6. SITE 168

The Shipboard Scientific Party[1]

SITE DATA

Position:
Latitude: 10° 42.2′N
Longitude: 173°35.9′E.

Geography: At west edge of Central Basin, about 300 km east of Mejit Island, in the Marshall Island Chain.

Water Depth:
PDR, to derrick floor: 5406 meters.
From drill pipe measurement from derrick floor: 5430 meters.
Adopted: 5420 meters.

Date Occupied: 6-7 May 71.

Time on Location: 42 hours.

Depth of Maximum Penetration: 85 meters.

Cores Taken: Five.

Total Length of Cored Section: 28 meters.

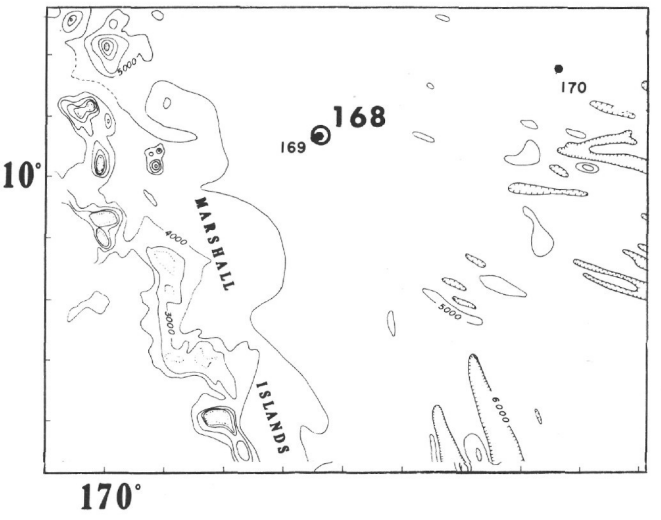
Total Recovery:
Length: 7.5 meters.
Percentage: 26.7.

Percentage of Penetrated Section Cored: 33.

Principal Results: At Site 168 only the top 85 meters of sediment were drilled before we lost a part of the bottom-hole assembly and were forced to stop. The last core, at 66 meters, was probably middle Eocene in age. The first chert stringers were met at 41 meters, in beds of probable late Eocene age. The predominant sediment type in the cores is brown radiolarian zeolitic clay. Calcareous nannofossils are common in the deepest sample. Site 168 is paired with Site 169, 7 km to the southwest, where the drill reached a basalt flow beneath Albian sediments. (See Figure 1.)

BACKGROUND AND OBJECTIVES

Site 168, located just east of the Marshall Islands, was judged to offer the best opportunity of the entire leg to sample pre-Cretaceous sediment. Based primarily on extrapolation of the age gradient, determined by the Cenozoic magnetic anomaly pattern in the eastern basin and the age of the deepest sediment at Site 164, an age of early to middle Jurassic was predicted.



Seismic profiles recorded by R/V *Vema* of LDGO and by R/V *Argo* of SIO indicate a sedimentary section 300 to 400 meters thick, overlying a smooth, eastward-dipping acoustic basement. In fact, the basement is so smooth and dips so uniformly away from the Marshall Island chain that there was more than a little hesitation in selecting the site, for fear that the acoustic basement is a volcanic apron, and the sediment above it might record the age of the islands, rather than the age of the crust. However, a close examination of all the data at our disposal showed no alternate location in the general area that offered a sufficient thickness of soft sediment for spudding in. Furthermore, the deeper section (opaque layer) at the site has the same thickness as is found in the least disturbed parts of the rougher region toward the east, so presumably it is characteristic of this part of the central basin.

OPERATIONS

The site was approached from the southeast, and the last few hours were devoted mainly to searching for a sufficient thickness of upper transparent layer (Figure 2) to permit spudding in. The site was eventually chosen within about 2 miles of the provisional site on the *Vema* profile (Figure 3).

