

4. SITE 87

The Shipboard Scientific Party¹

SITE DATA

Occupied: March 1-2, 1970.

Position: 23°00.90'N;
92°05.16'W.

Water Depth: 3751 meters.

Total Depth: 700 meters.

Holes Drilled: One.

Cores Taken: One.

BACKGROUND AND OBJECTIVES

The Sigsbee Basin of the Gulf of Mexico lies between the Sigsbee Scarp to the north (about 200 miles off the Texas-Louisiana coast), the Campeche Scarp to the south (about 150 miles off the Yucatan Peninsula) the West Florida Escarpment to the east, (about 120 miles west of the Florida Coast) and the foot of the Mexican continental slope to the west (about 180 miles east of the Mexican coast). The Sigsbee Basin includes the Mississippi Cone, to the east, and the Sigsbee Abyssal Plain to the west and south. The Sigsbee Abyssal Plain is interrupted only by the Sigsbee Knolls, the first three of which were discovered by M. Ewing in 1954 (Ewing, Ericson, and Heezen, 1958).

A study of thirty-three cores in 1953 led Ewing, Worzel, Ericson, and Heezen (1955), to conclude that the distribution of sediments in the Gulf of Mexico was profoundly influenced by turbidity currents. In arriving at this conclusion they considered the nature of the sediments cored, the topography of the Mississippi Cone, and the flat floor of the Sigsbee Deep. These authors also concluded, from seismic refraction measurements, that the crust was oceanic in character.

In 1954 a detailed topographic study, supplemented by 124 piston cores taken in the Gulf (Ewing, Ericson, and Heezen, 1958) led to the conclusion that silty sediments, supplied in quantity by the Pleistocene Mississippi River and distributed by turbidity current processes, covered the floor of the Gulf.

Site 87 was located near Site 3 of Leg 1 where eleven cores had been recovered from the upper 620 meters.

These cores were representative of the Upper Miocene to the Holocene.

Seismic refraction measurements (Ewing, Antoine and Ewing, 1960) had shown that the total sedimentary column was only 3 km thick near this location, perhaps the thinnest sedimentary cover in the Gulf of Mexico.

Since the section had been well sampled to a depth of 620 meters, and it was believed that a more stable hole could be made by continuous drilling, this site was chosen to obtain a framework for an interpretation of the history of the deep basin of the Gulf of Mexico by attempting to sample as deep as possible from 620 meters on down.

The *Glomar Challenger* occupied Site 87 for two days, March 1 and 2. Two cores were attempted and recovery was poor. The hole was terminated at a subbottom depth of 700 meters in probable Middle Miocene sands and silts. Coring results are given in Table 1.

NATURE OF SEDIMENTS

General Description

The objective of drilling Site 87 was to obtain samples below the deepest penetration of Site 3, Leg 1. The samples, therefore, can be considered to be a continuation of those obtained at Site 3, Core 1 at Site 87 is quite comparable to Core 11 of Site 3 and can be described as a predominantly olive gray (5Y4/1), horizontally laminated, very poorly sorted, often texturally graded, silty, very fine sand to slightly gravelly, fine sand, sometimes with dispersed mudclasts. The coarser sediments are intercalated with thin, light olive gray, faintly laminated, sparsely burrowed, silty clay or clay. Organic carbonaceous detritus is common throughout.

Mineralogically, the coarse-grained sediments are characterized by high percentages of plagioclase, a diverse heavy mineral assemblage including hornblende, and a fine gravel component of carbonate rock fragments. Unidentified zeolite grains were noted in several of the smear slides. Volcanic rock fragments appear to be a minor component.

Sedimentological Interpretation

The presence of texturally coarse graded beds with sharp basal contacts intercalated with faintly laminated, sparsely burrowed, silty clay or clay suggests deposition as turbidites with associated laminites. The occurrence of horizontal laminae within the coarse units (although moderately disturbed, some can be observed), the presence of dispersed mudclasts up to several centimeters in size, and the presence of abundant carbonaceous debris support the interpretation.

