8. SITE 107 – UPPER CONTINENTAL RISE

The Shipboard Scientific Party[1]

INTRODUCTION

Through the use of seismic profiles provided by the petroleum industry, supposed Eocene and late Cretaceous reflectors have been traced beneath the Atlantic continental shelf, and appear to approach the sea bottom along the base of the continental slope. The deepest reflector (late Cretaceous) was believed to lie beneath 600 meters of younger sediment at Site 107, located 30 miles seaward of the base of the continental slope in 2571 meters of water (Figures 1 and 2). The drilling/coring program was designed to sample the sediments of the upper continental rise and to determine the age of the sediments responsible for the two seismic events.

OPERATIONS

The ocean floor was reached at a depth of 2571 meters, and drilling commenced at 1245 hours on 28 May 1970. A tri-cone carbide button roller bit was used, since this rock bit has been proven to be as efficient as any other for drilling soft sediments and far superior for drilling harder formations.

The drill string was washed in for about 25 meters without difficulty, but deeper penetration rapidly became more difficult; at 50 meters penetration was slow, even though maximum bit weight and both of the mud pumps were used. The first core, taken at 57 to 66 meters (Figure 3), required well over half an hour to cut, and very little sample was recovered. Drilling was resumed then for another 10 meters, and a second core was taken. The three meters of sediment, which required about 40 minutes to cut, were composed of firm, sticky, Pleistocene clay containing a large, displaced, shallow-water microfauna. In view of the depth of penetration required to achieve significant geological results, coupled with the slow penetration rate, it was decided to abandon the hole and use the remaining time to test the turbocorer at a site on the continental slope.

STRATIGRAPHY

Biostratigraphy

The sediments at Site 107 are characterized by displaced inner sublittoral foraminiferal assemblages of Pleistocene age. Calcareous benthonic species predominate in both cores, comprising primarily the genera *Elphidium* and *Nonionella*, and small miliolids. Core 1 contains, in addition, a Pleistocene assemblage of relatively few well-preserved planktonic specimens representing only five species. This low planktonic species diversity in a region well above the lysocline is an additional indication of marginal marine conditions during deposition. A more diverse species association would be expected under open marine conditions. The predominant species is *Turborotalia inflata,* a cool-water indicator. A few reworked Eocene/Paleocene planktonic forms are also present (for example, *Globorotalia* sp. cf. *G. aequa,* and *G.* sp. cf. *G. cerroazulensis*). Core 2 contains a similar fauna, but the planktonic forms are less frequent. *Turborotalia inflata* is still the most abundant form. No Eocene/Paleocene species were observed.

The recovery of nannoplankton in Core 1 was sparse but the predominant species are Eocene with a few individuals of the Quaternary and Holocene (*Gephyrocapsa oceanica*), and reworked specimens from the late Cretaceous. The nannoplankton in Core 2 are likewise mixed and sparse; thus, an accurate age assignment based on calcareous nannoplankton is not possible.

Palynomorphs observed include predominantly pine, spruce, and oak pollen of Quaternary age, along with reworked grains of early Tertiary, early and late Cretaceous, and Carboniferous age.

These associations represent part of an inner sublittoral accumulation that has been displaced into bathyal depths. The presence of the predominantly cool-water species *Turborotalia inflata, Globigerina bulloides* and *G. pachyderma,* and abundant spruce pollen suggests that displacement occurred during the last Pleistocene glacial interval when a lowered sea level moved the inner sublittoral environment closer to the edge of the continental shelf.

The Paleogene planktonic species (foraminifera and nannoplankton) were originally deposited under open marine conditions, uplifted and reworked from the

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Atlantic Coastal Plain into the Pleistocene inner sublittoral deposits, and finally redeposited on the upper continental rise.

Such a history would account for the lack of a well-developed Pleistocene nannoflora, since the inner sublittoral environment often does not support a large community of these organisms. Moreover, the rapid deposition occurring in this environment and during subsequent displacement would dilute the concentration of nannoplankton.