The beacon was dropped underway at a place where the total sedimentary section corresponds to 0.31 sec reflection time. The profiler record (Figure 2) showed 0.05 sec from the sea floor to a zone of rather faint reflectors about midway into the upper transparent layer, which in this area is present only in patches that have the appearance of being erosional remnants. The base of the upper transparent layer is at 0.10 sec below bottom, and the opaque layer is 0.21 sec thick.

The spudding-in process at 1830 hrs on 6 May 71 began with a cored interval of 5413 to 5422 meters. No mud was found in the core, but the core catcher did contain a trace

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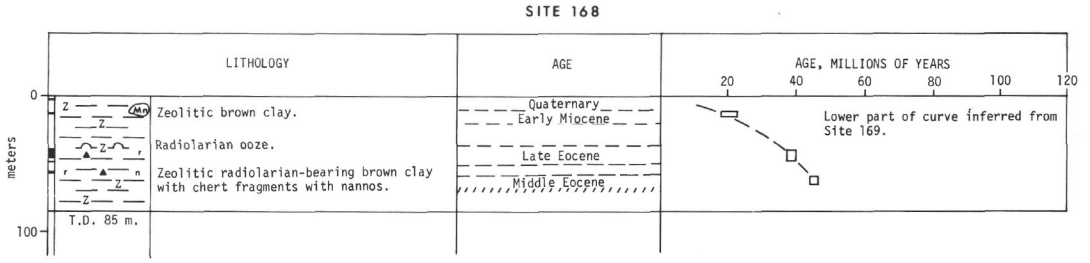


Figure 1. *Graphic log showing lithology, age, and rate of accumulation of sediments at Site 168.*

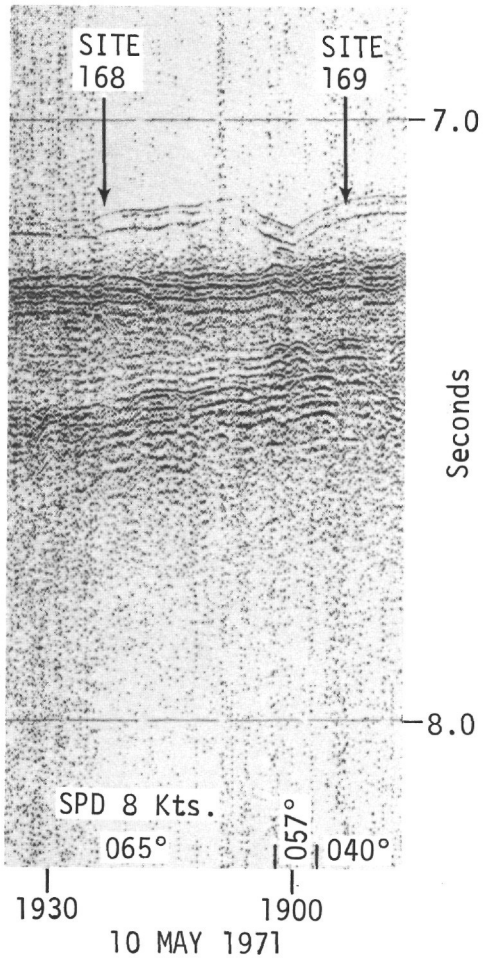


Figure 2. *Seismic profile recorded by* Glomar Challenger *along a course between Site 169 and 168. See Figure 3 for track.*

of mud, including a few Radiolaria and foraminifera. The second coring attempt, 5422 to 5431, recovered a full core catcher sample of zeolitic brown clay, with two small manganese nodules. Corrected echo soundings had predicted bottom at 5406 meters. With these confusing bits of data to operate on, we irresolutely took 5420 meters as official water depth, 14 meters below corrected PDR depth, a procedure that seemed to work best at the majority of sites in this part of the ocean.

