9. SITE 108 – CONTINENTAL SLOPE

The Shipboard Scientific Party[1]

INTRODUCTION

The objective at this site (see Figure 1, Chapter 8) was to drill at the base of the continental slope where erosion had removed a major part of the Tertiary and Quaternary sediments, presenting the possibility of sampling early Tertiary or Mesozoic sediments. Seismic profiler data, as well as cores and dredge hauls (Stetson, 1949; Northrop and Heezen, 1951), indicated probable exposures of Eocene sediment in this area. A reflector at a subbottom depth of about 500 meters (see Figure 2, Chapter 8) may be correlative with the late Cretaceous/Eocene contact penetrated in onshore wells (Kraft and Maisano, 1968). An intermediate reflector (Figure 2, Chapter 8) at about 200 to 250 meters was also a target of interest, since it appears to correlate with Horizon A.

Another objective was to test the turbocorer, particularly to evaluate its ability to spud in on a hard surface. The presence of indurated Eocene sediment at shallow subbottom depth provided the conditions required for this operation.

GEOPHYSICS

The seismic record in Figure 2 (Chapter 8) shows clearly the structural situation at this site and at Site 107. The layer exposed at the sea floor at Site 108 has apparently been uncovered by slumping of the post-Eocene material. The first core, and the only good one, was taken between 39 and 57 meters below bottom and is a moderately hard sediment containing approximately equal amounts of siliceous and calcareous material, and is of chalk-like consistency. This core is of mid-Eocene age (Figure 1). Piston cores of later Eocene age have been recovered from a comparable part of the slope in this general region (Stetson, 1940; Northrop and Heezen, 1951), so it is probable that drilling began in Eocene sediment.

OPERATIONS

Drilling was begun about mid-day on 29 May, 1970, in 1855 meters of water with a diamond bit on the turbocorer. After penetrating a few meters of soft sediments, the bit encountered firm material, which was penetrated slowly to a depth of 39 meters with the application of a weight of about 5000 pounds on the bit. The first core is a hard chalk composed primarily of middle Eocene siliceous and calcareous skeletal remains. A second cored interval at about 75 meters below bottom was penetrated more rapidly, but consists of about 0.5 meter of similar, hard, chalky sediment. Softer material that was presumably encountered had washed away during coring. A third attempt at coring was an experiment combining coring and drilling in which the core barrel was left in the drill while penetrating an interval of 66 meters (75 to 143 meters). This method was designed to recover some sample while maintaining maximum progress toward the deep reflector at 500 meters below bottom. Unfortunately, no sediment was recovered, presumably because no hard layers were encountered. Because drilling time for the cruise was at this point almost expended, this method was tried again while drilling from 143 to 209 meters. The result of the second attempt was even less successful; this time the bottom section of the core barrel–which contained the core catcher–apparently became stuck and turned with the bit, twisting it off from the main section. In the time remaining there was no way to seat a new core barrel, and the hole was abandoned.

STRATIGRAPHY

Biostratigraphy

A rich microfauna composed of planktonic and benthonic foraminifera, calcareous nannoplankton, dinoflagellates, and radiolarians indicate that the sediments penetrated are of middle Eocene age. The distribution of stratigraphically significant planktonic foraminifera and a general characterization of the samples from the two cores is given in Figure 1 and in the chapter by H. P. Luterbacher (this volume).

All of the washed residues are composed predominantly of well-preserved radiolarians. In addition, smaller benthonic foraminifera, similar to those known from the Gulf Coast Claibornian Stage, form an important part of some assemblages.

Core 1 is placed in the middle Eocene *Orbulinoides beckmanni* Zone on the basis of the presence of the zonal marker in its lower part. Core 2 contains *Globorotalia bullbroki* Bolli, *Globigerina frontosa* Subbotina, *Globigerapsis kugleri* Bolli, Loeblich and Tappan, transitional forms between *Pseudohastigerina*

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wilcoxensis (Cushman and Ponton), *P. micra* (Cole), and others. It is placed in the lower part of the middle Eocene *(Globorotalia lehneri* Zone or *Globigerapsis kugleri* Zone*)*.

