6. SITE 288

The Shipboard Scientific Party[1]

SITE DATA

Date Occupied: 21 May 1973 (0500)

Date Departed: 30 May 1973 (1500)

Time on Site: 202 hours

Position:
Latitude: 5°58.35'S
Longitude: 161°49.53'E

Water Depth (from sea level): 3000 corrected meters (echo sounding)

Bottom Felt at: 3030 meters (drill pipe)

Penetration:
Hole 288: 238 meters
Hole 288A: 988.5 meters
Hole 288B: 150 meters
Hole 288C: 117 meters

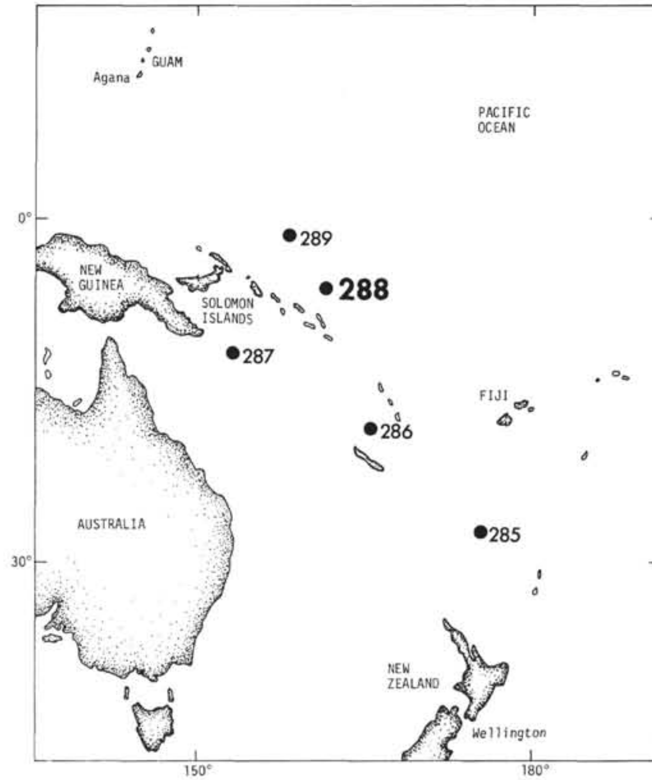
Number of Holes: 4

Number of Cores:
Hole 288: 11
Hole 288A: 30
Hole 288B: 1
Hole 288C: 1

Total Length of Cored Section:
Hole 288: 98 meters
Hole 288A: 284.5 meters
Hole 288B: 3 meters
Hole 288C: 4.5 meters

Total Core Recovered:
Hole 288: 50.4 meters
Hole 288A: 61.3 meters
Hole 288B: 3 meters
Hole 288C: 4.5 meters

Percentage Core Recovery:
Hole 288: 51%
Hole 288A: 22%
Hole 288B: 100%
Hole 288C: 100%



Oldest Sediment Cored:
Depth below sea floor: 988.5 meters
Nature: Cherty limestone
Age: Aptian
Basement: Not reached

Principal Results: The lithologic succession at Site 288 is in ascending order: Early Cretaceous (Aptian) to lower Paleocene nannofossil chalk and limestone with interbeds of chert, vitric clay, and siltstone 988.5-500 m); lower Oligocene to Pleistocene foram-nannofossil ooze and chalk with nodular chert from Miocene downwards. The site was located on the southeastern flank of the Ontong-Java Plateau. Basement was not reached, but a comparison to Site 289 suggests that the oldest sediments (Aptian) may not have been far above it. Following crustal formation in pre or early Aptian time, biogenic and minor volcanogenic sediments accumulated. Maximum depth at the site was reached in the Campanian while passing below the foram solution depth. Planktonic foraminifera make their appearance again in middle Maestrichtian sediments. The section is discontinuous, with a major hiatus in the Eocene and early Oligocene. Reworked sediments suggest that the site has been an unstable surface of gentle inclination—probably within a topographic low—which has been subject to current scour and minor slumping from Aptian to Miocene. More intense disturbances have occurred from the late Miocene on. Ash in the upper Pliocene is probably

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related to volcanism on the Stewart arch and the Roncador homocline. The Miocene/Pliocene hiatus may mark slumping associated with tectonism.

BACKGROUND AND OBJECTIVES

The Ontong-Java Plateau is underlain by a region of unusual oceanic crust that has an estimated maximum thickness of 40 km (Kroenke, 1972). The water depth over the plateau is mostly in the vicinity of 2 km, and as a consequence of its shallowness and its tropical location, the plateau is covered by a thick accumulation of biogenic sediment. One of the most prominent seismic reflections on the plateau is associated with the middle Eocene chert. This lies below the surface of the sediment at a depth close to a kilometer over a great part of the plateau and is close to acoustic basement. Occasionally subbasement reflectors are seen.

Seismic refraction studies on the plateau show that the layering of the crust is similar to typical oceanic sections, but each of the layers is thicker than normal. Accordingly, it was thought that the volcanic upper layer of the crust must be thicker; possibly flood basalt flows contributed significantly to this layer. Two sequences in the area have been studied, that on the island of Malaita (Solomon Islands) and at Site 64 on the Ontong-Java Plateau (Figure 1). The island of Malaita has an exposed sequence of oceanic chalks and limestones very similar to that sampled at Site 64, including the presence of Eocene chert in the section (Figure 1). The oldest fossil found on Malaita is *Planomelina buxtorfi* (Deventer and Postuma, 1973) which indicates an Albian age some meters above basaltic volcanic basement—the limestone/basalt contact is obscured by talus and the exact relationship is not clear. Drilling at Site 64 (Winterer, Reidel, et al., 1971) penetrated as far as middle Eocene chert.

Site 288 was located on the eastern flank of the plateau at 5°59'S and 161°50'E in 3030 meters of water (Figure 2), where it appeared that the sediment cover over the chert reflector was less than on the plateau proper and subbasement reflectors could be distinguished. It was hoped that the nature of the basement of the plateau could be determined, and consequently, reentry was planned for the site to ensure maximum penetration.

OPERATIONS

Site 288, on the eastern salient of the Ontong-Java Plateau was approached along 6° south latitude on a course of 090°. The approach track is shown in Figure 2 on a portion of the Bathymetric Chart of the Ontong-Java Plateau (Kroenke, 1972). The seismic profile on this track is shown in Figure 3.

The beacon was dropped underway at 0500 on 21 May 1973, following a Williamson turn after the first crossing of the site location.

This site was planned as a reentry operation, and Hole 288 was spudded at 1200 on 21 May 1973 to core the upper section of soft sediments and to establish drill pipe depth to the sea floor (3030 m). Eleven cores were cut with a program of alternate washing and coring to a depth of 238 meters (Table 1).

The string was pulled on 22 May 1973 and the reentry cone run with 56 meters of casing into Hole 288A. The hole was spudded in on 23 May 1973 and washed to plant the cone and bypass the section of Hole 288. Coring commenced at 267 meters subbottom and continued with alternate washing and coring to a depth of 884.5 meters subbottom (Table 1). At that point bit wear was becoming obvious, and the string was tripped before the hole became undersized. On recovery the bit was very close to failure.

