

9. SITE 39

The Shipboard Scientific Party¹

SITE BACKGROUND

Site 39 was located in the region between the Pioneer and Murray Fracture Zones, with the objective of recovering a continuous sediment core for paleontologic and stratigraphic study of the longitudinal variations in sediment components in the eastern Pacific. This site was selected, together with the adjacent ones in the north-south line along 140°W, to provide information on the geologic history of the North Pacific gyral, insofar as this might be recorded in the sediments.

The generally non-fossiliferous nature of the sediments at Sites 37 and 38 had reduced the probability of meeting the objectives for Site 39 as originally proposed by the Pacific Advisory Panel. The recovery, however, of an Eocene ooze at the base of the section at Site 38 suggested that Site 39, being nearer the equator, might contain a greater proportion of fossiliferous sediment in the section or, at the very least, it might also contain fossiliferous basal sediment to provide the means of dating the beginning of sedimentation in this region.

Site 39 is located in an area of abyssal hills having a relief of 40 to 200 meters. Some larger hills are present. A thin sediment section of less than 0.05 second occurs throughout most of the area surrounding the site. The 10-meter piston core taken by *Argo* was of non-fossiliferous, microneodule-bearing "red" clay which was similar to that at Site 37.

The drilling site was located on a hill of about 160 meters relief which was capped by as much as 0.05 second of sediment. However, the on-site seismic reflection profile (Figure 1) indicates only 0.03 second of sediment

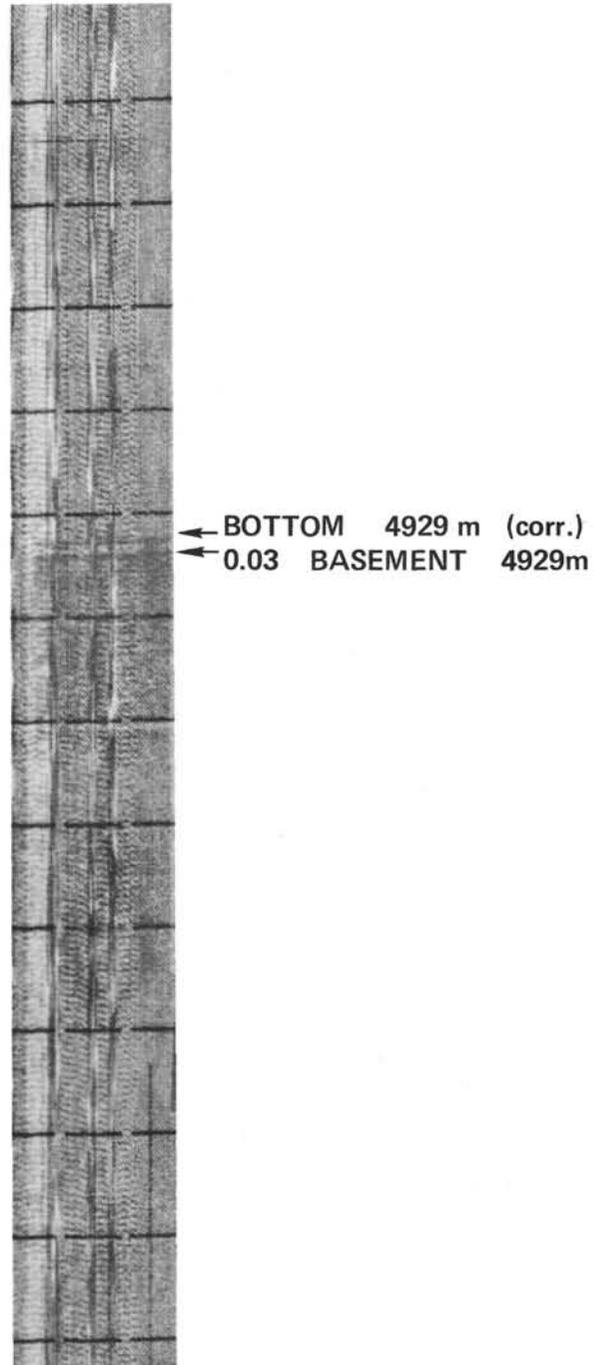


Figure 1. On-site seismic reflection profile taken at Site 39. (5 second sweep.)

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at the site. Although additional surveying might have revealed a location with slightly thicker sediment, it seems improbable that such a section would have provided significantly more information.