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TABLE 1
Core Inventory – Site 87

Core	No. Sections	Date	Time	Cored ^a Interval (m)	Cored (m)	Recovered (m)	Subbottom Penetration (m)		Lithology	Age
							Top	Bottom		
1	2	3/1	2200	4219-4228	9.0	2.5	648.0	657.0	Silty sand	Middle Miocene
2	0	3/2	1100	4271-4271	0.0	0.0	700.0	700.0	–	–
Total	2				9.0	2.5		700.0		
% Cut						1.3%				
% Recovered						27.7%				

^aDrill pipe measurement from derrick floor.

The sediments described above can be interpreted as a continuation of turbidite-dominated sedimentation first encountered at about 600 meters in Site 3, Leg 1. This appears to correspond with relationships noted on the profiler records and suggests that continuation of turbidites and associated sediments to a depth well below 700 meters is a valid interpretation. The compositional immaturity of the sands and a marked similarity to equivalent age sands at Sites 90 and 91 would indicate a provenance to the northwest. This interpretation will be discussed in more detail for Site 91.

Physical Measurements

A relatively small number of physical measurements were obtained on the recovered core of Site 87. Penetrometer measurements are within the range of consolidated to somewhat semi-consolidated and, when compared to up-hole measurements obtained at Site 3, appear to be representative of a projected trend with depth. As would be expected, penetrability is greater in the friable to unconsolidated sands as compared to the associated silts and clays.

Gamma-ray measurements, when compared to uphole determinations, agree well with previous data. Note that the scale was adjusted for the lesser time of counting now being used (75 seconds equals 150 seconds on Leg 1). Values obtained are intermediate between high count, highly argillaceous sediments from 500 to 600 meters (approximately), and low count, high calcareous sediments encountered between 275 and 400 meters.

Density determinations (GRAPE) are again characteristically low when compared to Leg 1 determinations. An approximate value for bulk density of 1.8 g/cc appears to be about 0.25 g/cc low.

BIOSTRATIGRAPHY

The summaries for each of the samples examined for calcareous nannofossils and/or foraminifers are given below. The location of Site 87 is the same as that for Site 3 of Leg 1 (the post Late Miocene was not cored on Leg 10). The biostratigraphy of the entire section (Site 87 and Site 3) was not integrated because the samples from Hole 3 were not available for examination by the authors.

Sample 1 (10-87-1-1, 143 to 145 cm):

Catinaster coalitus, *Cyclococcolithus neogammation*, *Discoaster brouweri*, *D. exilis*, *D. bollii*, and *Craspedolithus nitescens*

Age: Late Miocene (N.13/N.14) [± 10 my]

Environment: Bathyal.

Sample 2 (10-87-1-2, 62 to 64 cm)

Catinaster coalitus, *Cyclococcolithus neogammation*, *Discoaster brouweri*, *D. exilis*, *Coccolithus pataecus*, *C. sp. cf. C. doronicoides*, *Helicopontosphaera kamptneri*.

Age: Late Miocene (N.13/N.14) [± 10 my]

Environment: Bathyal.

Remarks: The sample also contains a Miocene-Pliocene assemblage of foraminifers, most of which may be displaced, including: *Bathysiphon* sp., *Haplophragmoides* sp., *Trochammina* sp., *Ellipsonodosaria* sp., *Rotalia* sp., and *Bulimina pupoides*.

Sample 3 (10-87-1, CC):

No calcareous nannofossils were noted and no age diagnostic foraminifers were recovered from the sample.

Age: Not determined from sample.

Remarks: The sample contains a displaced shallow-water fauna and coarse volcanic glass shards. The foraminifers include species of *Amphistegina*, *Robulus*, *Cibicides*, *Cassidulina*. Additionally, rare reworked forms of probable Cretaceous age were noted, including *Bolivina* sp. cf. *B. incrassata*, and miliolids in a limestone pebble.

Sample 4 (10-87 - Sinker bar sample from 700 meters):

Cyclococcolithus neogammation, *Discoaster brouweri*, *D. exilis*, *Discolithina vigintiforata*, *Helicopontosphaera intermedia*, *Globoquadrina dehiscens*, *Globorotalia mayeri*, *G. sp. cf. G. robusta*, and *Orbulina suturalis*.