Chert layers were encountered at only 41 meters below sea floor. Apparently these correspond to the faint reflectors within the upper transparent layer. Penetration was accomplished through this zone of alternating cherts and clays to a subbottom depth of 85 meters (through Core 5), at which point the bottom-hole assembly parted at the top of the lower pair of bumper subs. Examination after retrieval of the drill string indicated that the connection may have backed off somewhat, then pulled apart. The failure was not judged to be sufficient grounds for abandoning the idea of drilling in this area, so another hole was planned at the same position. However, before a new bottom-hole assembly could be put together, the beacon became erratic and it was decided to move to a new location, so that beacon redundancy would be available if needed. After a short survey, a new site (169) was chosen about 3 miles southwest of 168, and a new beacon was dropped.

BIOSTRATIGRAPHIC SUMMARY

Only 5 cores were recovered at this site. Cores 1 and 2 were taken at the sediment surface and contained, respectively, a calcareous sand with foraminifera of late Neogene to Quaternary age and a siliceous ooze no older than early Miocene. Cores 3 and 4 were taken together at 39 to 48 meters. The radiolarian fauna in the siliceous ooze of these cores is predominately late Eocene in age, but contains specimens from both the upper Oligocene and middle Eocene. Core 5 (57-66 m) was the last core recovered from this site and it, too, contained a highly mixed assemblage, predominately of late middle Eocene age, but containing Radiolaria from the Oligocene and upper Eocene and calcareous nannoplankton and Radiolaria from the lower part of the middle Eocene. The Pliocene, most of the Miocene and possibly parts of the Oligocene and Eocene sections appear to be missing at this site. The average sediment accumulation rate for the section drilled is 1.5 m/m.y.

LITHOLOGIC SUMMARY

Only five cores were cut at this site between 0 and 85 meters before the bottom-hole assembly parted and the hole was finished at a total depth of 85 meters. Material found in the core catcher of Core 1 was judged to be contamination from the drill string obtained while feeling for the bottom at the site; Core 2 was designated as representing the interval 2 to 11 meters subbottom depth. Recovery was very poor: Cores 2 and 3 were small core