Several minor problems slowed reentry—most due to pipe dope picked up by the sonar tool on run-in causing the transducer to drag and jam. The first tool run also became locked in sector scan. A second tool was run, and reentry accomplished at 0200, 27 May 1973. Seven additional cores were cut between 884.5 and 988.5 meters subbottom. Signs of approaching bit failure at that depth in the hard limestones and cherts prompted a decision for a second reentry to replace the bit. The string was tripped on 28 May 1973. On recovery the bit had 10%-20% life remaining.

A new bit was run, and reentry accomplished at 0500, 29 May 1973. At a depth of 105 meters subbottom resistance was encountered, and efforts to penetrate the blockage apparently resulted in penetrating the hole wall. Two additional cores were cut to verify that at 147-150 meters subbottom (Hole 288B) and 112.5-117 meters subbottom (Hole 288C), and the site was abandoned at 0500, 30 May 1973. The B and C holes were slant holes below casing depth.

An on-site profile (Figure 4) was shot (see Correlation of Reflection Profiles section), and an underway reflection was launched at the beacon on departing the site (Figure 5).

LITHOLOGY

Site 288, on the southeastern edge of the Ontong-Java Plateau, north-northwest of Stewart Island (Sikiana) and at the western end of Stewart Basin was drilled in a water depth of 3014 meters. Cores were taken 9.5 to 28.5 meters apart in Holes 288 and 288A, with the interval 846.5 to 903.5 meters subbottom being continuously cored. Successful reentry in Hole 288A resulted in deeper drilling and coring than would have been possible using the original bit. Forty-one cores were taken and 111.7 meters recovered in Holes 288 and 288A. A second reentry resulted in shallow slant penetration below the casing. Two cores, 288B-1 and 288C-1, totaling 7.5 meters of sediment were taken from just below the casing. This was the only sediment collected following the second reentry.

The rock types occurring at Site 288 are all sedimentary and are divided into two units (Figures 6 and 12), in descending order:

Unit 1 (0-466.5 m): Foram-nannofossil ooze and chalk increasing in consolidation downward from soft ooze semilithified chalk with associated nodular chert. Pleistocene-lower Oligocene.

Unsampled Interval (466.5-533.0 m).

Unit 2 (533.0-988.5 m): Nannofossil chalk and limestone interbedded with chert and vitric clay, and siltstone. Upper Paleocene-Lower Cretaceous (Aptian).

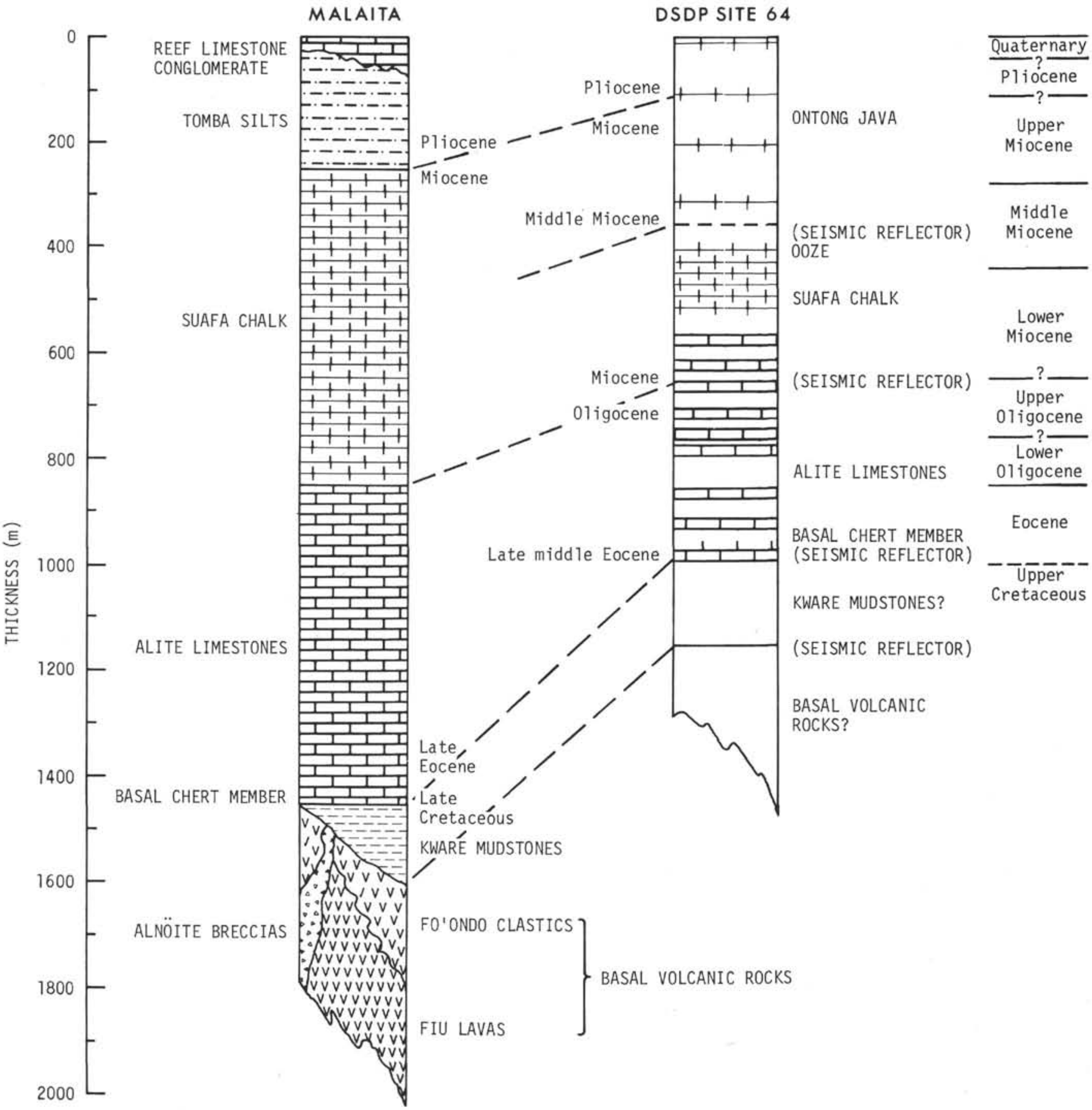

Figure 1. *Stratigraphic columns of the island of Malaita (Soloman Islands) and Site 64 on the Ontong Java Plateau. (Figure from Kroenke, 1972).*

Sediment composition as determined from smear slides is given in Appendix A and plotted in Figure 7. Grain size, carbon-carbonate, and X-ray determination data for each site are in chapters dealing with those subjects collectively for Leg 30 elsewhere in this volume.

Unit 1

The ooze and chalk of Unit 1 are further subdivided into two subunits.

Subunit 1A (82 m thick, 0-82 m): Pyrite-bearing, ash-rich, foram-nannofossil ooze, progressively increasing in stiffness downward; Pleistocene to upper Miocene.

Subunit 1B (418 m thick, 82-500(?) m): Bioturbated, soft foram-nannofossil ooze grading to semilithified chalk, and containing nodular chert near the base. This unit includes the upper Oligocene-lower Miocene and the middle upper Oligocene unconformities and overlies the unsampled interval; upper Miocene to lower Oligocene.