Because the track from Site 38 to Site 39 was essentially parallel to the north-south trend of the magnetic anomalies and because of the intervening Pioneer Fracture Zone, the magnetometer record could not be used to identify the anomaly at Site 39. The location of the site, however, when plotted on the magnetic anomaly chart of Menard (1964) indicates that the positive anomaly at the site is Anomaly 24 (60 million years).

Location

Site 39 is located at latitude 32° 48.28'N, longitude 139° 34.29'W on the flank of an abyssal hill.

OPERATIONS

The entire sedimentary column at this site was sampled with two cores. The travel time from the on-site seismic reflection profile indicates a thickness of at least 21 meters. The recovery of only 17 meters above basement indicates that, either the sonic velocity estimates used to interpret the seismic profile are too low, or coring was not initiated until after the upper few feet of sediment had been penetrated. At this site the first core was probably taken at least 4 meters below the sea floor, so that the depth shown in Table 1 should read 4 to 13 meters. Because of the uncertainty of the exact location with reference to the sea floor, the depth of the first core is indicated as 0 to 9 meters, as has been done for all other sites.

LITHOLOGY

At Site 39, coring was continuous between the sea floor and a total depth of 17 meters, and full recovery was obtained. As at previous sites, cores were badly

deformed during the coring process so that most sedimentary structures were destroyed. There were, however, some color contacts that remained quite sharp and moderate mottling was observed in Core 1 at about 7 meters.

The dominant lithology cored at this site is a yellow-brown mud. Colors are various shades of brown, reflecting the amount of amorphous iron oxides present. Near the top, colors are yellowish-to grayish-brown to a depth of about 4 meters (in Core 1); and, with increasing depth, the shades of brown become darker. With the exception of two thin intervals (7.5 to 9 meters in Core 1, and 13 to 14 meters in Core 2) of grayish-brown color, dusky brown is the dominant color between 4 meters depth and the basement.

Three noteworthy lithologic characteristics were noted in the cores. First, there is a general decrease in the amount of zeolites between the sea floor and the basement. Second, there is a relative increase in the amount of amorphous iron oxides with depth below the sea floor. Finally, thin interbeds of calcareous nannoplankton ooze pigmented with iron oxides occur directly above basement.

Zeolite-rich sediment (a zeolite content of 20 to 40 per cent) lies between the sea floor and 11 meters (in Core 2), and amorphous iron oxide-rich sediment (zeolites 0 to 5 per cent) occurs between this depth and basement. A possible altered volcanic ash at a depth of about 6.5 meters (in Core 1) contains more than 50 per cent phillipsite. Amorphous iron oxides increase from a low of 3 to 5 per cent near the sea floor to a high of 50 per cent near basement.

Manganese nodules at the top of Core 1 reflect a probable abundance of nodules on the sea floor at Site 39. Manganese micronodules were observed to a depth of about 2 meters in Core 1.

TABLE 1
Drilling Summary of Leg 5, Site 39

Date	Core	Depth Below Sea Floor (m)	Depth Below Rig Floor (ft)	Core Cut		Core Recovered		Per Cent Recovered
				(ft)	(m)	(ft)	(m)	
16 May	1	0-9	16,202-16, 230	28	8.5	28	8.5	100
	2	9-17	16,230-16, 257	27	8.2	27	8.2	100
	Totals				55	16.7	55	16.7

Note: Sonic water depth (corrected): 4929 meters; 16,165 feet; 2694 fathoms. Driller's depth: 16,202 feet.

Black aphanitic basalt comprises the basement rock. Only a few centimeters were recovered as fragments in the core catcher of Core 2 and in the drill center bit.

PALEONTOLOGY

Nannoplankton

Calcareous nannoplankton only occur in Core 2, Sections 4, 6 and the core catcher. The samples from the Core 2 core catcher are immediately adjacent to the basaltic basement material obtained in the core catcher and represent the oldest sediment available.

Most of the coccoliths, sphenoliths and discoasters found are heavy forms indicating high carbonate conditions at some time in the past. This could have aided in the buffering and maintaining of at least some preservation of the nannofossils, even scattered and rare as they now occur in the sediment—during the subsequent dissolution, history and development of the “red” clays that are presently characteristic of this site.

Besides being heavily calcified forms, all of the nannofossils show a peculiar optical appearance. They exhibit a higher relief and birefringence than normal, and the asteroliths still show some birefringence when in a horizontal position under crossed polarized light. This indicates that in the process of preservation they have been replaced or changed to possibly an ankeritic or dolomitic composition.