Lithology

The two short cores recovered at this site contain dark gray silty to sandy clay (Figures 4 and 5). Over half the length of each core liner contained muddy and sandy water indicating that sand layers had been penetrated but not retained.

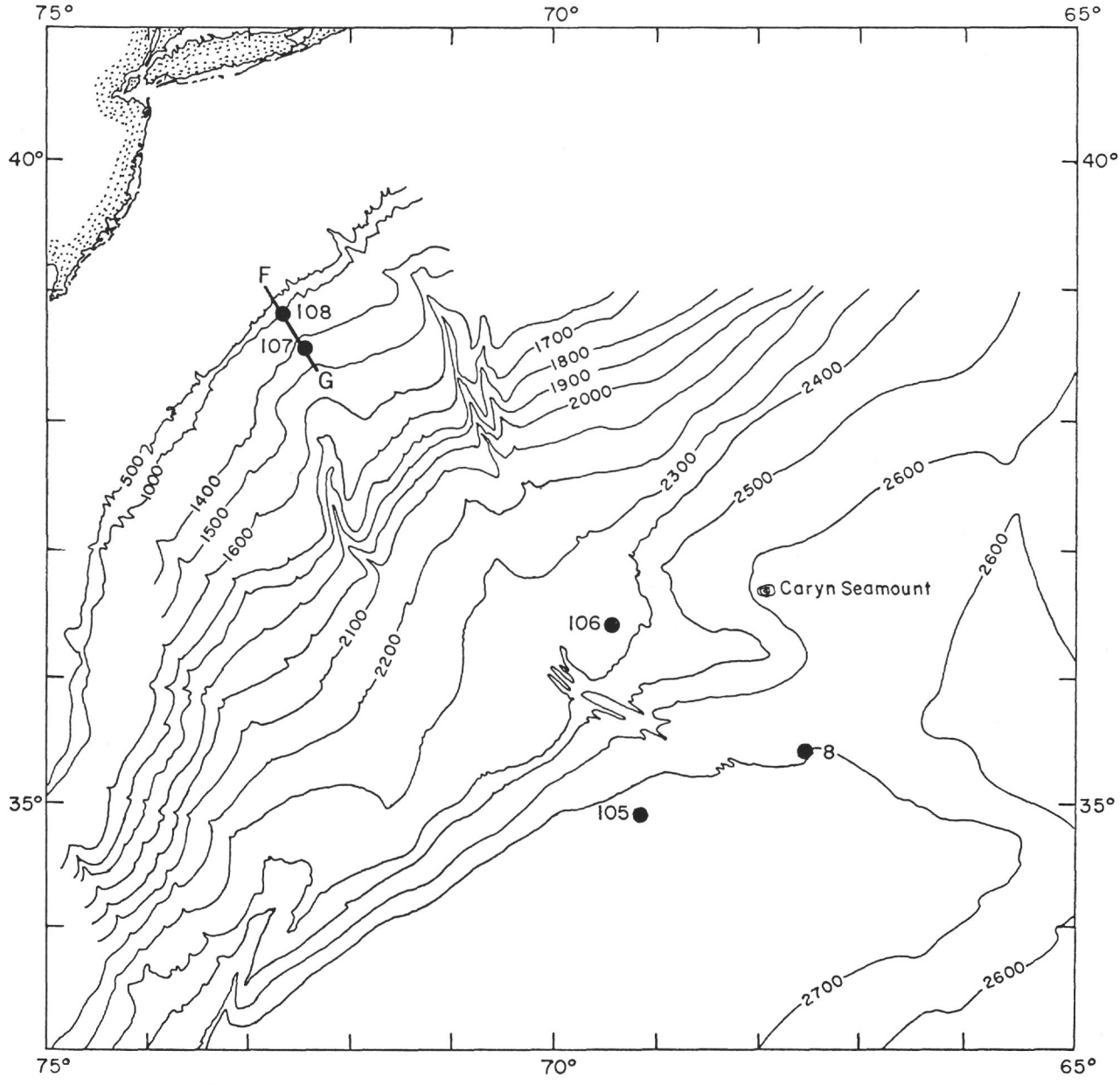


Figure 1. *Bathymetry of the continental slope and rise southeast of New York. Track FG corresponds to Figure 2.*