The foram-nannofossil ooze of Subunit 1A is brown at the surface, but changes color rapidly downward to light gray within the first 3 meters of Core 288-1. Although a slight color change is associated with the Plio-Pleistocene hiatus in Core 288-2-2 reported in the

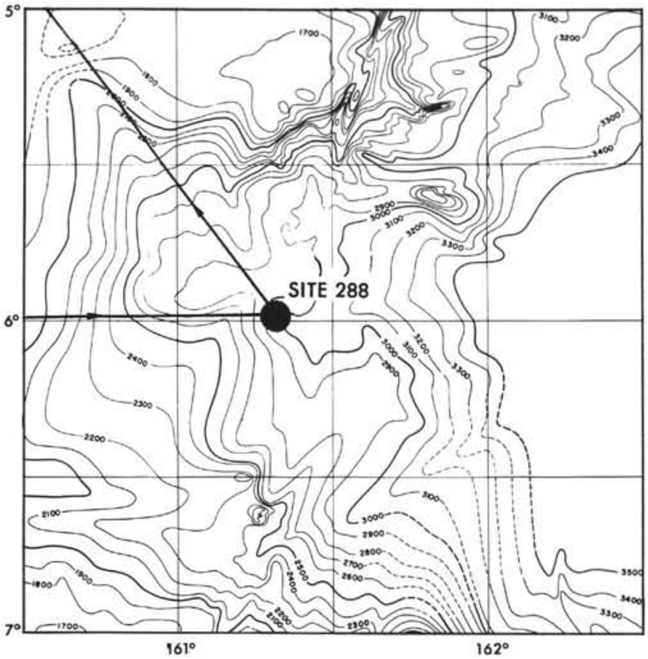

Figure 2. *Location of Site 288 on the Steward Basin and the adjacent part of the Ontong Java Plateau. Contours in hundreds of meters. (Bathymetric map from Kroenke, 1972.)*

Paleontology section, the unit continues to change color downward from light gray to yellowish-gray, finally becoming uniform gray ooze near the base. This color change is accompanied by an increase in consolidation from a very soft to stiff ooze. Increasing amounts of pyrite and ash occur near the bottom of Unit 1 coincident with an increase in insoluble residue content (Figure 8). The upper Miocene-lower Pliocene hiatus is marked by a slight change in color (from light gray to light yellowish-gray) and a decrease in degree of induration and is taken as the boundary between Subunits 1A and 1B.

The very soft, uniformly very light gray, micarb-rich foram-nanno ooze found at the top of Subunit 1B grades downward to a semilithified, intensely mottled and bioturbated white nanno chalk containing calcareous spicules and gray nodular cherts near its base. The intensity of mottling and bioturbation apparently increases with depth in the unit. Below the Oligocene-Miocene unconformity, minor amounts of chert are found in Core 288A-1 at about 305 meters subbottom (upper upper Oligocene) and again in Core 288A-3 (lower upper Oligocene). The cherts in the latter core occur in a zone lacking Radiolaria (see Paleontology section). A sizable chert stringer is inferred to occur between Cores 288A-3 and 4 because of drilling difficulty within that interval. Although little chert was found in Core 288A-4 (381-389.5 m), an increase in the insoluble residue content occurs there (Figure 9), and fragments found at the top of Core 288A-5 may have come from this interval. Radiolarians, however, are numerous and well preserved throughout most of Cores 288A-4 and 5, but are poorly preserved in the core

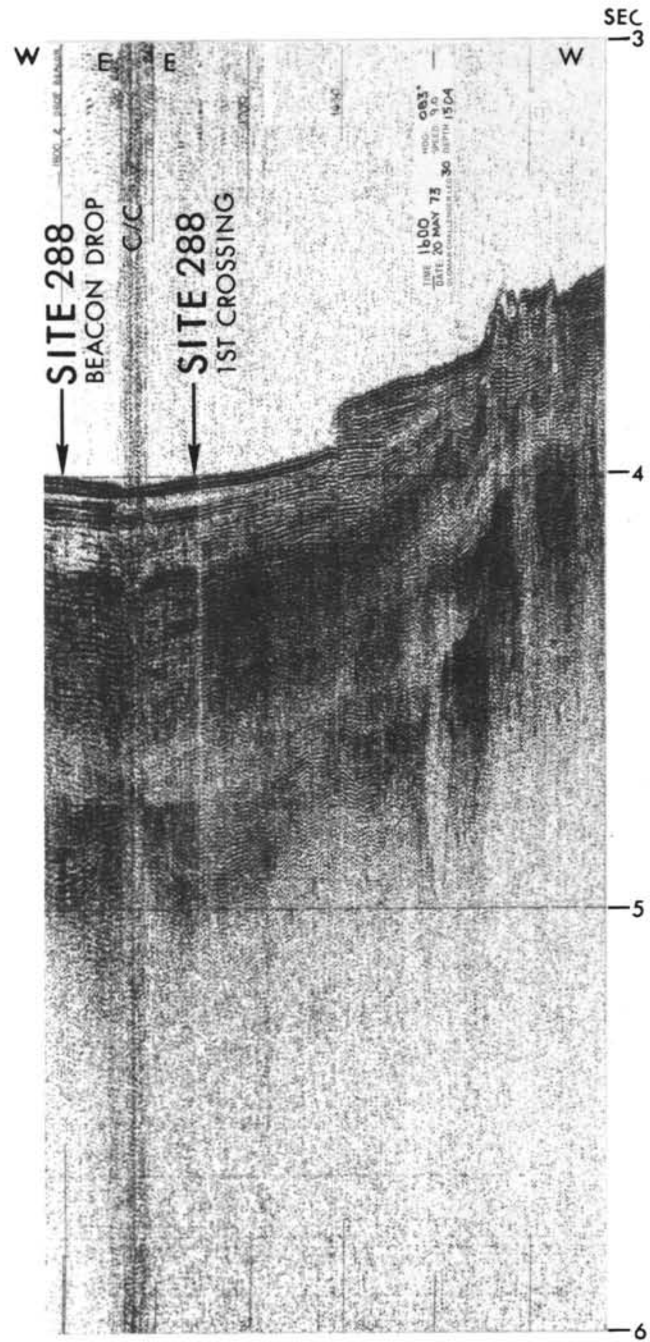

Figure 3. *Seismic profile taken on D/V* Glomar Challenger *on approach to Site 288.*

catcher of Core 288A-5. The radiolarians begin to disappear in Core 288-6 coincident with the occurrence of chert, completely disappearing below Core 288-8 (533 m) at the top of Unit 2.

Units 1 and 2 are separated by an unsampled interval, 66.5 meters thick, between Cores 288A-6 and 288A-8. This interval may include either one or two major unconformities as is discussed in the Paleontology section and may encompass part of the lower Oligocene and/or most of the Eocene and part of the Paleocene. Lack of any core recovery in Core 288A-7 is attributed to chert