Some of the diagnostic species not found in earlier holes of this leg include: *Marthasterites tribrachiatus* (Bramlette and Riedel), *Discoaster diastypus* Bramlette and Sullivan and vars., and *D. nobilis* Martini. The assemblage is indicative of the Lower Eocene (*D. diastypus* - *M. tribrachiatus* Subzone).

Some rare asteroliths occur which have around eight fairly long rays that are swollen medially. These may represent a heavily calcified form of *Discoaster binodosus* Martini. The form identified as *D. nobilis* is equivalent to at least part of the forms identified as such by previous authors (see Hay *et al.*, 1967). Whether this form is a heavily calcified version of Martini's species or *D. falcatus* Bramlette and Sullivan needs clarification.

Foraminifera

Foraminifera occurred very rarely in the lowermost parts of Core 2 which was taken just above the basement. The state of preservation is poor.

Species which were recovered from Hole 39 include:

Sample 39-2-6, 118-120 cm:

Globorotalia chapmani Parr, *Acarinina primitiva*

(Finlay), *Acarinina* cf. *A. pseudotopilensis* (Subbotina).

Sample 39-2, core catcher:

Globorotalia aequa Cushman and Renz, *Globorotalia dolobrata* Jenkins, *Globorotalia* aff. *G. formosa gracilis* Bolli, *Globorotalia planoconica* Subbotina, *Acarinina primitiva*, *Acarinina* cf. *A. pseudotopilensis*, *Acarinina soldadoensis* (Bronnimann).

Radiolaria

Radiolaria were not found in any of the cores from this hole.

SUMMARY

The sediment section cored at Site 39 is 17 meters thick. This short section may represent a long period of deposition, as the oldest fossils are Early Eocene in age, younger than 52.5 million years.

The basement rock is a black aphanitic basalt. In the amorphous iron oxide sediment overlying the basement, only small changes in lithology and color were noted. As in the bottom core at Site 38, the sediment directly overlying the basement at Site 39 contains calcareous microfossils. In general, with increasing distance above basement, zeolite content increases and the amount of amorphous iron oxide pigmentation decreases. The reasons for the microfossil preservation and the changes in both zeolite content and iron pigmentation are not known at present.

Here, as at Site 38, the age determined by studies of microfossils is younger than the age expected from the magnetic anomaly.

Deposition of calcareous fossils occurred in Early Eocene time. Later, the accumulation of calcareous material ceased and amorphous iron oxides were deposited. Because the true time span represented by the sediment at Site 39 is unknown, no sedimentation rate has been calculated.

The amorphous iron oxide sediment occurring at this site is discussed in detail in Chapter 26 of this volume.

REFERENCES

- Hay, W. W. *et al.*, 1967. Calcareous nannoplankton zonation of the Cenozoic of the Gulf Coast and Caribbean-Antillean area and transoceanic correlation. *Trans. Gulf Coast Assoc. Geol. Soc.* 17, 428.
- Menard, H. W., 1964. *Marine Geology of the Pacific*. New York (McGraw Hill) 271 p.

THE CORES RECOVERED FROM SITE 39

The following pages present a graphic summary of the results of drilling and coring at Site 39. Fig. 2, a summary of Site 39 is at the back of the book. Figures 3 to 4 are summaries of the individual cores recovered. A key to the lithologic symbols is given in the Introduction (Chapter 1).