Smear slides show that the hemipelagic mud is composed of approximately 25 per cent quartz, feldspar, and heavy mineral-rich sand and silt, and 75 per cent clay minerals, calcite/dolomite fragments, plant debris, and a sparse assemblage of foraminifera, nannoplankton, diatoms, and sponge spicules.

CONCLUSIONS

Drilling at Site 107 penetrated displaced sediment containing a Pleistocene, inner sublittoral microfauna, with reworked Paleogene specimens, in a matrix of silty and sandy clay. Intervals of sand appear to have been penetrated, but were too loose to be retained in the core barrel.

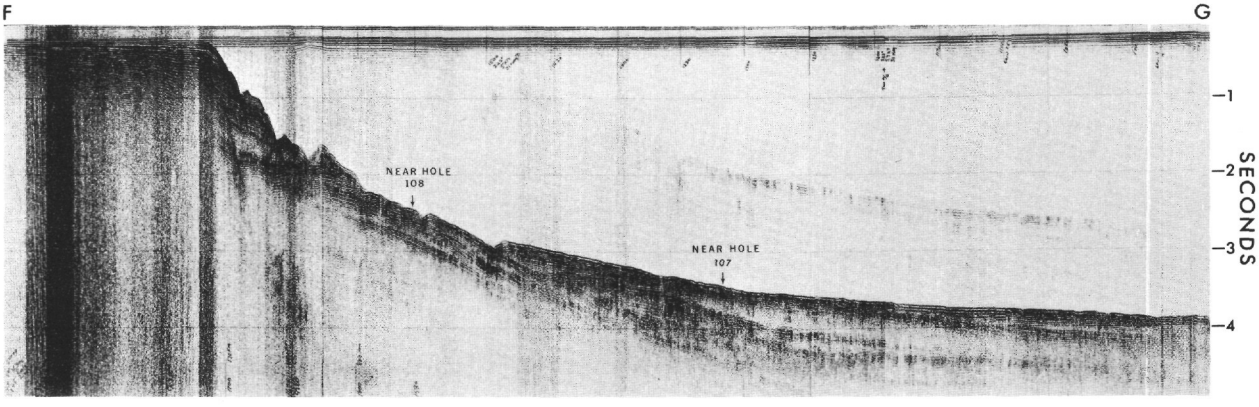


Figure 2. Glomar Challenger *profiler record in vicinity of Sites 107 and 108.*

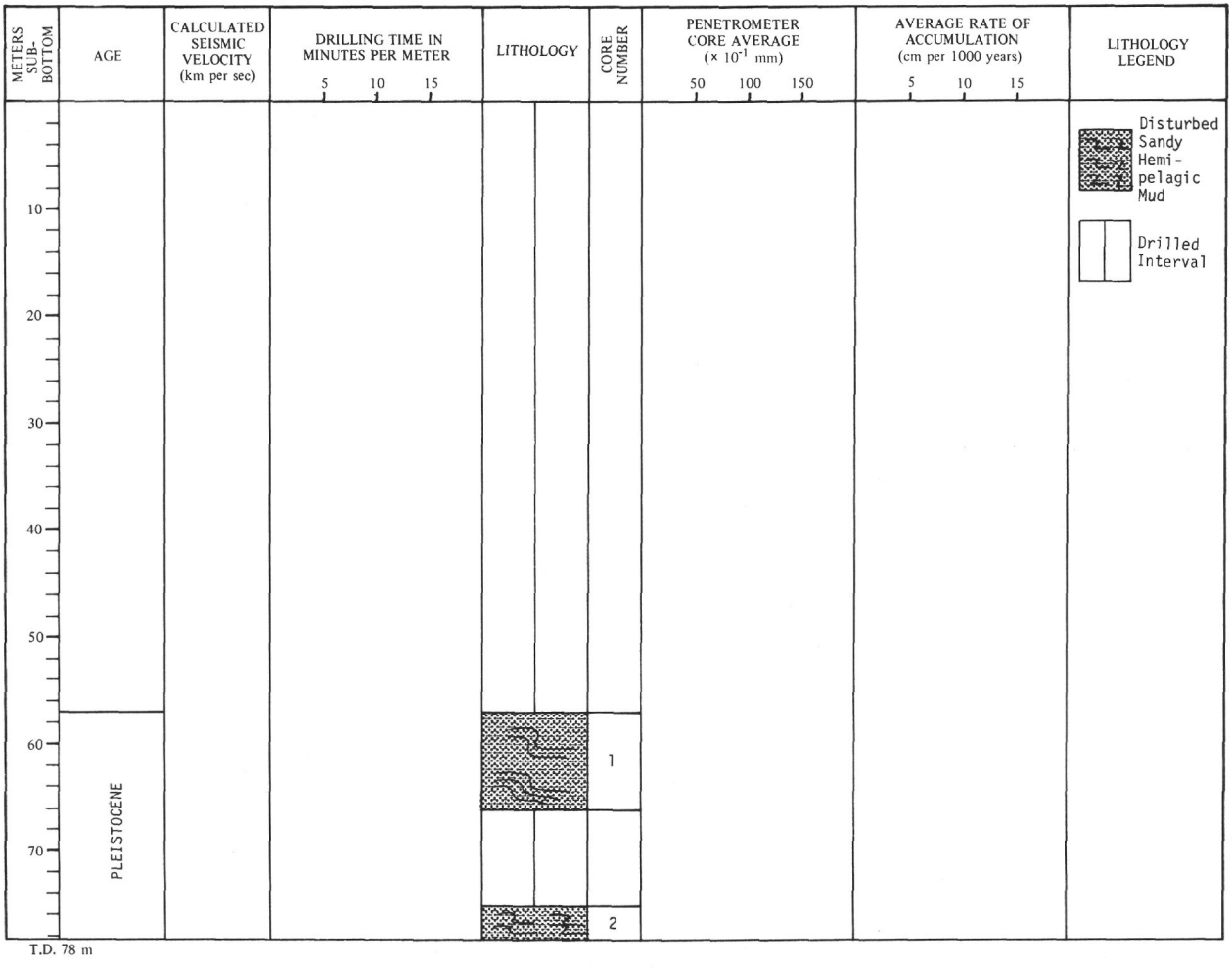


Figure 3. *Site 107 summary chart*

Hole 107

Latitude: 38°39.59N.

Longitude: 72°28.52W.

Water depth: 2571 meters (drill pipe); 2565 meters (PDR)

Core No.	Interval Cored (meters)[a]				Lithology	Age		
	Depth	Amount	Recovery	Subbottom Depth		Foraminifera	Nannoplankton	Dinoflagellates
(Drilled)	(2581-2638)	(57)		(57)				
1	2638-2647	9	<0.1	66	Gray silty clay	Pleistocene		
(Drilled)	2647-2656	(9)		(75)				
2	2656-2659	3	1.5	78	Gray silty clay	Pleistocene		