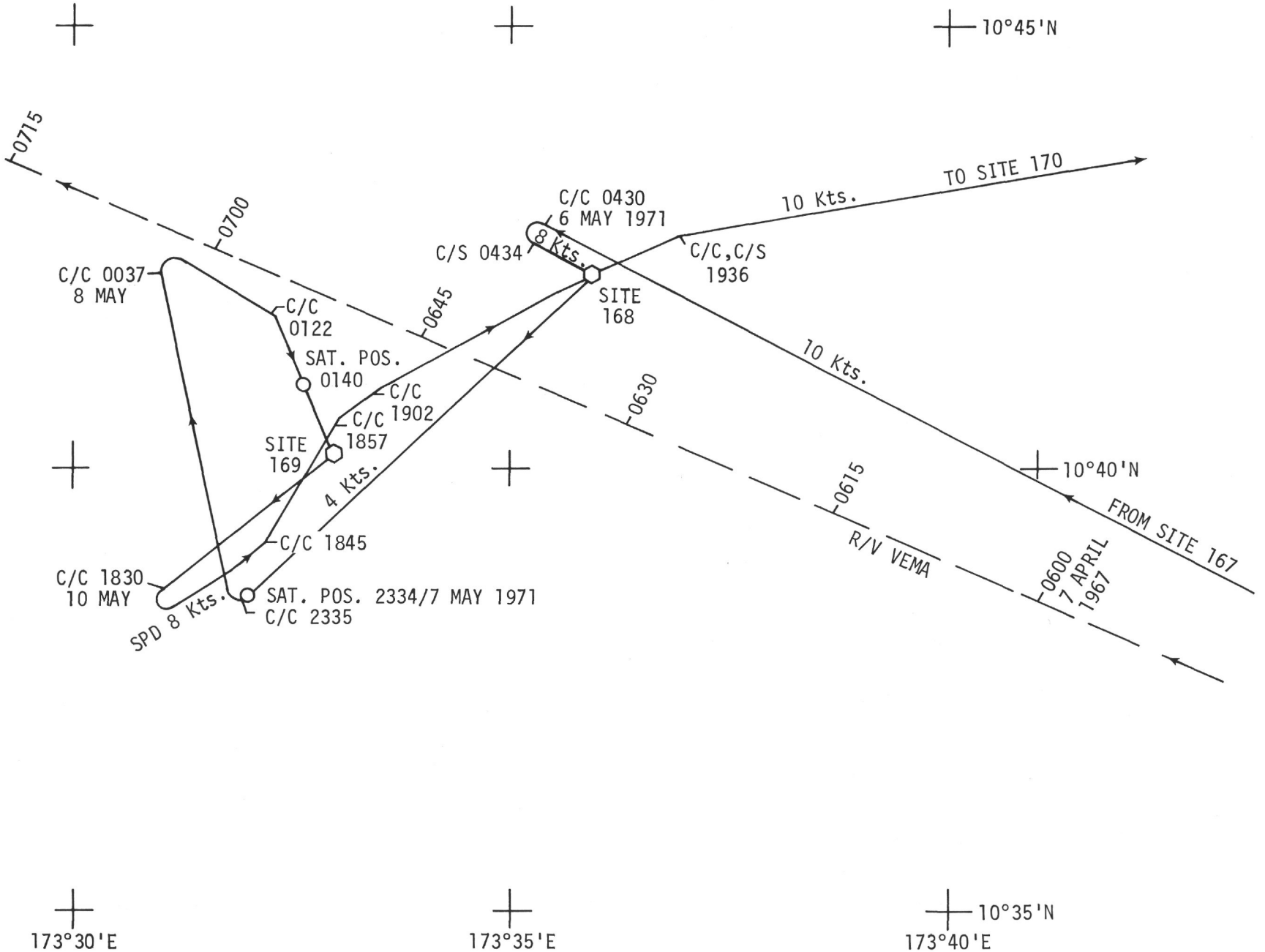


Figure 3. *Tracks of* Glomar Challenger *and* Vema *in the vicinity of Sites 168 and 169.*

catcher samples; Core 4 contained 7 meters of watery sediment; Core 5 was represented by a core catcher sample and 1 meter of very soupy material – the liner was not cut; Core 6 also was only a core catcher sample.

The entire section at this site is considered to be a single major lithologic unit. However, the section from 0 to 41 meters is chert-free whereas the section from 41 to 85 meters is chert-bearing, and a zone of weak reflectors appears to correlate with the uppermost chert beds. Therefore, it is possible to differentiate two subunits on the basis of chert content and acoustic profiles.

Subunit 1 – Zeolitic Brown Clay and Radiolarian Ooze

These sediments contain abundant (up to 50% in Core Catcher 2) euhedral phillipsite as individual laths and clusters of crystals. Rare subhedral pyroxene grains up to 0.1 mm long showing faint green brown pleochroism are present. Fragments of twinned plagioclase, volcanic glass, and orange palagonite make up a trace. Manganese micronodules and pyrite also form a few percent of the sediment. Radiolarian debris and fragments of apatitic fish teeth are minor constituents in Core Catcher 2. In Core Catcher 3 siliceous organic remains dominate in the form of whole and fragmental Radiolaria, spicules, and silicoflagellate debris; diatoms are rare. The sediments are dark grayish brown to brown in color. Manganese nodules up to 1 cm in diameter were noted. Since all of the material was homogenized and watery, no sedimentary structures were preserved.

Subunit 2 – Interbedded Chert and Radiolarian and Nannofossil Bearing Zeolitic Clay.