Both cores contain abundant, well-preserved middle Eocene nannoplankton assemblages. Core 1, considered to be from the upper part of the middle Eocene, as indicated by: *Chiasmolithus grandis, C. gigas, Reticulofenestra umbilica, Cyclococcolithus lusitanicus, Discoaster barbadiensis, Rhabdosphaera spinula, Helicopontosphaera seminula lophota,* and *Campylosphaera dela.* Core 2 is characterized by *Chiasmolithus grandis, C. expansus, Zygolithus dubius, Rhabdosphaera spinula, Sphenolithus radians, Discoaster diastypus, D. distinctus, Helicopontosphaera seminula lophota* and *Campylosphaera dela*, and is assigned to the lower part of the middle Eocene.

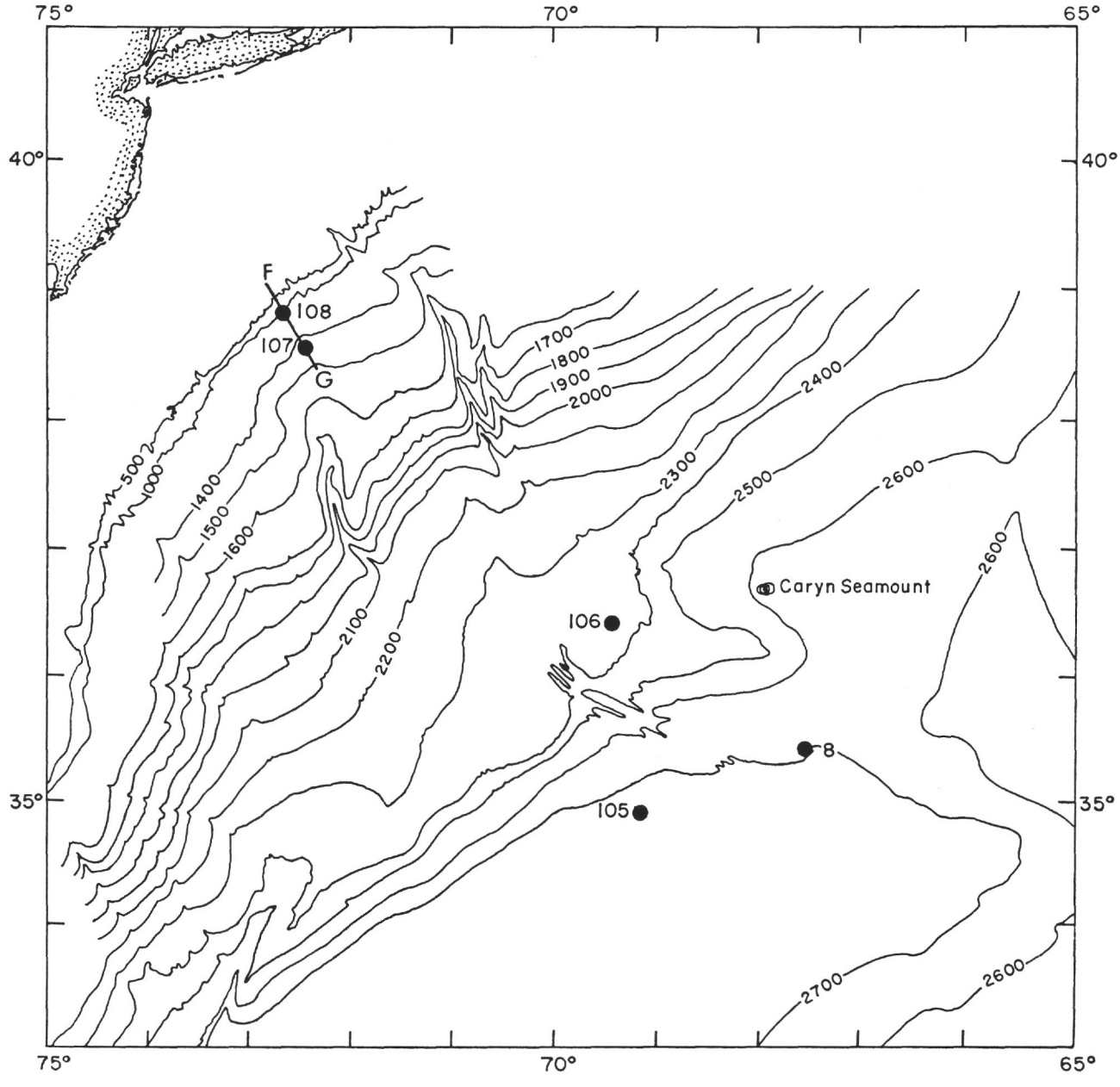


Figure 1. *Bathymetry of the continental slope and rise southeast of New York. Track FG corresponds to Figure 2.*

