/clay)

LITHOLOGY AND PALEONTOLOGY

DISTURBANCE

(8-26-66)

64

81

82

NANNO OOZE

beds with color grading: darker hues at bottom
mainly orange with yellowish gray (5Y 7/2),
brownish yellow (10YR 6/6), redish yellow
(7.5YR 7/6) and white
diffuse boundaries
scattered forams
one single layer of silt
moderate burrowing

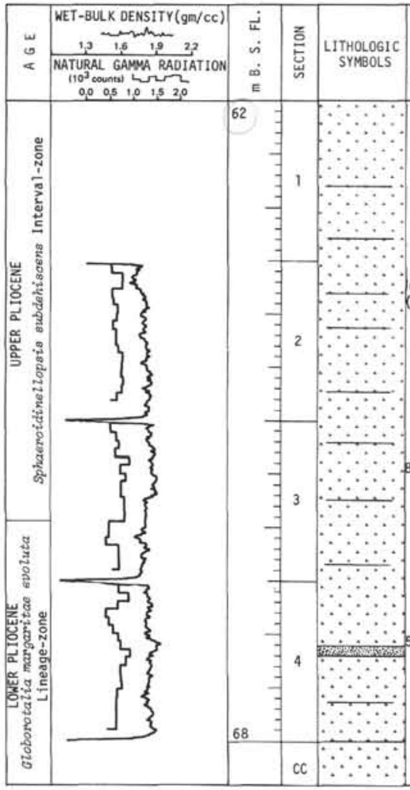
Smear

nannos	70
discoasters	8
forams	3
mica	10
pyrite	5
hematite, etc.	4

V

Globorotalia puncticulata is the most conspicuous representative of the genus in Core 4, which yielded specimens of *Sphaeroidinellopsis seminulina* and *S. subdehiscens* in every sample investigated. *Globoquadrina altispira* is recorded at some intervals with rare specimens. Nannoplankton of the *Reticulofenestra pseudoumbilica* Zone NN15.

SITE 125A CORE 5 Cored Interval 62-71 m



% $CaCO_3$ (% sand/silt/clay)

LITHOLOGY AND PALEONTOLOGY

DISTURBANCE

69

(6-26-68)

84

55

NANNO OOZE

beds of alternate colors
mainly orange-brown and yellowish red (5YR 5/8)
sharp contacts
layer of foraminiferal sand in section 4

Smear

nannos	70
discoaster	10
forams	2
mica	10
pyrite, etc.	2

W

D

D

The highest range of *Globorotalia margaritae* (cum var) is in Section 3 at 118-121 cm.

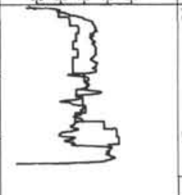
Globorotalia puncticulata is frequent throughout.

Globoquadrina altispira abundant in Sections 3 and 4.

Nannofossil zones:

Reticulofenestra pseudoumbilica
Zone NN15 from 1-1 cm to 3-40 cm.
Discoaster asymmetricus
Zone NN14 of the Lower Pliocene from 4-40 cm to 5 cc.

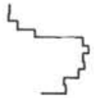
SITE 125A CORE 6 Cored Interval 71-80 m

AGE	WET-BULK DENSITY(gm/cc) 1.3 1.6 1.9 2.2 NATURAL GAMMA RADIATION (10^3 counts) 0.0 0.5 1.0 1.5 2.0	m B. S. FL.	SECTION	LITHOLOGIC SYMBOLS	% CaCO$_3$ (% sand/silt/clay)	LITHOLOGY AND PALEONTOLOGY	DISTURBANCE
LOWER PLIOCENE *Globorotalia margaritae evoluta* Lineage-zone UPPER MIOCENE		71 72.3 72.6	1 CC		(6-33-61) 32	71-72.3 m: NANNO OOZE (as core 5A) 72.3-72.35 m: DOLOMITE indurated, olive gray (5Y 6/1) 72.35-72.60 m: DOLOMITIC OOZE bedded olive gray (5Y 6/1) plastic X-rays dolomite quartz Tr. clays Tr. halite Tr. gypsum Tr. pelagic sedimentation of the Lower Pliocene is deep-water and open marine and begins at 127 cm in Section 1. sapropel with spores of terrestrial plants in the core catcher. *Ceratolithus rugosus* nannofossil zone NN13.	