TABLE 1
Coring Summary, Site 288

Core	Date (May 1973)	Time	Depth From Drill Floor (m)	Depth Below Sea Floor (m)	Length Cored (m)	Length Recovered (m)	Recovery (%)
Hole 288							
1	21	1335	3030.0-3033.0	0.0-3.0	3.0	2.9	97
2	21	1440	3040.0-3049.5	10.0-19.5	9.5	6.4	67
3	21	1545	3059.0-3068.4	29.0-38.5	9.5	9.5	100
4	21	1700	3078.0-3087.5	48.0-57.5	9.5	2.7	28
5	21	1820	3097.0-3106.5	67.0-76.5	9.5	9.5	100
6	21	1940	3116.0-3125.5	86.0-95.5	9.5	9.2	97
7	21	2110	3144.5-3154.0	114.5-124.0	9.5	2.3	24
8	21	2245	3173.0-3182.5	143.0-152.5	9.5	1.6	17
9	22	0025	3201.5-3211.0	171.5-181.0	9.5	1.5	16
10	22	0145	3230.0-3239.5	200.0-209.5	9.5	2.4	25
11	22	0305	3258.5-3268.0	228.5-238.0	9.5	2.4	25
Total					98.0	50.4	51
Hole 288A							
1	23	1415	3297.0-3306.5	267.0-276.5	9.5	4.4	46
2	23	1540	3335.0-3344.5	305.0-314.5	9.5	1.9	20
3	23	1720	3373.0-3382.5	343.0-352.5	9.5	2.5	26
4	23	2020	3411.0-3420.5	381.0-390.5	9.5	2.1	22
5	23	2200	3449.0-3458.5	419.0-428.5	9.5	0.9	9
6	23	2335	3487.0-3496.5	457.0-466.5	9.5	3.1	33
7	24	0135	3525.0-3534.5	495.0-504.5	9.5	0.0	0
8	24	0325	3563.0-3572.5	533.0-542.5	9.5	2.0	21
9	24	0510	3601.0-3610.5	571.0-580.5	9.5	9.5	100
10	24	0640	3639.0-3648.5	609.0-618.5	9.5	3.0	32
11	24	0815	3677.0-3686.5	647.0-656.5	9.5	2.6	27
12	24	1005	3715.0-3724.5	685.0-694.5	9.5	0.9	9
13	24	1140	3734.0-3742.5	704.0-713.5	9.5	0.3	3
14	24	1305	3753.0-3762.5	723.0-732.5	9.5	0.8	8
15	24	1500	3772.0-3781.5	742.0-751.5	9.5	2.1	22
16	24	1655	3791.0-3800.5	761.0-770.5	9.5	1.4	15
17	24	1845	3810.0-3819.5	780.0-789.5	9.5	0.2	2
18	24	2100	3829.0-3838.5	799.0-808.5	9.5	0.2	2
19	24	2250	3848.0-3857.5	818.0-827.5	9.5	0.5	5
20	25	0250	3876.5-3886.0	846.5-856.0	9.5	4.1	43
21	25	0530	3886.0-3895.5	856.0-865.5	9.5	3.5	37
22	25	0730	3895.5-3905.0	865.5-875.0	9.5	1.7	18
23	25	1015	3905.0-3914.5	875.0-884.5	9.5	4.0	42
		Reentry – stab in at 0200, 27 May 1973					
24	27	1030	3914.5-3924.0	884.5-894.0	9.5	1.8	19
25	27	1240	3924.0-3933.5	894.0-903.5	9.5	1.1	12
26	27	1700	3943.0-3952.5	913.0-922.5	9.5	1.5	16
27	27	2210	3962.0-3971.5	932.0-941.5	9.5	1.6	17
28	28	0230	3981.0-3990.5	951.0-960.5	9.5	1.2	13
29	28	0720	4000.0-4009.5	970.0-979.5	9.5	1.2	13
30	28	1020	4009.5-4018.0	979.5-998.5	9.0	1.2	13
Total					284.5	61.3	22
Hole 288B							
1	29	1700	3177.0-3180.0	147.0-150.0	3.0	3.0	100
Total					3.0	3.0	100
Hole 288C							
1	30	0130	3142.5-3147.0	112.5-117.0	4.5	4.5	100
Total					4.5	4.5	100

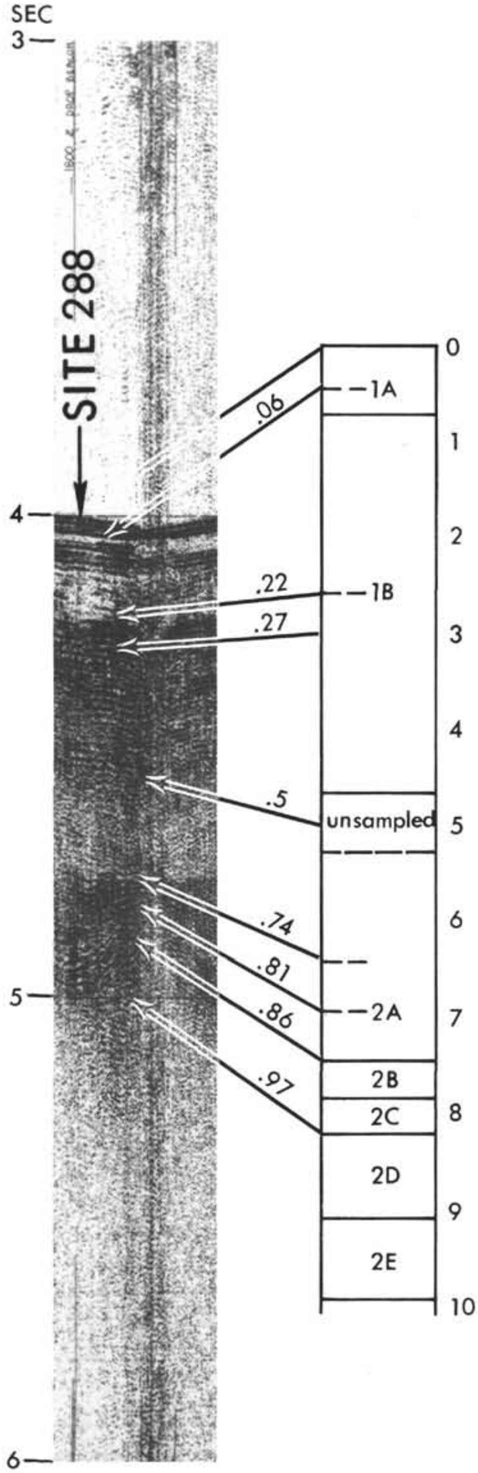

Figure 4. *Part of seismic profile shown in Figure 3 with column showing correlation of reflectors with lithologic units.*

stringers, perhaps representing the middle Eocene cherts found at Site 64 on the Ontong-Java Plateau (Winterer, Riedel, et al., 1971).

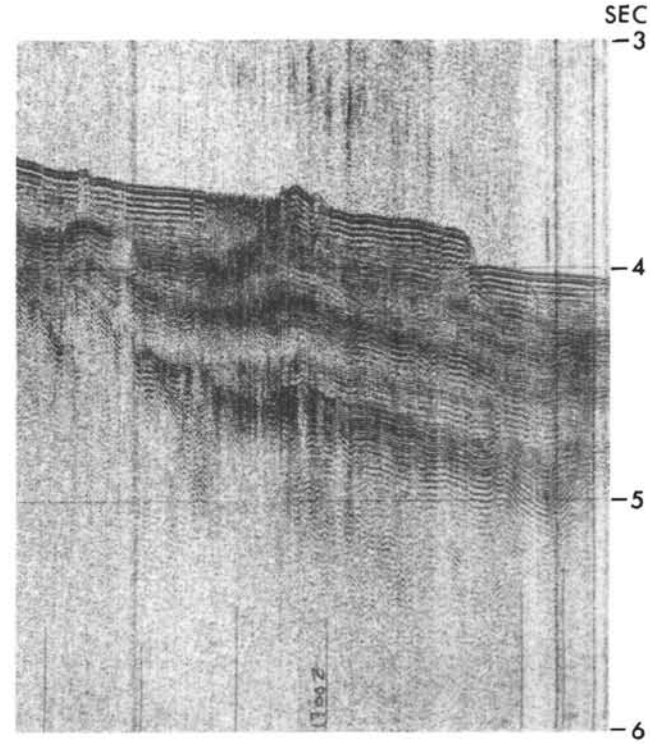

Figure 5. *Seismic profile taken on D/V* Glomar Challenger *on departure from Site 288.*

Unit 2

The chalks and limestones interbedded with cherts and vitric siltstones are further subdivided into:

Subunit 2A (204 m thick, 533-737 m): Nanno-foram chalk and nanno ooze to chalk interbedded with cherts; upper Paleocene through Santonian.