Cores 4, 5, and 6 recovered only fragments and soupy mixtures of sediments and the interbedded nature of the chert and clays are assumed. In Core 4 dense, dark brown to black chert fragments were abundant in radiolarian-rich phillipsitic, dark brown clay. Core 5 material was similar to 4 but contains nannofossils and very fine-grained anhedral calcite fragments. Core 6 material was zeolitic radiolarian-bearing brown clay. X-ray analyses (A. C. Pimm, personal communication) show that phillipsite is abundant in Core 2 and common in Core 3. Clinoptilolite is common in Cores 3, 4, and 5. Quartz is common throughout and cristobalite is present in Cores 4 and 5.

CORRELATION BETWEEN STRATIGRAPHIC SECTION AND SEISMIC REFLECTION PROFILE

The correlations for Site 168 are given together with those of Site 169 at the end of the report on Site 169.

CONCLUSIONS

The conclusions for Site 168 are given together with those of Site 169 at the end of the report on Site 169.

APPENDIX A
Core Inventory – Site 168

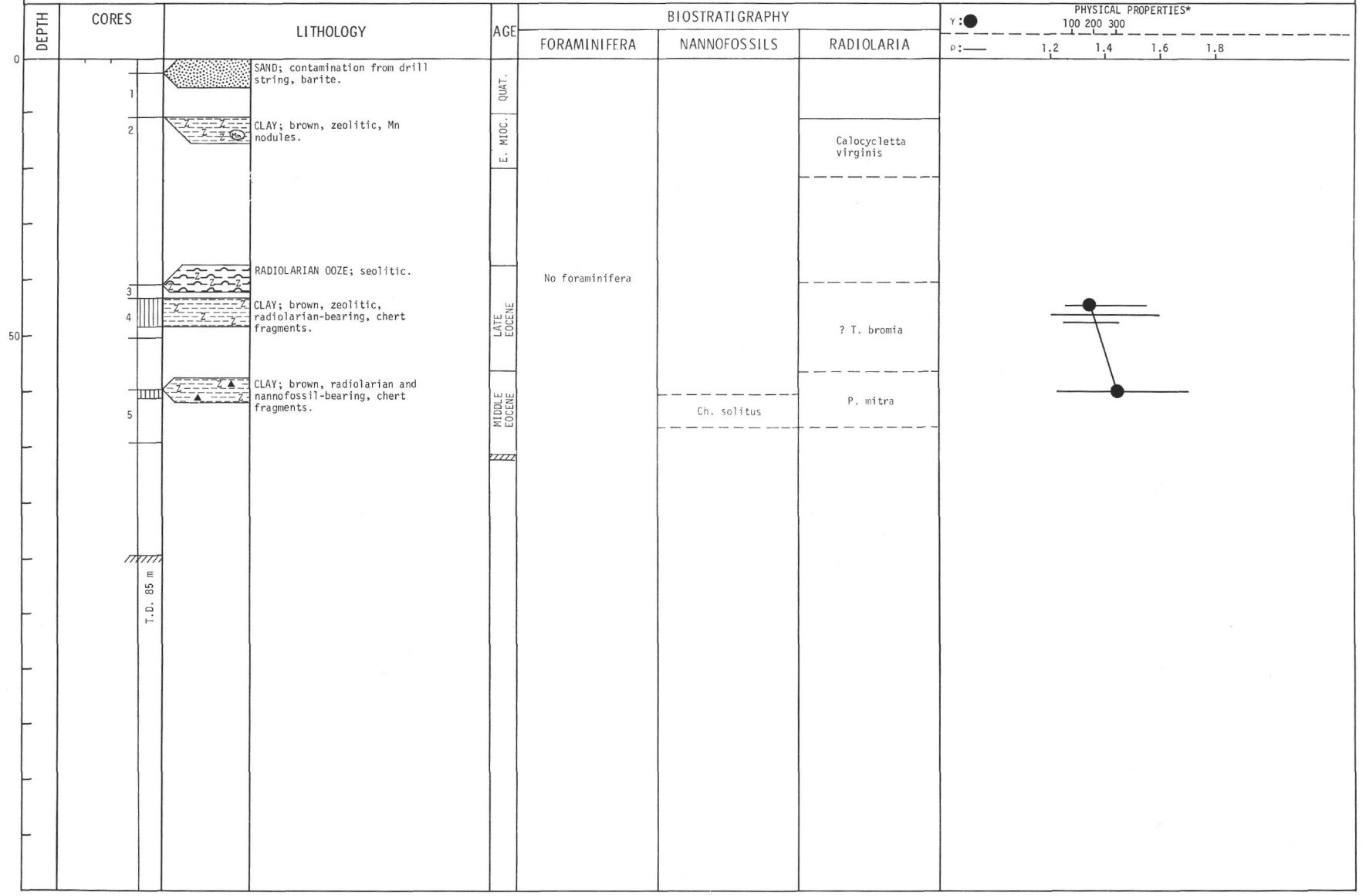
Core	Depth Below Sea Floor (m) Top	Depth Below Sea Floor (m) Bottom	Total Depth[a] (m) Top	Total Depth[a] (m) Bottom	Cored (m)	Recovered (m)	Lithology	Age
1		2	5413	5422	–	CC Tr	Sand (mainly contamination from drill string)	Quaternary
2	2	11	5422	5431	1	CC	Zeolitic brown clay; manganese nodules	Early Miocene
3	39	41	5459	5461	2	CC	Radiolarian ooze (zeolitic)	Late Eocene
4	41	48	5461	5468	7	5	Brown clay with radiolarians; chert fragments	Late Eocene
5	57	66	5477	5486	9	1	Brown clay nannofossils and Radiolaria; chert fragments	Middle Eocene
6	76	85	5496	5505	9	CC	Broke bottom hole assembly. End of Hole.	