SITE 125 A CORE 7 Cored Interval 80-89 m

AGE	WET-BULK DENSITY(gm/cc) 1.3 1.6 1.9 2.2 NATURAL GAMMA RADIATION (10^3 counts) 0.0 0.5 1.0 1.5 2.0	m B. S. FL.	SECTION	LITHOLOGIC SYMBOLS	% CaCO$_3$ (% sand/silt/clay)	LITHOLOGY AND PALEONTOLOGY	DISTURBANCE
UPPER MIOCENE (by correlation)		81.1 81.5	CC	VOID	(0-30-70) 23	DOLOMITIC OOZE no visible structures medium dark gray (N4) plastic to stiff Smear: dolomite 80, quartz 10, nannos 10, pyrite X-rays: quartz, dolomite barren of microfossils	V

SITE 125A CORE 8 Cored Interval 89-98 m

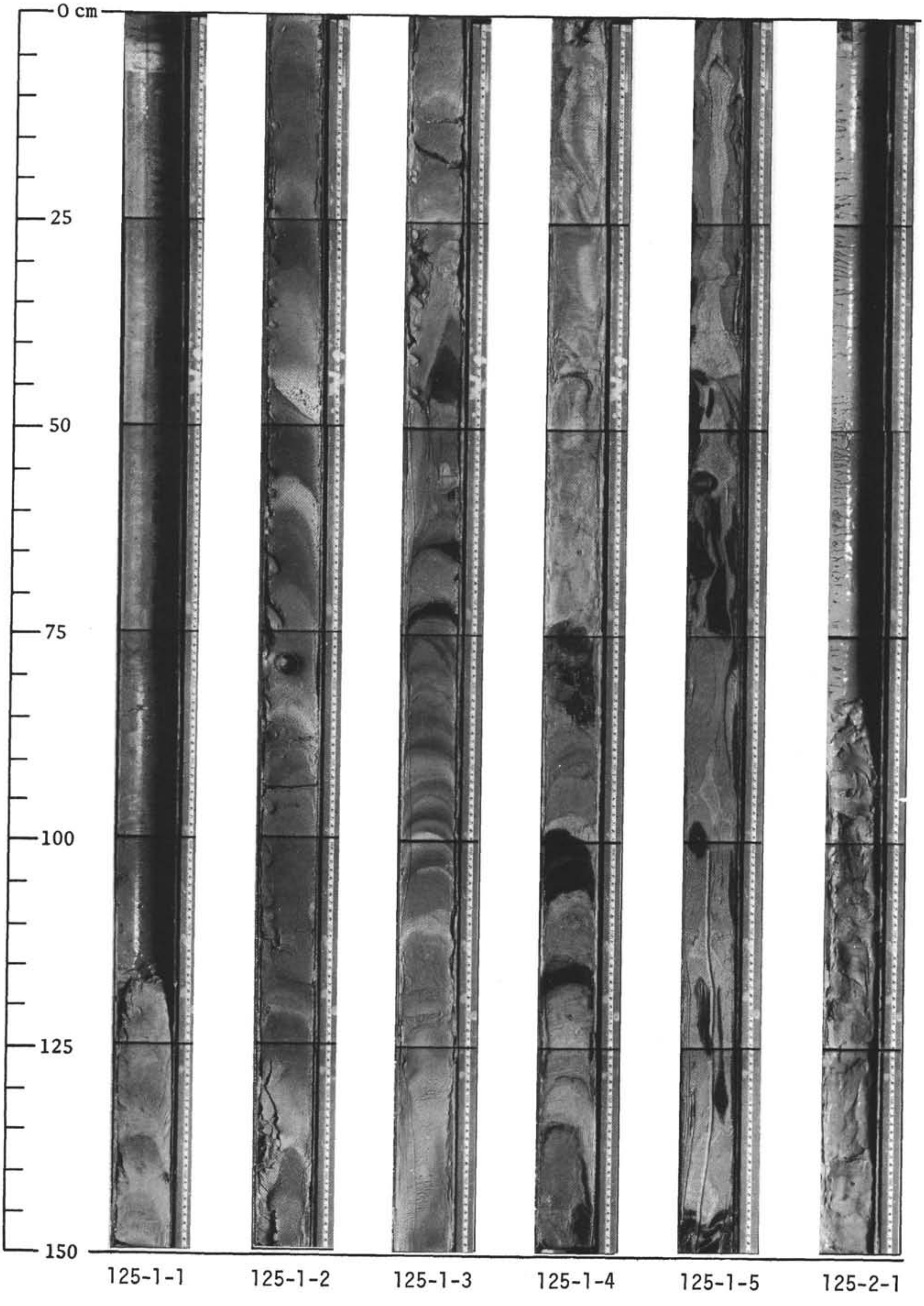
AGE	WET-BULK DENSITY(gm/cc) 1.3 1.6 1.9 2.2 NATURAL GAMMA RADIATION (10^3 counts) 0.0 0.5 1.0 1.5 2.0	m B. S. FL.	SECTION	LITHOLOGIC SYMBOLS	% CaCO$_3$ (% sand/silt/clay)	LITHOLOGY AND PALEONTOLOGY	DISTURBANCE
UPPER MIOCENE (by correlation)		89.8 90.5	1 CC	VOID	24	DOLOMITIC OOZE dark medium gray (N4) plastic to stiff faint bedding pyrite barren of microfossils	V