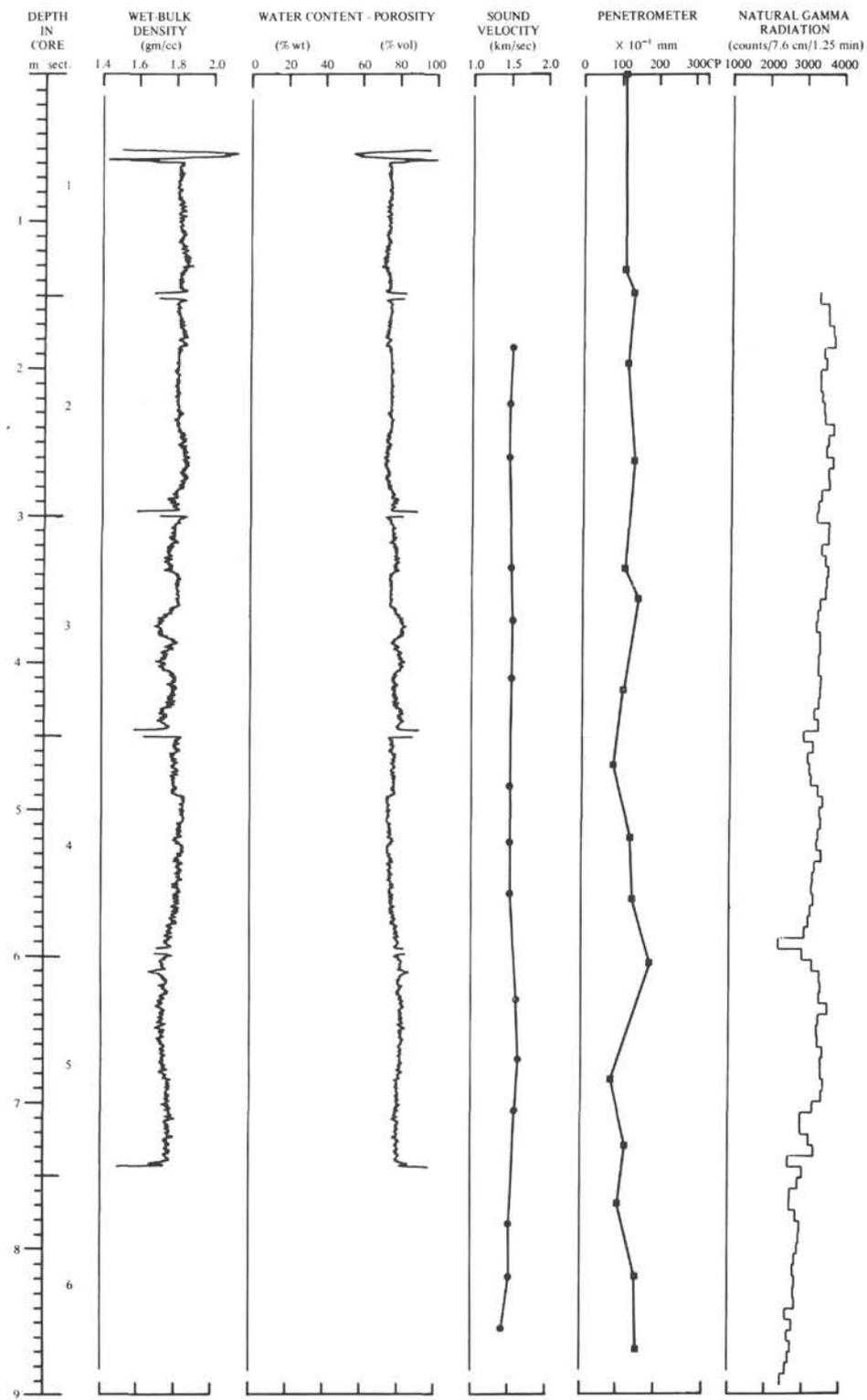


Figure 3A. *Physical Properties of Core 1, Hole 39*

AGE		DEPTH (METERS)	SECTION NUMBER	LITHOLOGY	SAMPLE INT		LITHOLOGY
SERIES SUB-SERIES	ZONE SUB-ZONE				PALEO	SMEAR	
							Core is disturbed
		1	1	Z Z	n	*	Yellow brown Manganese nodules
				Z Z	f n	*	
		2	2	Z Z	*	*	Color change
				Z Z	*	*	Dark yellow brown alternating with grayish brown
		3	3	Z Z	*	*	Zeolitic "red" clay
				Z Z	*	*	Smears { Clay d Phillipsite a Iron oxides d Manganese Micro-nodules r
		4	4	Z Z	*	*	
				Z Z	*	*	Color change
		5	4	Z Z	n	*	Dusky brown
				Z Z	*	*	Color change
				Z Z	*	*	Moderate brown
		6	6	Z Z	*	*	Color change
					*	*	Phillipsite bed, probably devitrified ash.
		7	5	Z Z	*	*	Dusky brown
				Z Z	*	*	
				Z Z	*	*	Color change and lithologic change
		8	6	Z Z	*	*	Grayish brown
				(Z) (Z)	*	*	Zone of zeolite nodules
				Z Z	*	*	Smears { Clay a Phillipsite c Iron oxides a
				Z Z	*	*	
			cc		n		

Figure 3B. Core 1, Hole 39 (0-9 m Below Seabed)