[a]Measured from the derrick floor.

APPENDIX B
Physical Properties – Site 168

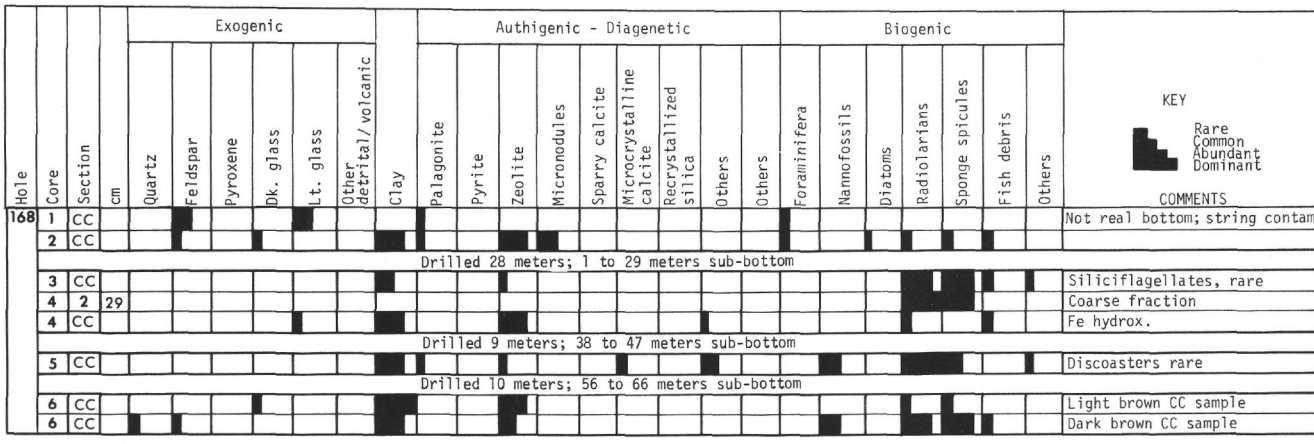
Core Section	Section Weight Wet Bulk Density (g/cc)	GRAPE					Syringe[a]				Natural Gamma Radiation		Sonic Velocity	
		Wet Bulk Density		Assigned Grain Density (g/cc)	Porosity		Interval Sampled (cm)	Wet Bulk Density (g/cc)	Grain Density (g/cc)	Porosity (%)	Total Count	Net	Interval Sampled (cm)	(km/sec)
		Total Range (g/cc)	Undisturbed (g/cc)		Total Range (%)	Undisturbed (%)								
4-1		1.25-1.55		2.75	69.5-86.9							1625	175	
4-2		1.20-1.60		2.75	66.6-89.9									
4-3		1.25-1.45		2.75	75.3-86.9									
5-1		1.22-1.70		2.75	60.8-88.6							1650	300	