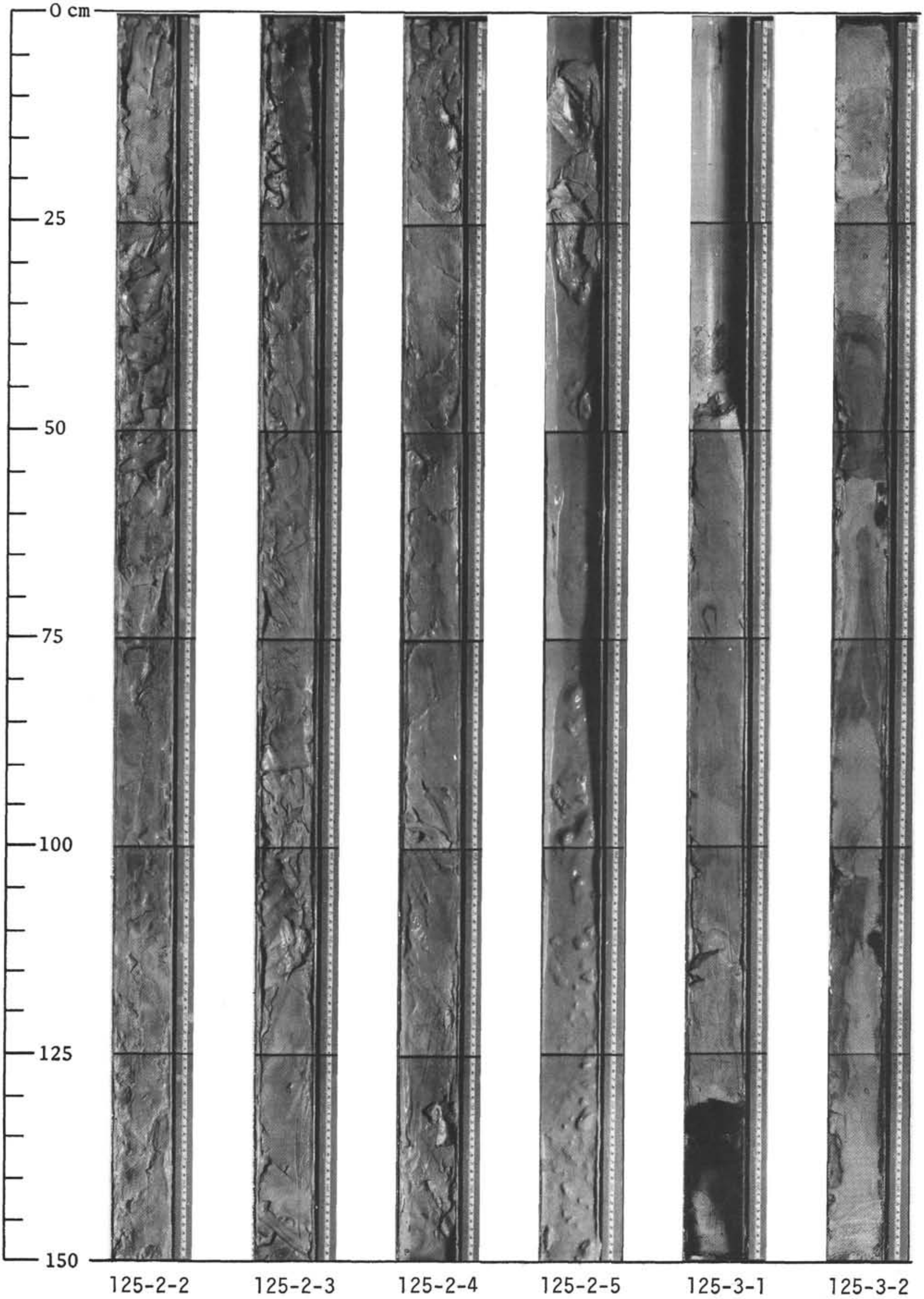
SITE 125A CORE 9 Cored Interval 98-102 m