A large and varied assemblage of dinoflagellates is also present in both cores. The occurrence of *Wetzeliella* and *Hystrichokolpoma cinctum* supports the Eocene age determination based on planktonic foraminifera and calcareous nannoplankton.

The following diagnostic Eocene radiolarians were identified: *Podocyrtis paplis, Spongatractus pachystylus, Phomocyrtis embolum, Sethamphora mongolfieri, Lichnocanium bellum* (?), *Podocyrtis triacantha, Dictyophimus babylonis, Anthrocyrtium hispidum, Lithocyclia ocellus, Calocyclas turris,* and *Eusyringium fistuligerum.*

Lithology

Both cores recovered at this site contain light greenish-gray, radiolarian-nannoplankton-foraminiferal ooze of soft to firmly indurated consistency. The hard material shows little disturbance from coring other than cracking into sections 20 to 30 centimeters long. Moderate to intense mottling of the firmer sediment indicates considerable bioturbation. Smear slides (Figure 2) reveal abundant and well-preserved calcareous nannoplankton, foraminifera, diatoms, radiolarians, sponge spicules, and rare glauconite particles. No terrigenous components were observed.

CONCLUSIONS

The material recovered at this location indicates continuous sedimentation during the middle Eocene of biogenous sediment under deep marine conditions. Seismic reflectors and coring results at this site suggest that the post-middle Eocene sediment probably have been removed by slumping.

REFERENCES

Northrop, I. and Heezen, B. C., 1956. An outcrop of Eocene sediment on the continental slope. *J. of Geol.*, **59**, 396.

Stetson, H. C., 1949. Sediments and stratigraphy of the east coast continental margin; Georges Bank to Norfolk Canyon. *Papers in Physical Oceanography and Meteorology.* 11.