LEG XVII SITE 168 LAT. 10°42.2'N LONG. 173°35.9'E DEPTH 5420 m SHEET 1 OF 1



SITE 168

SMEAR SLIDE SUMMARY



Hole	Core	Section	cm	Exogenic: Quartz	Feldspar	Pyroxene	Dk. glass	Lt. glass	Other detrital/volcanic	Clay	Authigenic - Diagenetic: Palagonite	Pyrite	Zeolite	Micronodules	Sparry calcite	Microcrystalline calcite	Recrystallized silica	Others	Others	Biogenic: Foraminifera	Nannofossils	Diatoms	Radiolarians	Sponge spicules	Fish debris	Others	COMMENTS
168	1	CC																									Not real bottom; string contam.
	2	CC																									
				Drilled 28 meters; 1 to 29 meters sub-bottom																							
	3	CC																									Siliciflagellates, rare
	4	2	29																								Coarse fraction
	4	CC																									Fe hydrox.
				Drilled 9 meters; 38 to 47 meters sub-bottom																							
	5	CC																									Discoasters rare
				Drilled 10 meters; 56 to 66 meters sub-bottom																							
	6	CC																									Light brown CC sample
	6	CC																									Dark brown CC sample

Site 168 Hole Core 1 Cored Interval: See Table I, Site 168

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
QUAT.(?)		f	R	P	Core Catcher				*	Sand; fine to very fine-grained, made up of barite, K-feldspar, plagioclase, fragments of planktonic foraminifera.

Site 168 Hole Core 2 Cored Interval: 0 to 1 meter

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY MIOCENE	Calocycletta virginus	r	R	P	Core Catcher		Mn		*	Brown clay: very dark grayish brown (10YR 3/2), zeolitic, 2 manganese nodules 1 cm in diameter.

Site 168 Hole Core 3 Cored Interval: 29 to 31 meters

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE EOCENE	Theocyrtis bromia	r	A	M	Core Catcher				*	Radiolarian ooze; zeolitic.

Explanatory notes in Chapter 1

Site 168 Hole Core 4 Cored Interval: 31 to 38 meters

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE EOCENE	Thyrsocyrtis bromia	r	A	M	1	0.5				Brown clay: dark-brown (7.5YR 3/2), zeolitic, radiolarian-bearing. Chert fragments, black (10YR 2.5/1) scattered throughout. Entire sections recovered as watery, completely mixed material.
					1	1.0				
					2				*	
					3					
					4					
					5					
		r	A	M	Core Catcher					Brown clay: dark-brown (7.5YR 3/2), zeolitic, radiolarian-bearing.