Subunit 2B (38 m thick, 737-775 m): Nanno chalk and limestone interlaminated with vitric siltstone and interbedded with chert. Santonian to upper Coniacian.

Subunit 2C (39 m thick, 775-814 m): Interbedded nanno chalk and chert. Coniacian.

Subunit 2D (94 m thick, 814-908 m): Interbedded rhythmic sequences of vitric clay to siltstone, nanno chalks to silicified limestone, and cherts. Coniacian through middle Cenomanian.

Subunit 2E (80.5 m thick, 908-988.5 m): Limestone and silicified limestone, interbedded with chert and containing glauconite at the base. Lower Cenomanian through Aptian.

Subunit 2A is an intense white to pale yellowish-white to very light gray nannofossil chalk to ooze, lacking the bioturbation of Subunit 1B, devoid of Radiolaria, and containing calcareous spicules and authigenic calcite together with minor amounts of zeolitic clay. Interbedded chert, reddish-brown at the top of the unit, increases downward. Subunit 2A includes both the Thanetian-Danian hiatus and the Tertiary-Cretaceous hiatus reported in the Paleontology section.

An abrupt reversal in degree of induration occurs below the Tertiary hiatus within Core 288A-9-2 (572 m). The nanno chalk changes from semilithified chalk to

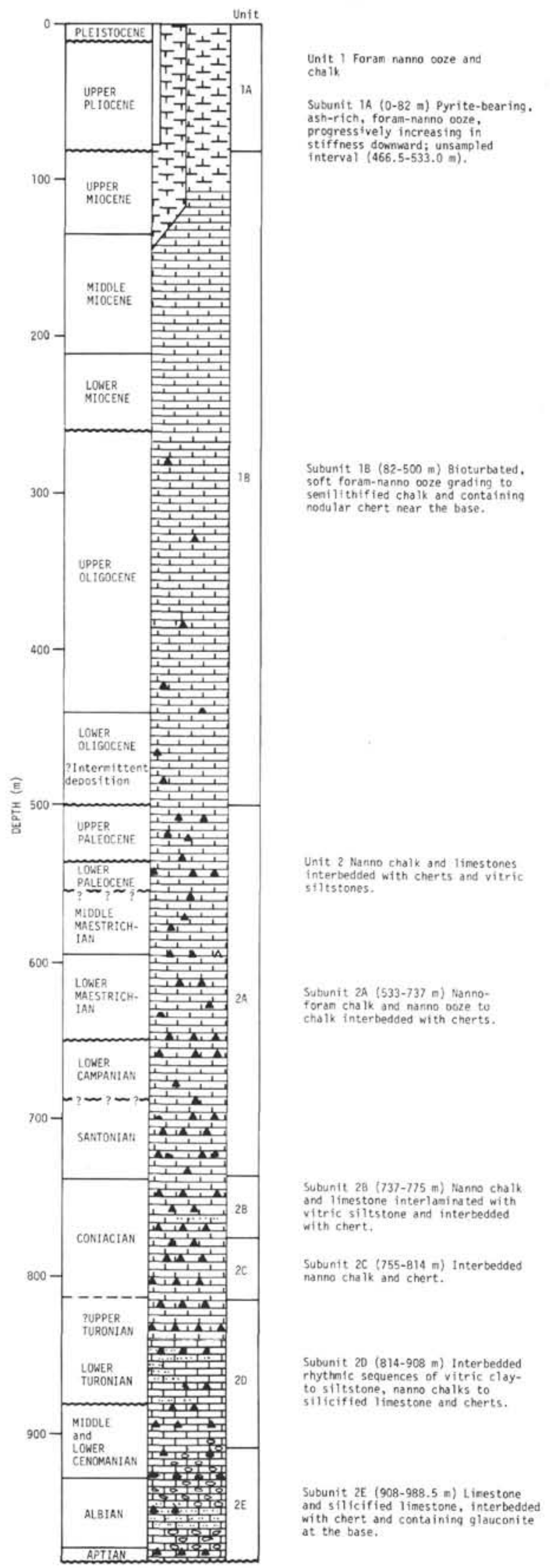

Figure 6. *Stratigraphic column for Site 288.*

soft nanno ooze, becoming foram rich with depth in the core. In Core 288A-11 (647 m) the unit has returned to a semilithified state. X-ray analyses reveal the only occurrence of dolomite (2% of the crystalline fraction) at Site 288 is in Core 288A-11-2 (649.4 m), together with a very high concentration of palygorskite (60% of the crystalline fraction).

Subunit 2B differs from the overlying Subunit 2A in consisting of flaser bedded and laminated pale yellowish-white to dark brown nanno chalk grading to limestone, interlaminated with vitric siltstones, and interbedded with dark reddish-brown to dark brown chert.

Subunit 2C lacks the abundant volcanogenic component of 2B and thus more closely resembles Subunit 2A. White to light gray nannofossil chalks and reddish-brown to pinkish-gray cherts comprise the bulk of Subunit 2C.

Subunit 2D in contrast with 2C is characterized by abundant volcanogenic sediments. Dark grayish to light reddish-brown vitric claystones and interbedded pinkish-white to light gray nanno chalks grade downward into rhythmic sequences of light grayish through light bluish, pinkish, and greenish-gray partially silicified nannofossil limestone interlaminated with greenish to dark gray vitric siltstone and interbedded dusky red to brownish-gray chert. Manganese dendrites occur commonly in the pinkish-gray to light reddish-brown limestones at the base of Subunit 2D (Core 288A-25, 894-895.5 m) separating it from the underlying Subunit 2E.

At the top of Subunit 2E, laminated, flaser bedded, pinkish-white to grayish-brown limestone interbedded with dusky red chert grades downward to partially silicified, laminated, and lenticular dark gray limestone containing increasing amounts of glass shards, feldspars, heavy minerals, opaque minerals, zeolites, and glauconite. At the base of the unit the limestone interbeds with dark gray chert. This is the bottom of the sedimentary sequence cored at Site 288.

GEOCHEMICAL MEASUREMENTS

Table 2 and Figure 9 present measured values and plots for pH, alkalinity, and salinity for interstitial water samples from Holes 288 and 288A. As at previous sites, salinity values are relatively constant—increasing only slightly with depth. Sediments at Site 288 are entirely carbonaceous except for a small influx of volcanic ash in Cores 1 to 5 (0-76.5 m subbottom). This is in contrast to the large volcanic terrigenous components at Sites 285-287. In contrast to data from these sites, alkalinity and pH at Site 288 show little variation with depth. The only excursions are in alkalinity values above 100 meters—the zone of siliceous contributions.