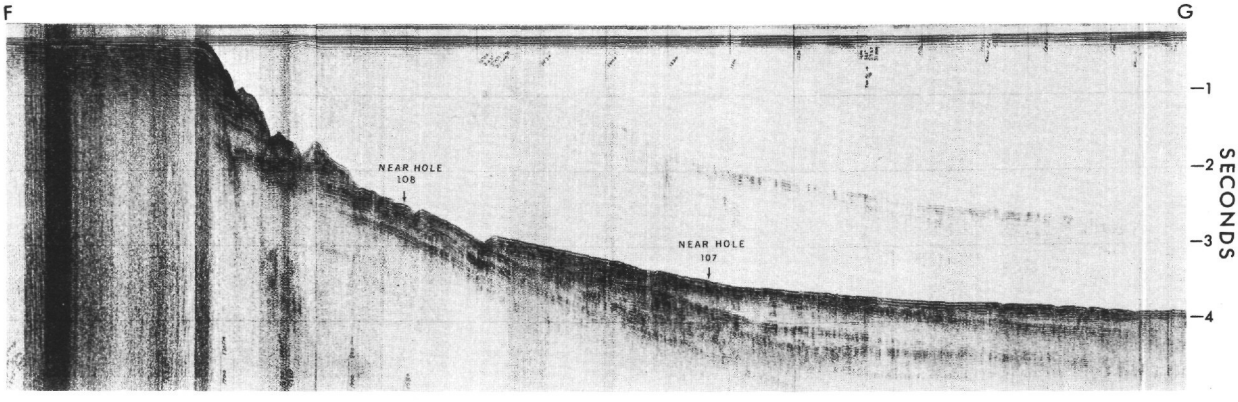


Figure 2. Glomar Challenger *profiler record in vicinity of Sites 107 and 108.*

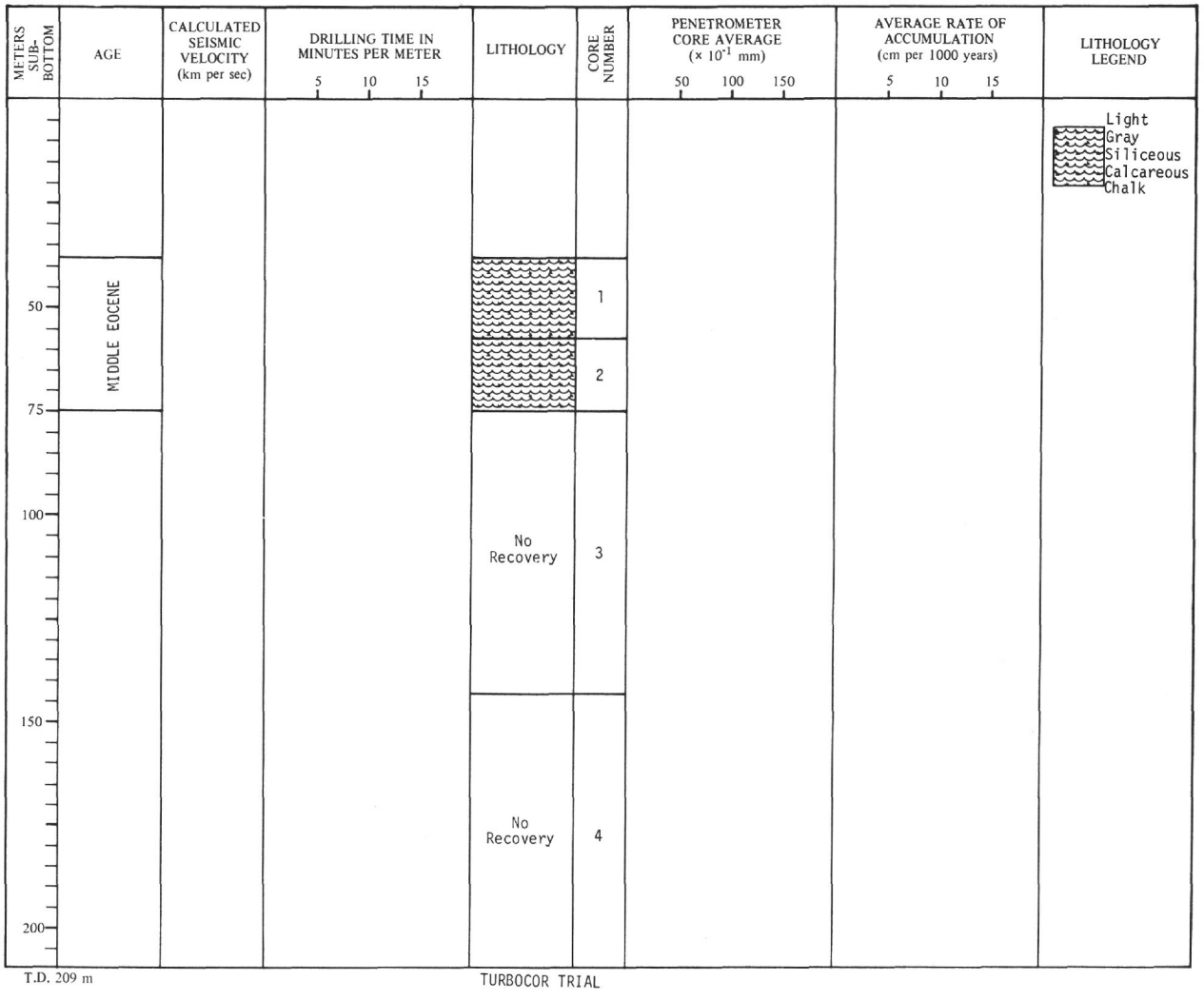


Figure 3. *Site 108 summary chart*

Hole 108

Latitude: 38°48.27′N.

Longitude: 72°39.21′N.