Age: Late Middle or early Late Miocene (N.12/N.13) [± 12 my]

Environment: Probable bathyal.

Remarks: The sample also contains an assemblage of Pliocene age from down-hole contamination.

DISCUSSION AND INTERPRETATION

Site 87 was to be an extension to greater depth of Site 3, Leg 1. An on-station profile record is shown in Figure 1. Only two samples were recovered: a core barrel from

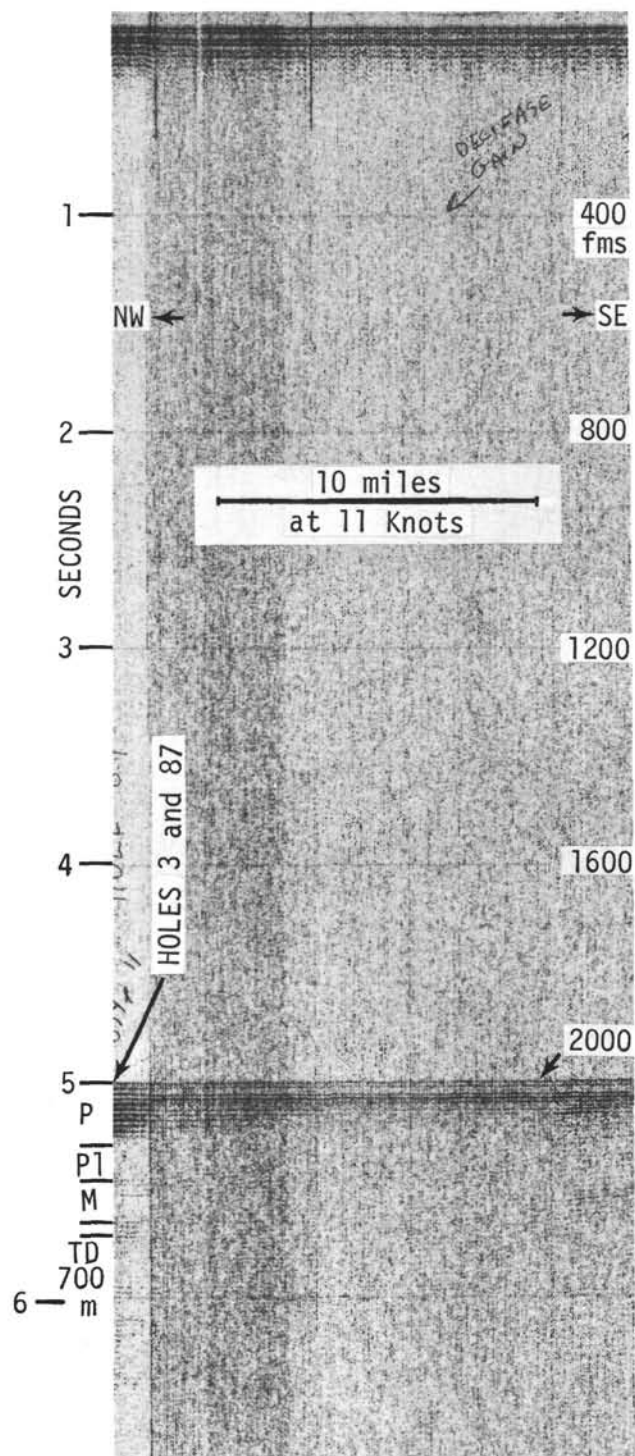


Figure 1. Profile record, Site 87.

650 meters, and a small sample from the overshot bar at 700 meters, the maximum depth of penetration. The hole was abandoned without attempting to go further because of equipment difficulty and the prohibition from the National Science Foundation that penetration would be limited to 2500 feet. Since the equipment difficulty would have required about 48 hours to raise the core barrel to the deck, repair or replace it and drill again to the depth achieved; and since at that time only an additional 67 meters could have been drilled because of the depth restrictions, the hole was abandoned without further drilling. The National Science Foundation ruling was changed about 20 hours after we had departed the site. The new rule authorized penetration to 5000 feet, providing the section was continuously cored, each core was monitored for petroleum indications and officials of the Deep Sea Drilling Project, Global Marine, Inc., and the National Science Foundation were notified at each increment of 500 feet beyond 2500 feet.