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

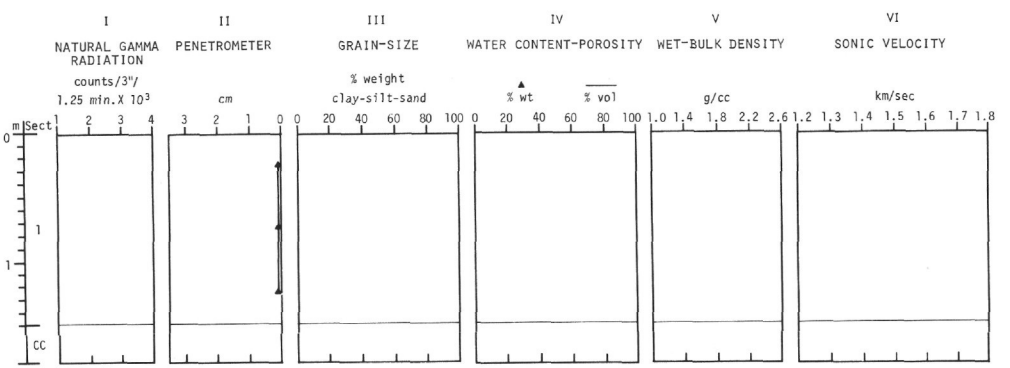
Figure 4. *Core Summary table, Site 107.*

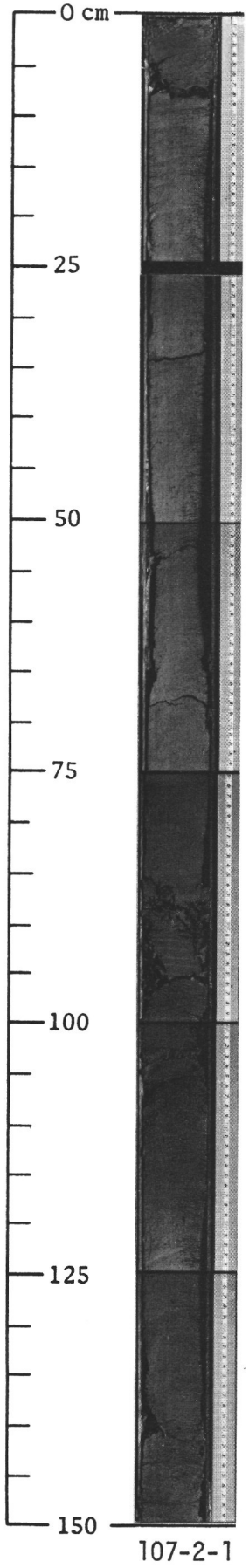
Hole 107, Core 1 (57m to 66m)

AGE	ZONE	DEPTH (m)	SECTION NO.	LITHOLOGY	SAMPLE INTERVAL	LITHOLOGY	DIAGNOSTIC FOSSILS
EARLY-MIDDLE PLEISTOCENE	N.22 Globorotalia truncatulinoides		CC		F,CN SS	Core catcher sample only: Hemipelagic mud, sandy, soft, gray (N4). Clay minerals, abundant. Quartz, abundant. Feldspar, common. Heavy minerals, common. Foraminifers, rare. Dolomite, common.	*CORE CATCHER* PLANKTONIC FORAMINIFERS: *Turborotalia inflata*, *Globorotalia truncatulinoides*, *Globigerina bulloides*, *G. pachyderma*, Plus reworked eocene species. CALCAREOUS NANNOPLANKTON: Reworked eocene and cretaceous species.

Hole 107, Core 2 (75m to 78m)

AGE	ZONE	DEPTH (m)	SECTION NO.	LITHOLOGY	SAMPLE INTERVAL	LITHOLOGY	DIAGNOSTIC FOSSILS
EARLY PLEISTOCENE	N.22 Globorotalia truncatulinoides	1	1		F,CN F,CN SS	Hemipelagic mud, sandy, soft, dark gray (N3). No apparent structures (faint bedding in the upper part?). Clay minerals abundant Quartz, abundant. Heavy minerals, common. Feldspar, common. Nannoplankton, rare. Dolomite, rare.	*CORE CATCHER* FORAMINIFERS: *Turborotalia inflata*, *Globigerinoides ruber*, *Globigerina bulloides*, *Globigerina pachyderma*, *Elphidium* spp., *Nontonella* sp., *Buccella* sp., Miliolids CALCAREOUS NANNOPLANKTON: Reworked Eocene and Cretaceous species.
			CC				

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