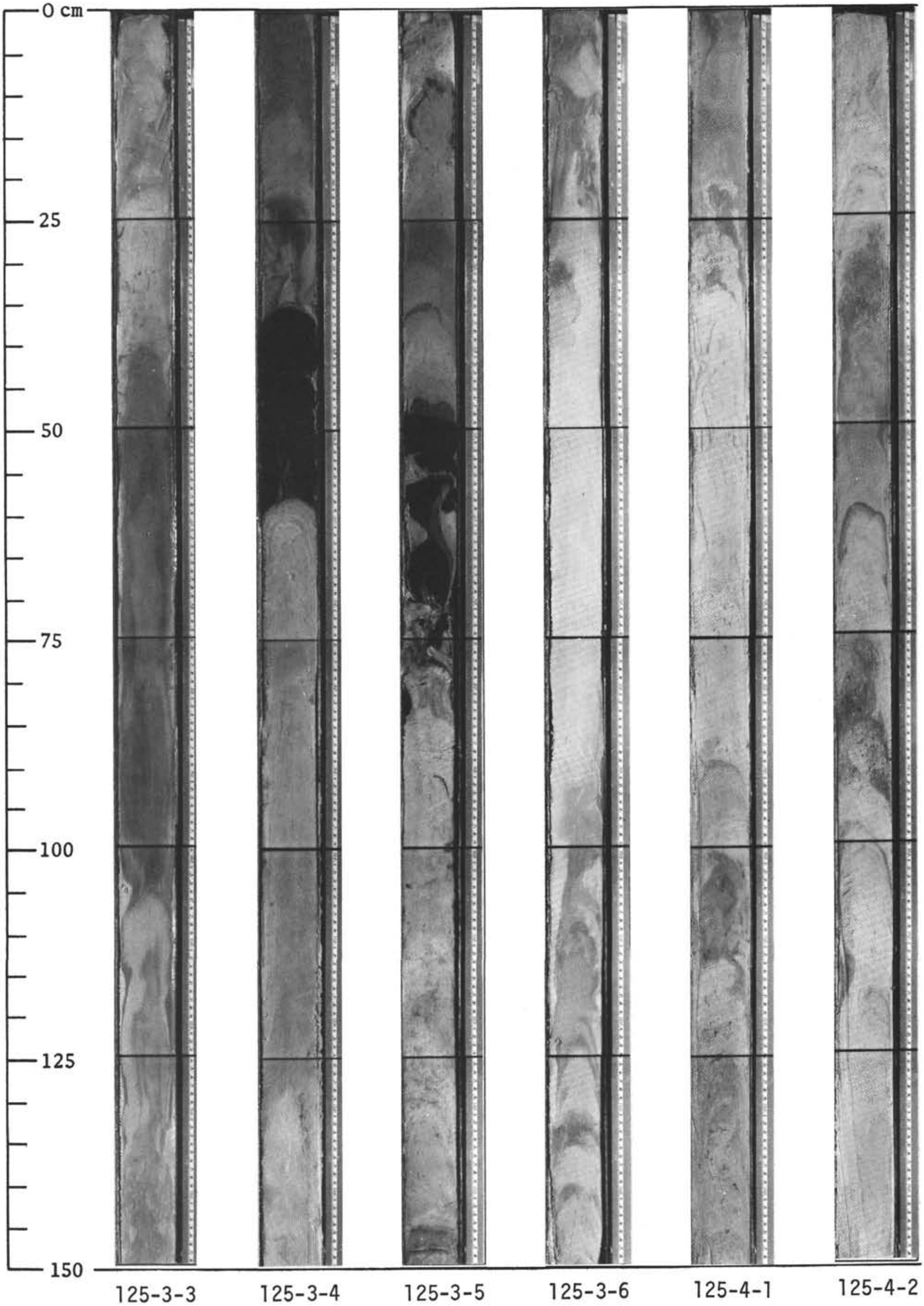
AGE	WET-BULK DENSITY(gm/cc) 1.3 1.6 1.9 2.2 NATURAL GAMMA RADIATION (10^3 counts) 0.0 0.5 1.0 1.5 2.0	m B. S. FL.	SECTION	LITHOLOGIC SYMBOLS	% CaCO$_3$ (% sand/silt/clay)	LITHOLOGY AND PALEONTOLOGY	DISTURBANCE
UPPER MIOCENE (by correlation)		99 99.5	CC	VOID	20	DOLOMITIC OOZE dark medium gray (N4) plastic to stiff (brittle) faint bedding pyrite X-rays dolomite quartz clays Tr. calcite Tr. barren of microfossils	V