PHYSICAL PROPERTIES

Sonic velocity, wet-bulk density, and porosity were measured on samples obtained from Hole 288 and 288A

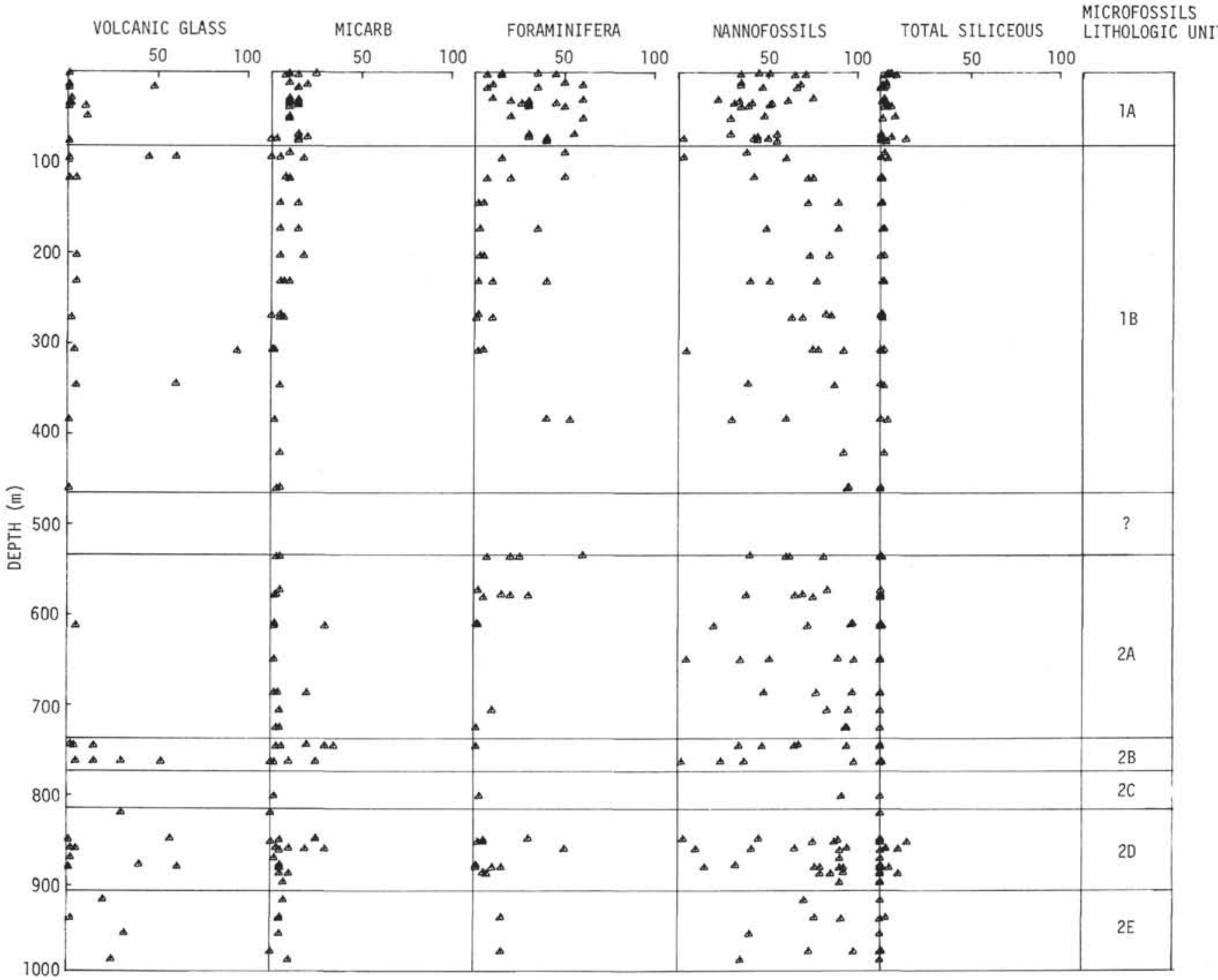

Figure 7. *Sediment composition as determined in smear slides, Site 288.*

calculated from these measurements. Methods and procedures are again the same as those described for Site 285. The results, shown in Figure 10, are somewhat more sporadic than those obtained from previous sites. This is due in part to more discontinuous coring in the upper part of the column and in part to substitution or alternation of personnel involved in measuring the velocity of the samples. The latter is also believed to be the cause of much of the noncorrespondence of horizontal and vertical velocity values and the scatter of the data points shown in Figure 10, necessitating considerable editing of the data.

As was well established at the previous sites, bulk density and porosity are again found to be almost mirror images with velocity in general paralleling bulk density. This general tracking of the physical property curves gives credance to the reliability of the edited data, particularly to the increase in velocity at the bottom of Hole 288A. Both velocity and bulk density increase rapidly with depth in the hole reaching approximately 1.9 km/sec and 1.9 g/cc, respectively in Core 288-11 at a subbottom depth of 230 meters. Velocity anisotropy also appears to have become established by this depth.

The uppermost measured core from Hole 288A (below the lowermost core taken from Hole 288 and approximately 270 m below the sea floor) exhibits a drop in both velocity and density in comparison to that measured from the lowermost core at Hole 288. Because both these sets of physical properties behave in a similar manner, the velocity decrease is considered to be real, perhaps being related to the presence of hollow calcareous sponge spicules mentioned in the Lithology section, causing an increase in porosity and a decrease in density.

In Hole 288A, velocity fluctuates around 1.7 km/sec down to a depth of about 460 meters. At about 530 meters, a spurious measurement or misorientation of the sample could be the explanation for the apparent reversal in the anisotropy relationship. Notwithstanding, below 550 meters the velocity appears to drop to

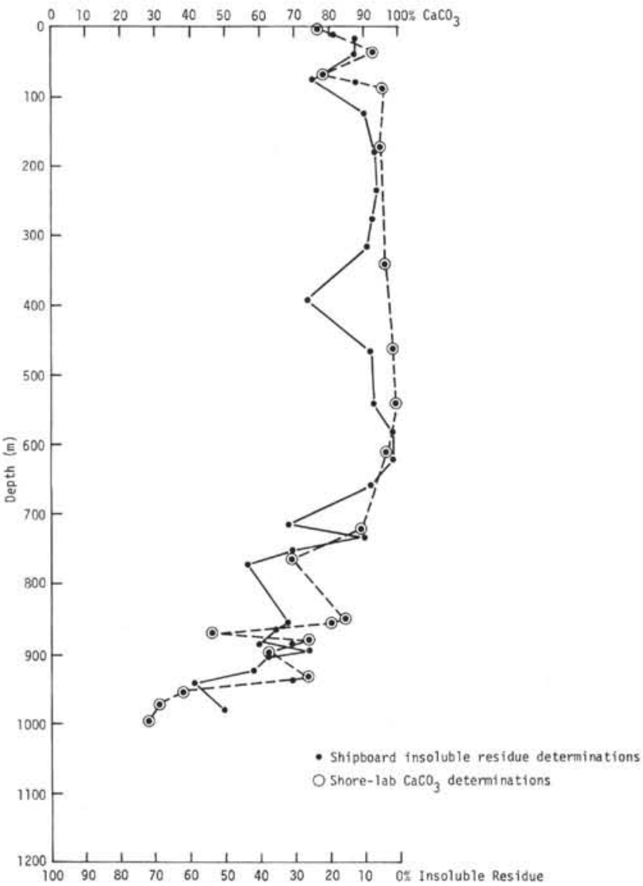

Figure 8. *Shipboard insoluble residue (10% HCl) and shore lab. Calcium carbonate determinations for sediments from Site 288.*

between 1.60 and 1.65, remaining within this range to a depth of 650 meters subbottom. At 685 meters subbottom the velocity begins to increase, accompanied by a pronounced increase in anisotropy. Coincidentally, at about 650 meters subbottom the amount of amorphous material increases markedly in the core along with the first appearance of authigenic carbonates, the only occurrence of dolomite.