Water depth: 1845 meters (drill pipe); 1815 meters (PDR)

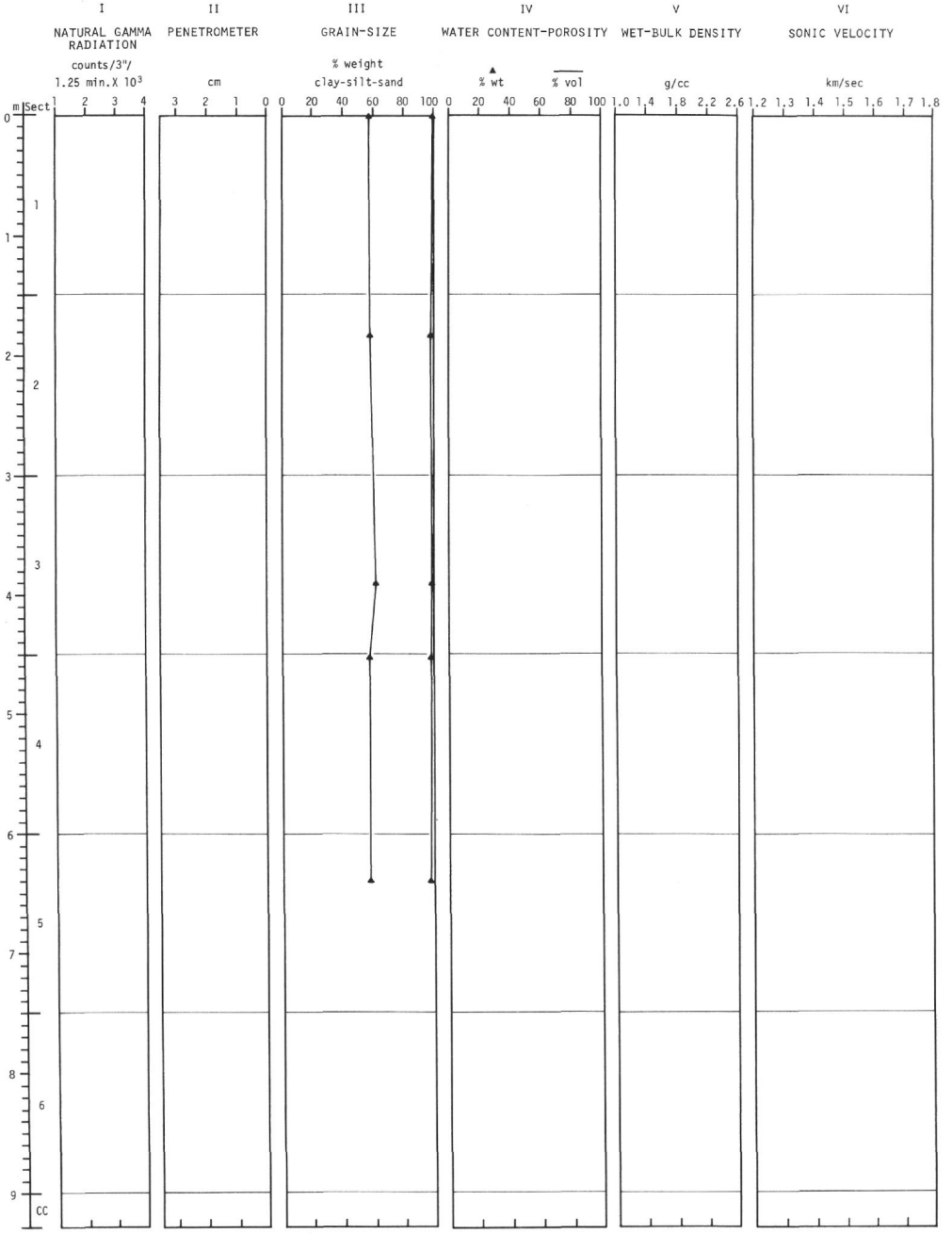
Core No.	Interval Cored (meters)[a]				Lithology	Age		
	Depth	Amount	Recovery	Subbottom Depth		Foraminifera	Nannoplankton	Dinoflagellates
(Drilled)	(1855-1894)	(39)		(39)				
1	1894-1912	18	6.5	57	Light gray siliceous chalk	← Middle Eocene →		
2	1912-1930	18	0.7	75	Light gray siliceous chalk	← Middle Eocene →		
3	1930-1998	68	0	143				
4	1998-2064	66	0	209				

[a]All intervals are measured by drill pipe from derrick floor which is 10 meters above water surface.