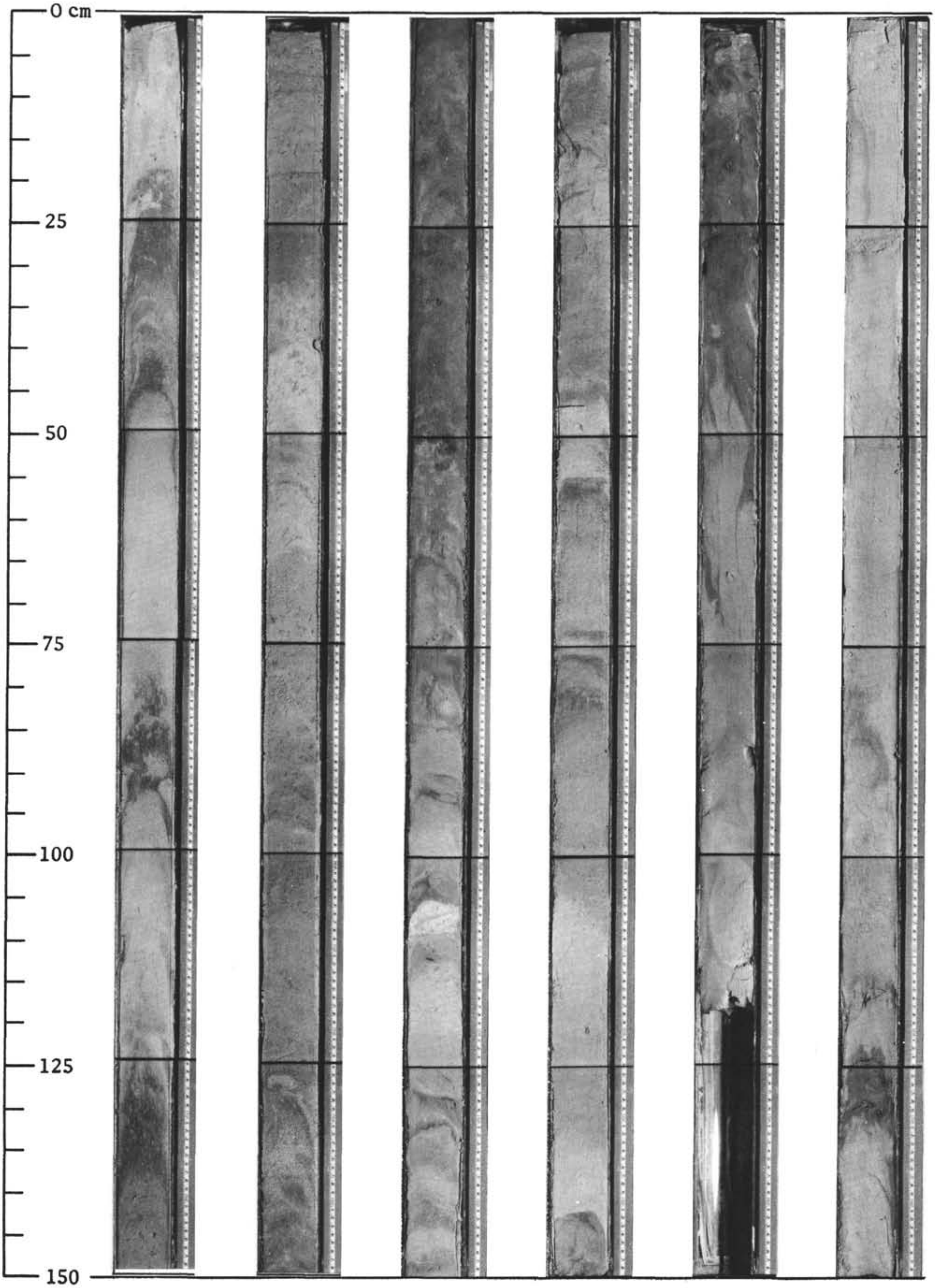
SITE 125A CORE Drill Bit Cored Interval · 121 m

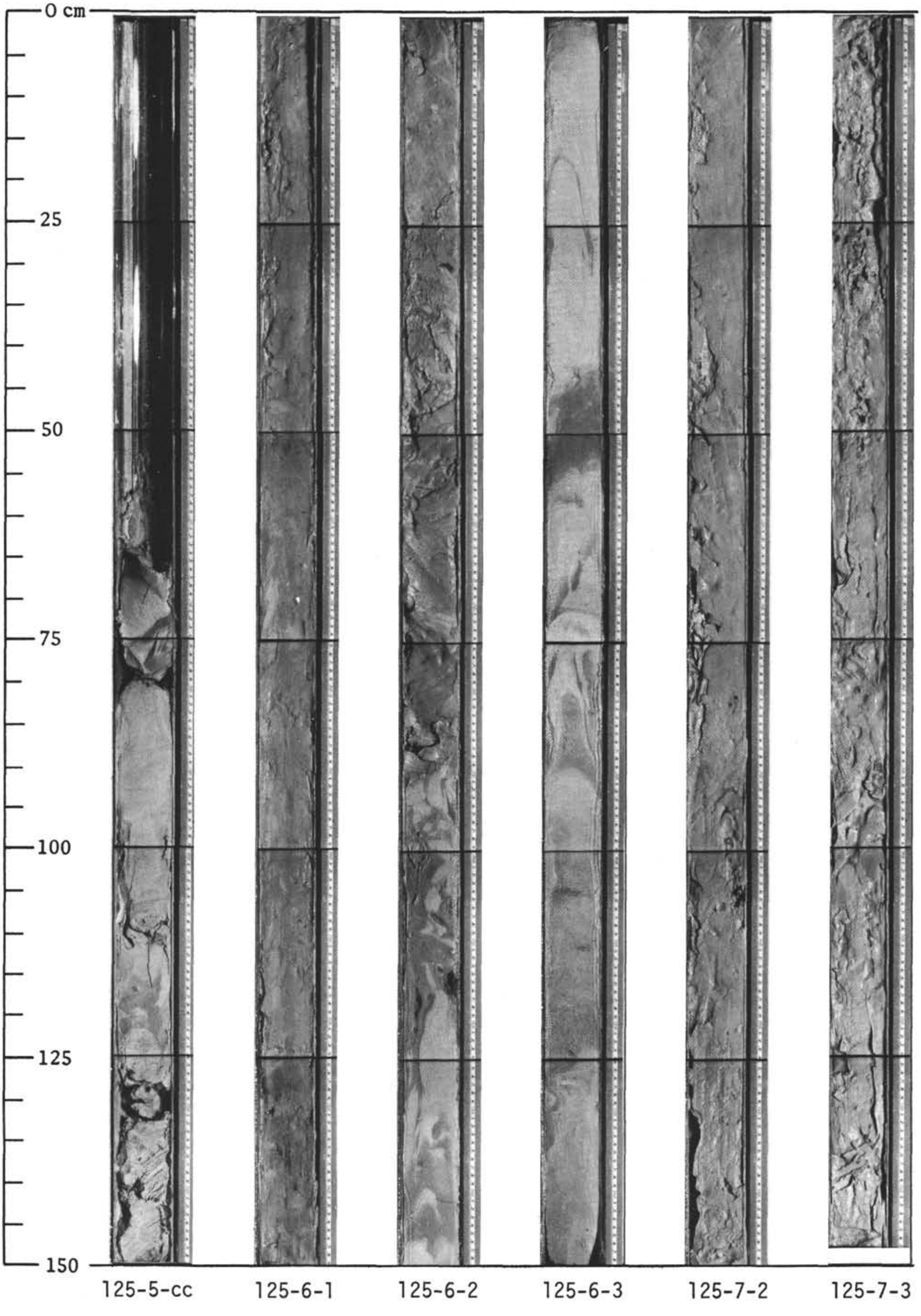
AGE	NATURAL GAMMA RADIATION	WET-BULK DENSITY (gm/cc)	m B. S. FL.	SECTION	LITHOLOGIC SYMBOLS	% CaCO$_3$ (% sand/silt/clay)	LITHOLOGY AND PALEONTOLOGY	DISTURBANCE
							DOLOMITIC OOZE dark medium gray (N4) plastic occurrence of gypsum crystals (packing the drill bit) GYPSUM (plugging the drill bit) massive rock white saccharoidal Planktonic foraminiferal mixed (downhole contaminants) diatom flora characterized by *Melosira granulata*, *Coscinodiscus miocaenicus*, and *Navicula*. Total drilling: 121 m in dolomitic ooze with gypsum	