Just below 740 meters subbottom (Cores 288A-15-1 and 15-2), and abrupt drop in both vertical and horizontal velocity occurs from between 2.20 and 2.35 km/sec to a minimum between about 1.65 and 1.95 km/sec (vertical and horizontal, respectively), with both velocities remaining within the range down to 820 meters subbottom. Moreover, at the depth at which the velocity decrease occurs, the grain density, which had been varying around 2.7 g/cc, begins to decrease reaching a minimum of about 2.45 g/cc also at 820 meters subbottom. This decrease in grain density may be simply the effect of a decrease in permeability preventing complete drying or elimination from the pore spaces during the density determination. This suggests, in turn, that redeposition of silica in the pore spaces may have occurred resulting in a restriction of fluid flow. At about 845 meters subbottom, velocity increases markedly accompanied by an increase in grain density values to between 2.6 and 2.7 g/cc. Between 845 meters and the bottom of the hole, almost 990 meters below the ocean floor, large excursions in velocity occur ranging from 2.5 to over 3.5 km/sec. In similar fashion bulk density increases, fluctuating between 2.1 and 2.3 g/cc, and porosity decreases, fluctuating between 35% and 16%. In the same interval, the limestone becomes very siliceous with quartz and cristobalite appearing in large quantities.

Calculated acoustic impedance values for Site 285, although not conclusive because of the discontinuous coring above 700 meters, suggest that high contrasts occurring at about 230 and 685 meters may be responsible for the two very prominent bands of reflectors occurring in the reflection records.

CORRELATION OF REFLECTION PROFILES

At Site 288 a series of prominent reflectors occurs in three general bands (Figure 4): one at 0.06 sec and a second group at 0.22, 0.27, and 0.5 sec. The 0.5-sec reflector may represent the top of Unit 2 and the first appearance of chert in the section. It coincides with an unsampled interval in the hole. The third group of reflectors is between 0.74 and 0.97 sec with reflectors at 0.74, 0.81, 0.86, and 0.97 sec. The 0.86-sec reflector coincides with the top of Subunit 2B.

Basement was not reached, and a well-defined acoustic basement is not apparent on the profile.

PALEONTOLOGY

Biostratigraphic Summary

The 41 cores recovered from Holes 288 and 288A together record a very discontinuous history of sedimentation from Aptian (Lower Cretaceous) through late Pleistocene. Detection of biostratigraphic divisions is complicated by very extensive post-Paleocene reworking and resedimentation and by the paucity of foraminifera faunas at certain levels in the Cretaceous. The biostratigraphy is summarized in Figure 12.

Stratigraphic Boundaries

Plio-Pleistocene Disconformity

The foraminifera positioning depends upon the existence of the Pleistocene (younger than 690,000 yr) fauna of *Globoquadrina pseudofoliata* and right-coiling *Pulleniatina finalis* with *Sphaeroidinella dehiscens* in Sample 288-2-2, 24-26 cm, while Sample 288-2-2, 104-106 cm contains the Pliocene assemblage of *Globigerinoides fistulosus, Globorotalia humerosa, G. multicamerata, G. tosaensis,* and *Pulleniatina praecursor* (ca. 2.4 m.y. B.P.). Between these faunas exists a slight sediment color change, recorded at 50 cm depth in Core 289-2-2, but apparently existing at ca. 30 cm. Nannoplankton determinations are in flat disagreement, positioning the Plio-Pleistocene boundary between Samples 288-2-5, 30-31 cm and 288-2, CC.

It is presumed that the Plio-Pleistocene discontinuity is at the change of sediment color and that the discrepant Pleistocene floral element has been downwardly injected by drilling disturbance of the soupy sediment.

TABLE 2
Summary of Shipboard Geochemical Measurements, Site 288

Sample (Interval in cm)	Depth Below Sea Floor (m)	Lab Temp (°C)	*p*H Punch-in/ Flow-through	Alka-linity (meq/kg)	Salinity (°/₀₀)
Surface seawater			8.4/8.35	2.25	35.2
Hole 288					
2-4, 144-150	15.96-16.00	22.4	7.34/7.34	2.93	35.2
4-1, 144-150	49.44-49.50	22.0	7.34/7.29	3.32	35.5
6-5, 144-150	93.94-94.00	22.4	7.29/7.21	3.81	35.2
8-1, 0-3	143.00-143.03	21.7	– /7.38	2.25	35.8
10-1, 144-150	201.44-201.50	22.4	– /7.27	3.13	35.8
11-1, 144-150	229.94-230.00	22.0	– /7.34	2.64	36.0
Hole 288A					
2-1, 144-150	306.44-306.50	21.7	– /7.12	2.35	36.0
3-1, 144-150	344.44-344.50	21.9	– /7.41	1.86	35.8
6-1, 144-150	458.44-458.50	24.0	– /7.37	2.25	36.3
9-1, 144-150	572.94-573.00	23.8	– /7.21	2.25	36.3
10-1, 0-6	609.00-609.06	23.6	– /7.25	1.86	36.6
11-1, 144-150	648.44-648.50	23.3	– /7.32	1.96	36.6
15-1, 144-150	762.44-762.50	23.2	– /7.44	1.66	36.6