The samples obtained are predominantly terrigenous quartz-rich clays and silts. Quartz grains are abundant and show little sorting or rounding. Unaltered, highly angular volcanic glass is present. The sediments have an average carbonate content of about 15 per cent. Clay minerals are abundant and there are many graded beds of coarse material, probably turbidites. All of the material was laid down in a bathyal environment and is Late Middle Miocene to Late Miocene in age.

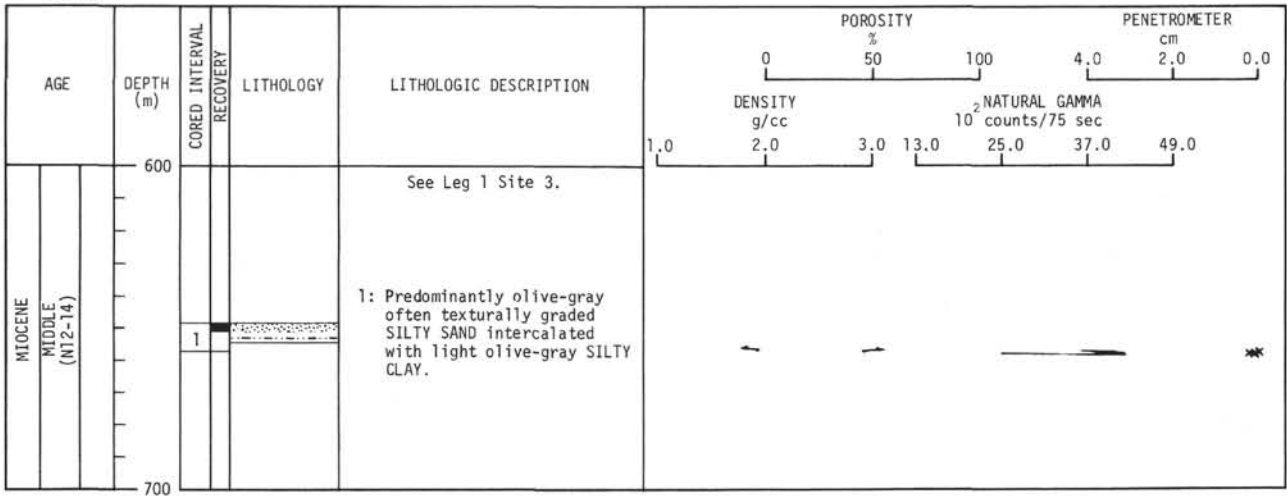
Thus, the section shows, as described for Site 3 (Ewing et al., 1969), continuing Miocene bathyal deposition with frequent turbidite contributions both from the southwest (the carbonates and volcanic portions) and probably from the north and east (terrigenous silts and clays).

The core at 650 meters was dated as Late Miocene, laid down about 10 my ago. This indicates an average sedimentary rate at this site of $6.5 \text{ cm}/10^3 \text{ y}$

REFERENCES

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SITE 87



Site 87 Hole Core 1 Cored Interval: 648-657 m

AGE	ZONE	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	GRAIN SIZE WEIGHT %		
							SAND	SILT	CLAY
MIDDLE MIOCENE	N12/N14	1	0.5	VOID					
			1.0	Intercalated SILTY SAND and SILTY CLAY. Former olive-gray (5Y4/1); horizontally laminated, very poorly sorted, often texturally graded, sometimes with dispersed mud clasts. Latter with sparse burrows.		28.9	51.1	20.0	
		2	Carbonaceous throughout. Section 1: 110-137 cm. Horizontally laminated with abundant mudstone clasts, organic carbon debris.						
		Core Catcher		137-145 cm. Laminated mudstone, slightly burrowed.					
				Section 2: 85-135 cm. Horizontally laminated silty sand and sandy silt, poorly sorted and probably multi-graded.					