Figure 4. *Core Summary table, Site 108.*

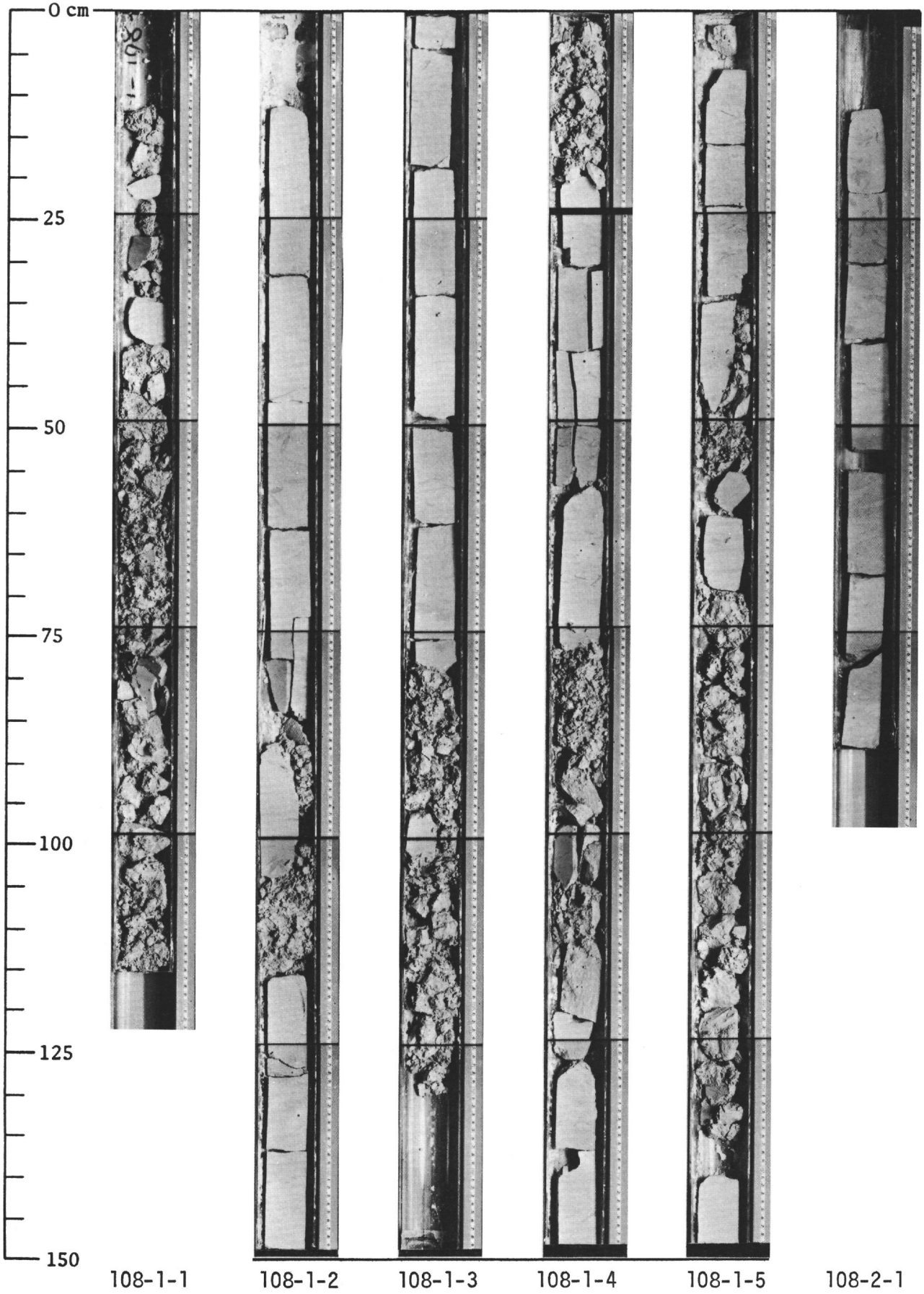
Hole 108, Core 1 (39m to 57m)