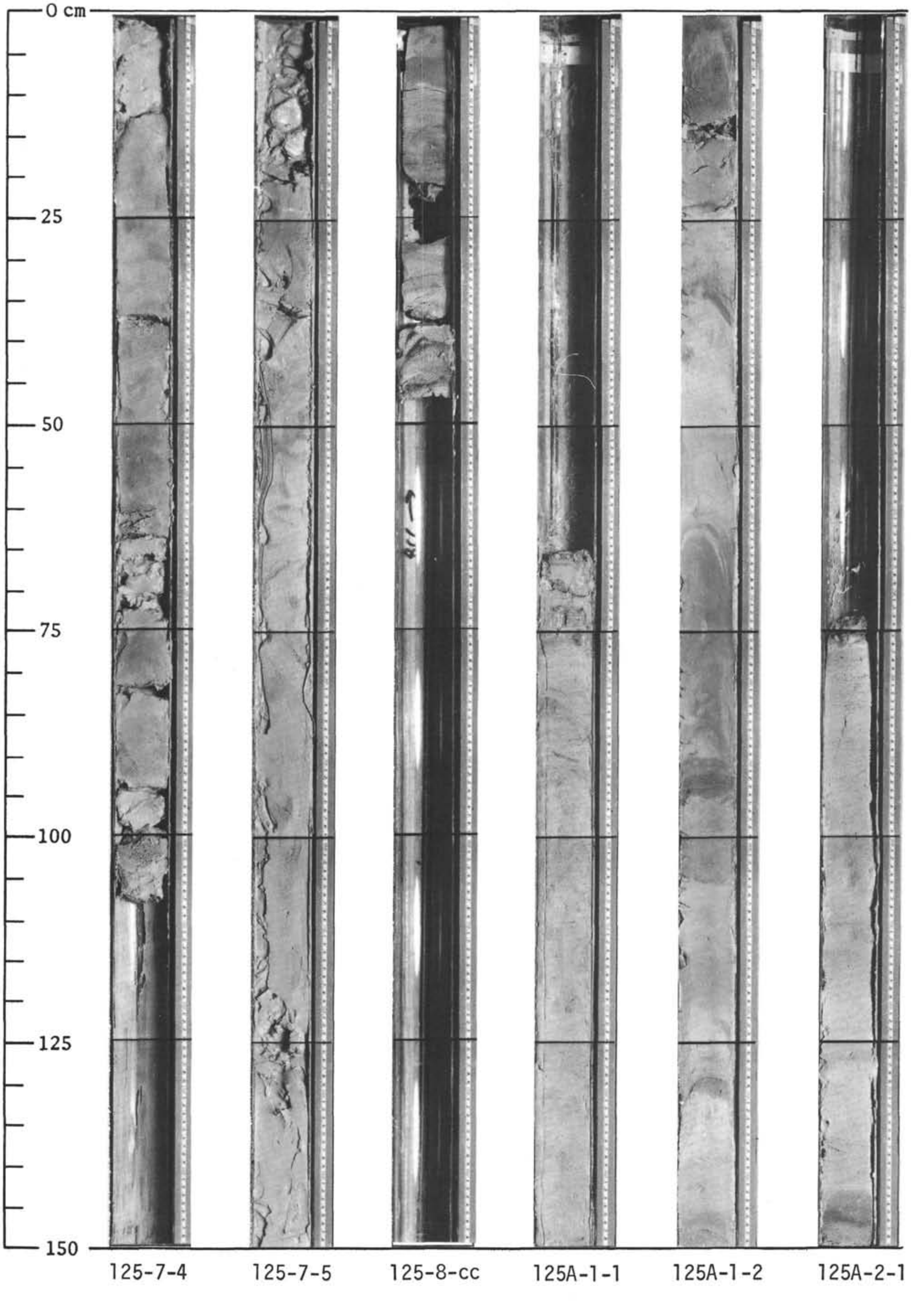

0 cm
25
50
75
100
125
150
125-1-1
125-1-2
125-1-3
125-1-4
125-1-5
125-2-1

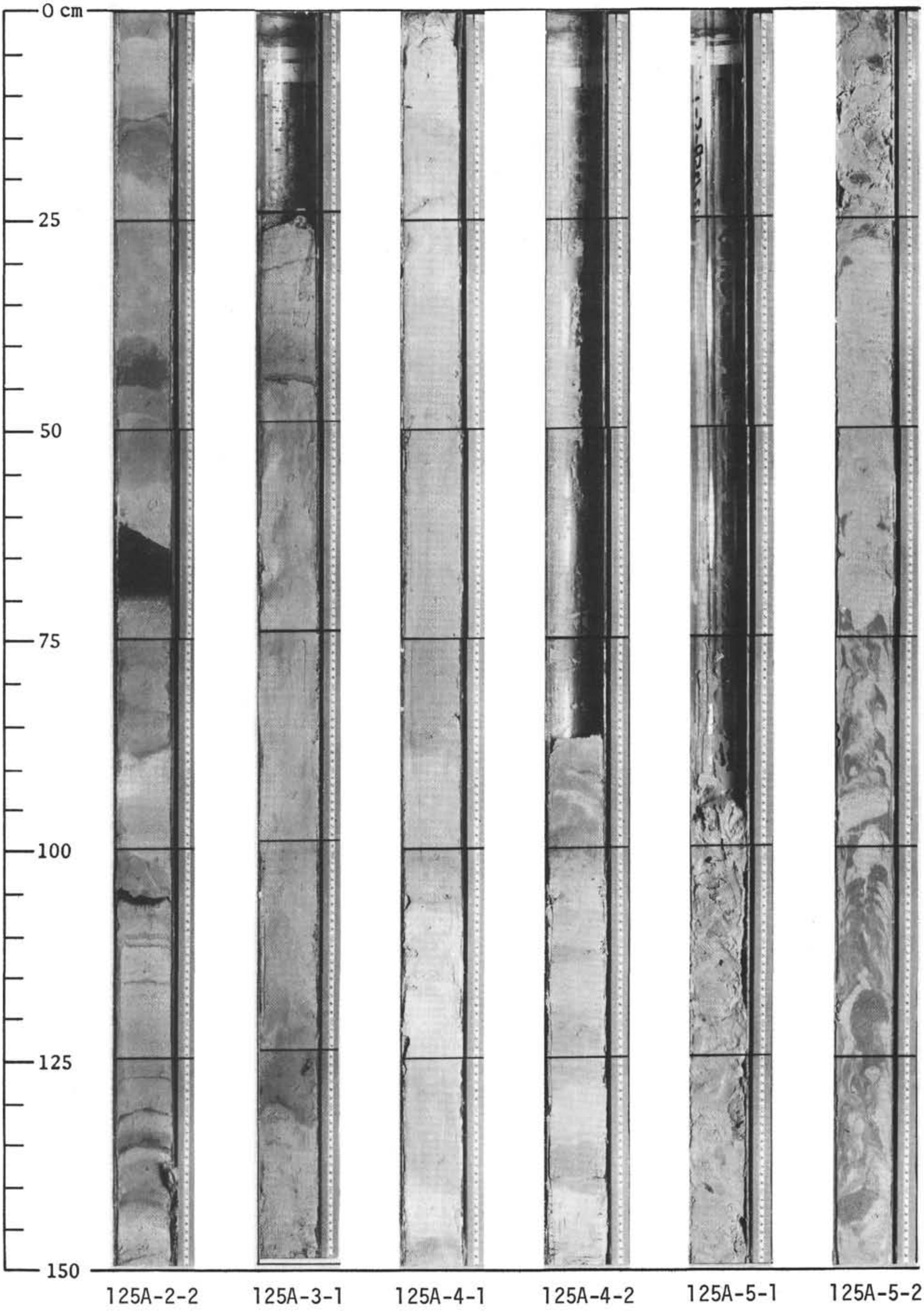

0 cm
25
50
75
100
125
150
125-2-2
125-2-3
125-2-4
125-2-5
125-3-1
125-3-2

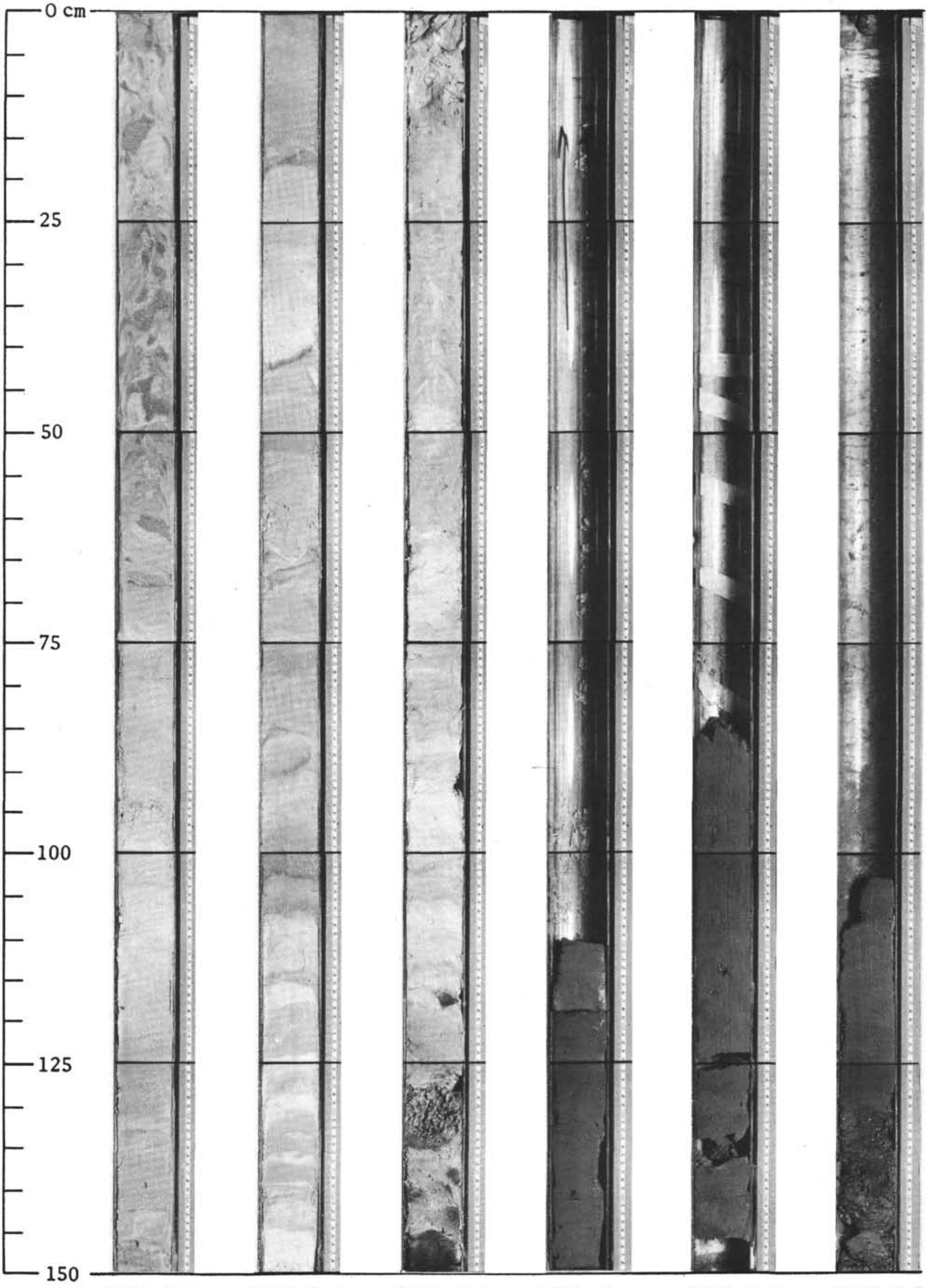

0 cm
25
50
75
100
125
150
125-3-3
125-3-4
125-3-5
125-3-6
125-4-1
125-4-2


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


0 cm
25
50
75
100
125
150
125-5-cc
125-6-1
125-6-2
125-6-3
125-7-2
125-7-3


0 cm
25
50
75
100
125
150
125-7-4
125-7-5
125-8-cc
125A-1-1
125A-1-2
125A-2-1


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


0 cm
25
50
75
100
125
150
125A-5-3
125A-5-4
125A-6-1
125A-7-cc
125A-8-1
125A-9-1