Plate 1. Core 1, Hole 39

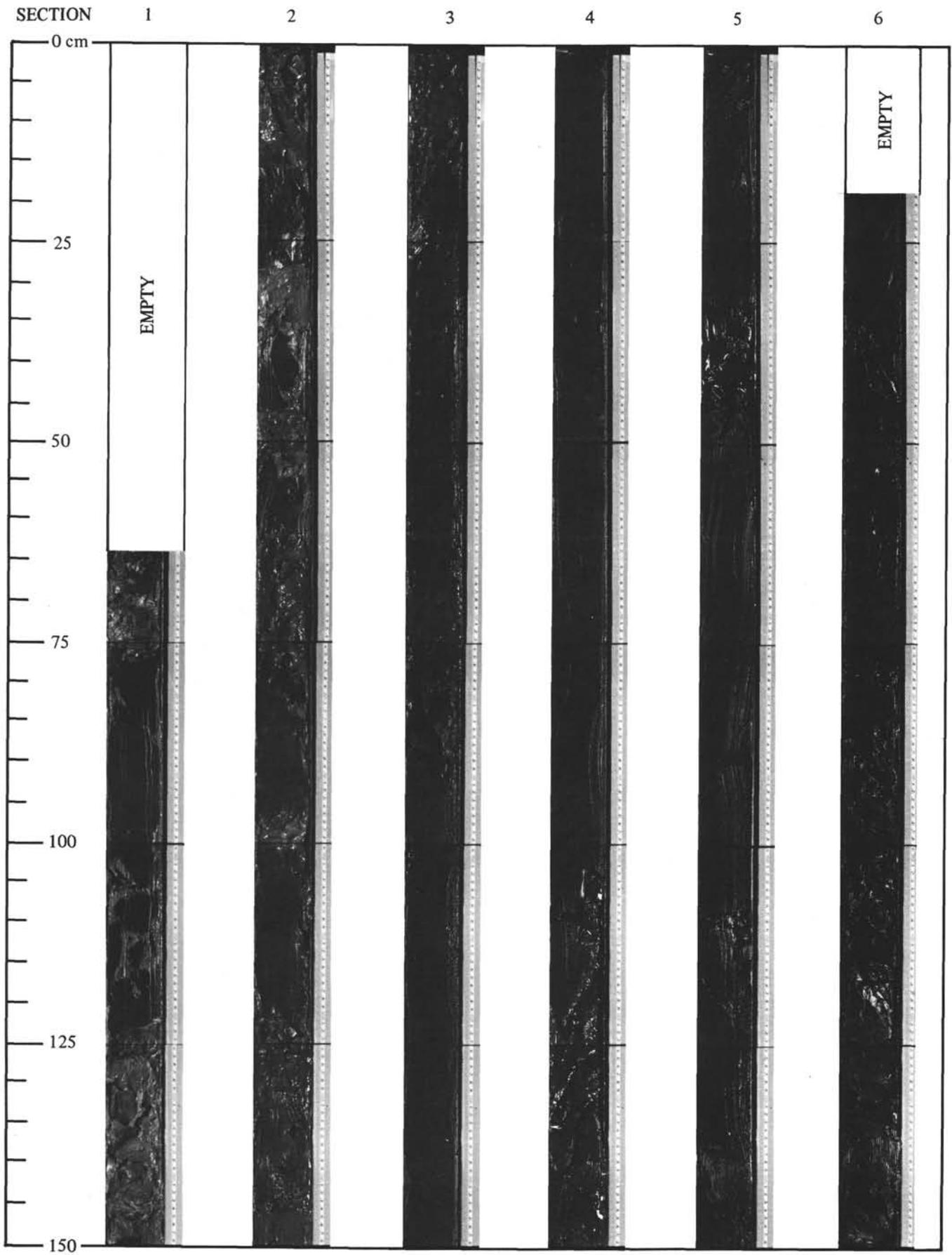


Plate 2. Core 2, Hole 39

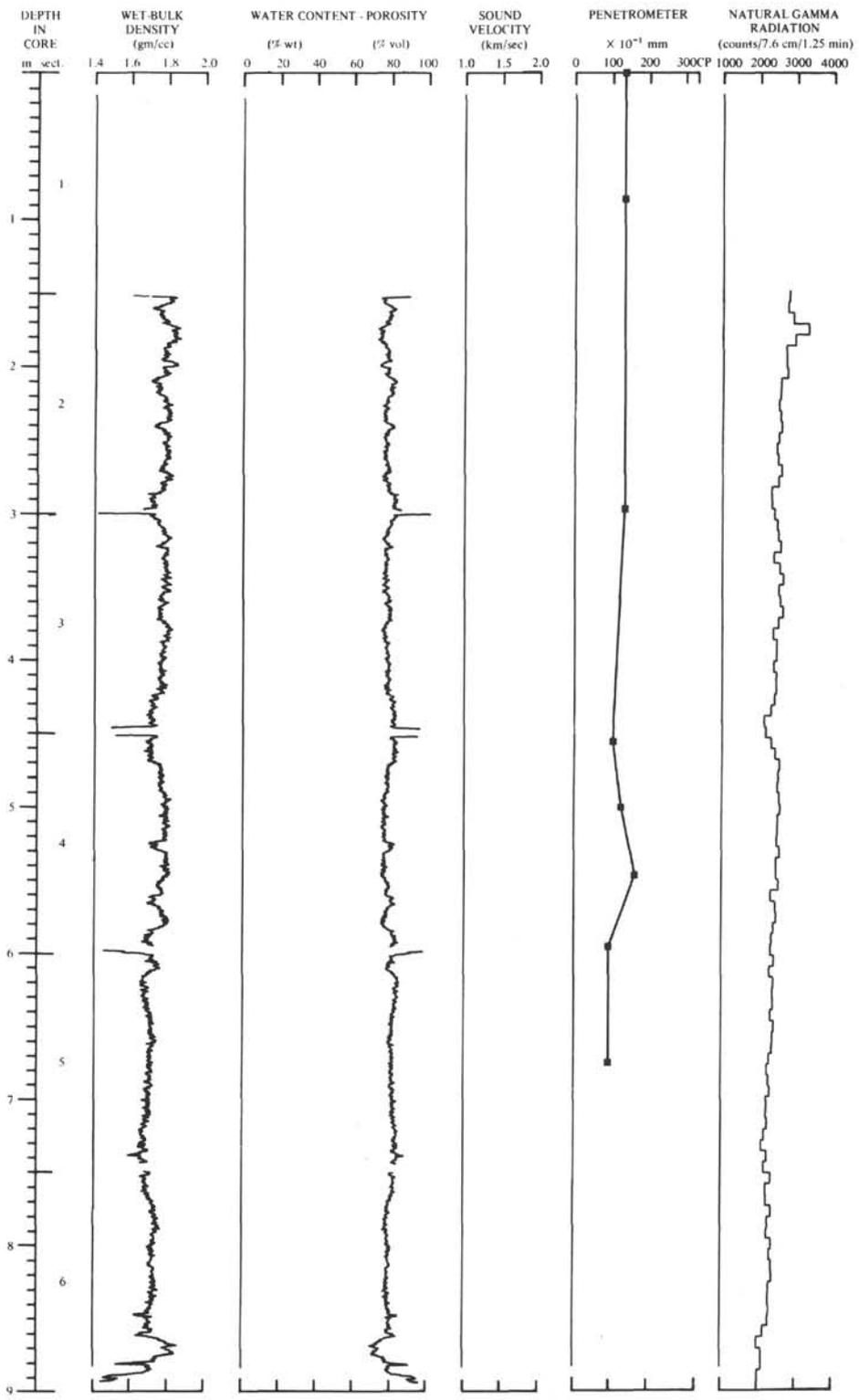


Figure 4A. Physical Properties of Core 2, Hole 39

AGE		DEPTH (METERS)	SECTION NUMBER	LITHOLOGY	SAMPLE INT.		LITHOLOGY	
SERIES SUB-SERIES	ZONE SUB-ZONE				PALEO	SMEAR		
?	?			NO RECOVERY			Core is disturbed	
		1	1		f	*	Dusky brown	
							*	Color change
							*	Moderate brown
		2	2			*	Color change	
							*	"Amorphous iron oxide sediment
							*	Smears { Clay ? d Iron oxides a Zeolites c
							*	----- Small lithologic change
		3	3					> Zone moderately mottled
		4	4				*	
							*	Dusky brown
		5	5				*	Color change
							*	"Amorphous iron oxide sediment
							*	Smears { Clay ? d Iron oxides a Others r
							n f -n-	Grayish brown
							*	
					f	Color change		
					*			
					f	Dusky brown		
					*			
					f			
					*			
					-n-	Lithologic change		
					f			
					n	"Amorphous iron oxides with foraminifera and nannofossils		
					n n	Black basalt recovered from center bit		

Figure 4B. Core 2, Hole 39 (9-17 m Below Seabed)