AGE	ZONE	DEPTH (m)	SECTION NO.	LITHOLOGY	SAMPLE INTERVAL	LITHOLOGY	DIAGNOSTIC FOSSILS
MIDDLE EOCENE	P.13 *Orbulinoides beckmanni* *Bramlettius serraculoides*	1	1		SS PF	Siliceous nannoplankton - foraminifera ooze, indurated, light greenish gray (5G 8/1). Moderate to intense burrowing throughout. Calc. nannoplankton, abundant. Foraminifers, abundant. Siliceous organisms (radiolarians, diatoms, sponge spicules), abundant. Terrigenous components are almost absent.	PLANKTONIC FORAMINIFERS: *Hantkenina alabamensis,* *Globorotalia bullbrooki,* *Globigerapsis index,* *Pseudohastigerina micra*
		2	2		PF CN PF		PLANKTONIC FORAMINIFERS: *Hantkenina dumblei,* *Globorotalia bullbrooki,* *Globigerapsis kugleri,* *Truncorotaloides rohri,* *Pseudohastigerina micra,* *Globorotalia renzi* CALCAREOUS NANNOPLANKTON: *Chiasmolithus grandis,* *Helicopontosphaera seminulum lophota,* *Discoaster barbadiensis,* *Reticulofenestra umbilica,* *Cyclococcolithina luaitanica,* *Campylosphaera dela,* *Lophodolithus reniformis*
		3	3		PF		
		4	4		PF		PLANKTONIC FORAMINIFERS: *Globorotalia bullbrooki,* *Globorotalia spinulosa,* *Globigerapsis kugleri,* *Orbulinoides beckmanni,* *Pseudohastigerina micra* *CORE CATCHER* CALCAREOUS NANNOPLANKTON: *Transversapontis obliqipons,* *Rhabdosphaera spinula,* *Chiasmolithus grandis,* *Discoaster barbadiensis,* *Campylosphaera dela,* *Helicopontosphaera seminulum lophota* DINOFLAGELLATES: *Wetzeliella* sp. cf. *W. echinosuturata* *Hystrichokolpoma cinctum*
		5	5		PF		
		7	CC		D,F, SS CN		PLANKTONIC FORAMINIFERS: *Hantkenina* sp. aff. *H. mexicana* *Orbulinoides beckmanni,* *Globorotalia bullbrooki*



Hole 108, Core 2 (57m to 75m)

AGE	ZONE	DEPTH (m)	SECTION NO.	LITHOLOGY	SAMPLE INTERVAL	LITHOLOGY	DIAGNOSTIC FOSSILS
MIDDLE EOCENE	P.11-12 Globorotalia lehneri? Reticulofenestra umbilica	1	1		PF CN	Siliceous nannoplankton-foraminifera ooze, indurated, light greenish gray (5G 8/1). Calc. nannoplankton, abundant. Foraminifers, abundant. Siliceous organisms (radiolarians, diatoms, sponge spicules), abundant. Terrigenous components almost absent.	PLANKTONIC FORAMINIFERS: *Globorotalia spinulosa,* *Truncorotaloides rohri,* *Globigerina senni,* *Globigerapsis* sp. CALCAREOUS NANNOPLANKTON: *Reticulofenestra umbilica,* *Chiasmolithus grandis,* *C. expansus,* *Cyclococcolithina lusitanica,* *Sphenolithus radians,* *Discoaster barbadiensis,* *D. distinctus,* *Campylosphaera dela* *CORE CATCHER* DINOFLAGELLATES: *Wetzeliella* sp. cf.*W.echinosuturata,* *Hystrichokolpoma cinctum* CALCAREOUS NANNOPLANKTON: *Reticulofenestra umbilica,* *Campylosphaera dela,* *Discoaster barbadiensis,* *D. distinctus, D. diastypus,* *Cyclococcolithina inversa,* *Helicopontosphaera seminulum lophota.* PLANKTONIC FORAMINIFERS: *Globorotalia bullbrooki,* *Globorotalia spinulosa,* *Globigerapsis kugleri,* *Pseudohastigerina micra.*
			CC		PF,D, SS CN		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