Explanatory notes in Chapter 1

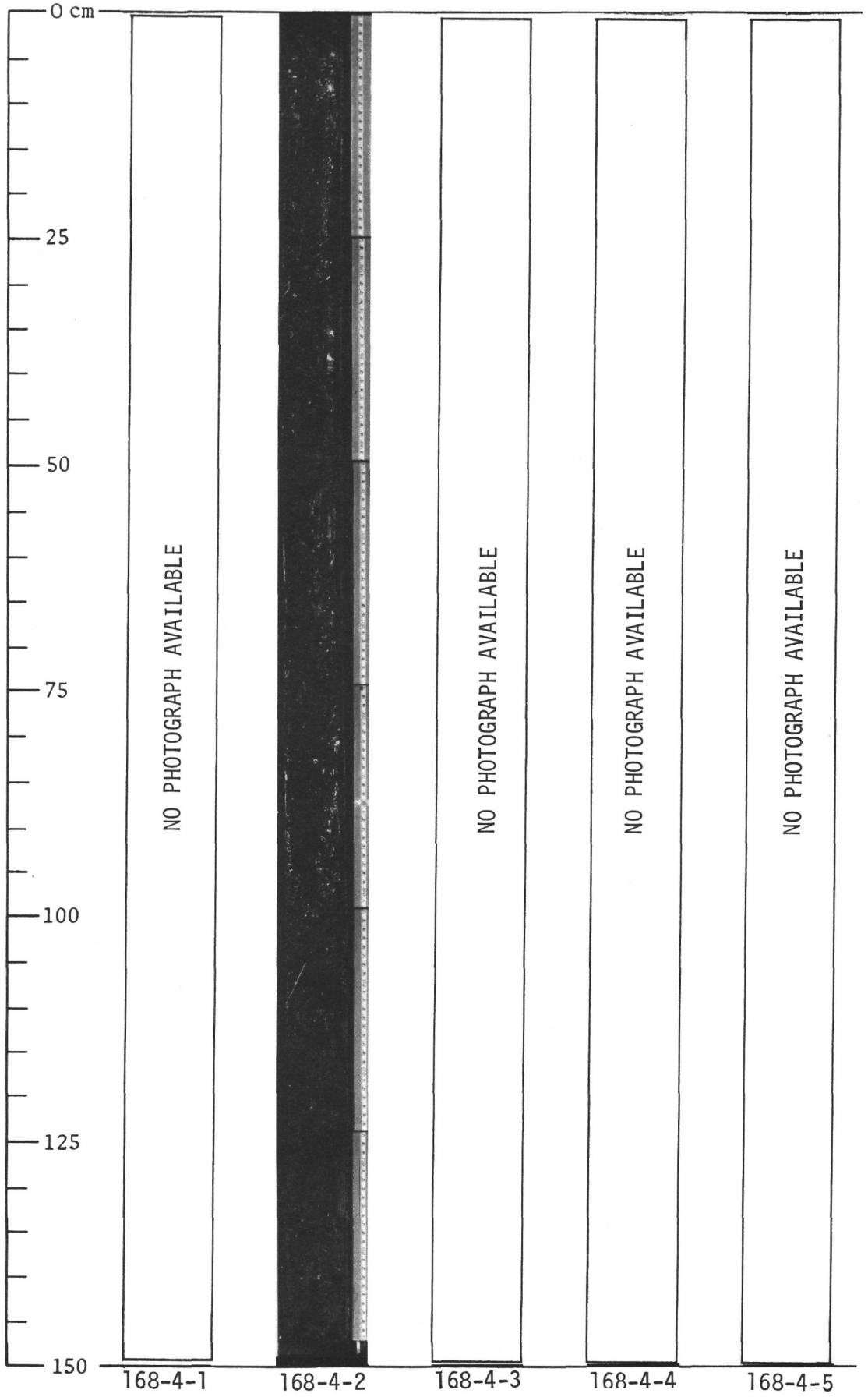
Site 168 Hole Core 5 Cored Interval: 47 to 56 meters

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE EOCENE	Chiasmolithus solitus Podcyrtis mitra				1	0.5 1.0				Brown clay; liner not cut as material was very watery.
		r n	A C	M M	Core Catcher				*	Brown clay; zeolitic, radiolarian and nannofossil-bearing with chert fragments, dark-brown (10YR 3/3) to black (10YR 2.5/1).

Site 168 Hole Core 6 Cored Interval: 66 to 75 meters

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
?					Core Catcher				*	Brown clay; (7.5YR 5/6), zeolitic. Mixed with very dark grayish-brown (10YR 3/2) zeolitic and radiolarian-rich brown clay.

Explanatory notes in Chapter 1


0 cm
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50
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