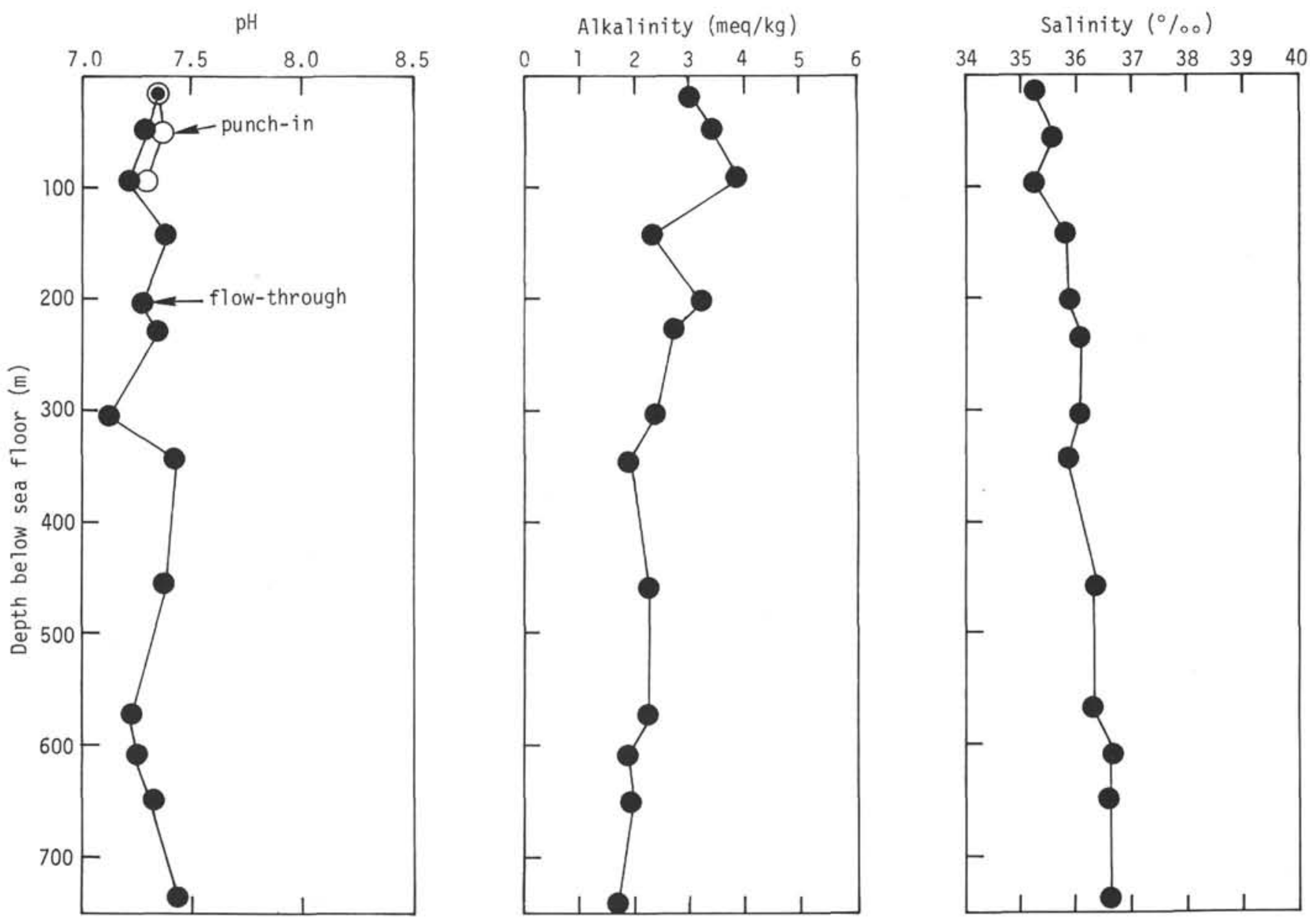

Figure 9. *Graphic summary of shipboard geochemical data taken at Site 288.*

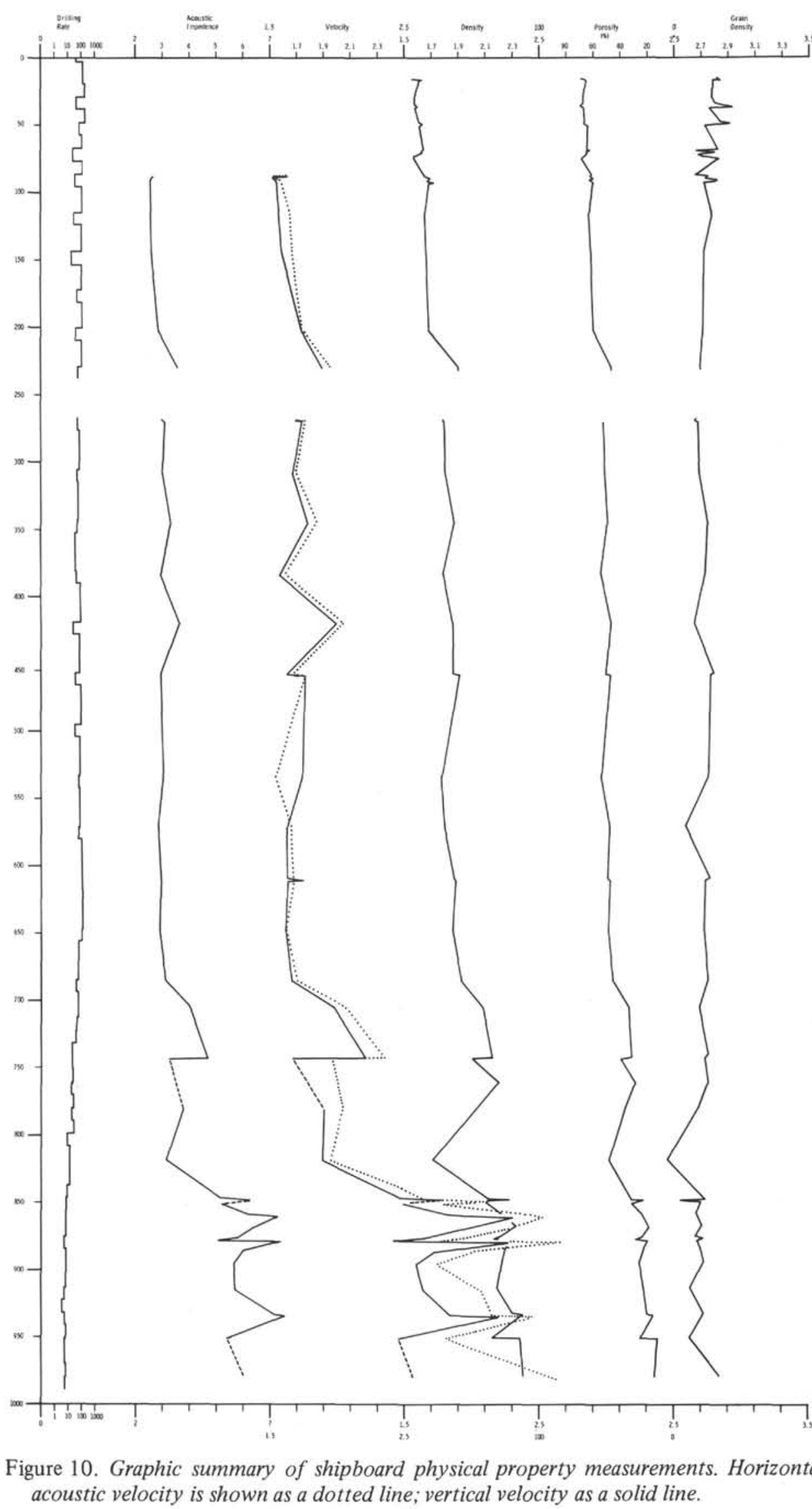

Figure 10. *Graphic summary of shipboard physical property measurements. Horizontal acoustic velocity is shown as a dotted line; vertical velocity as a solid line.*

Miocene-Upper Pliocene Disconformity

Sample 288-5, CC contains foraminifera fauna no different from that of Core 288-2-2, possibly indicating wholesale, postdepositional thickening of the "Pliocene" sheet. Sample 288-6-1, 90-92 cm contains the upper Miocene foram *Globorotalia plesiotumida* and Sample 288-6-1, 110-112 cm has a high *Ommatartus antepenultimus* Zone (upper Miocene) Radiolaria fauna with the morphologic base of *S. omnitibus* between 6-1 and 6-4. The highest Miocene Radiolaria faunas are undetected.

Middle Miocene-Upper Miocene Boundary

Sample 288-7, CC contains upper Miocene N16 zone foraminifera, *Globorotalia plesiotumida* and *G. merotumida*, and the upper part of the middle Miocene *Discoaster hamatus* nannoplon zone. Core 8 contains the N13-14 (intra-middle Miocene) boundary. 014

Lower Miocene-Middle Miocene Boundary

Sample 288-10, CC contains middle Miocene N10 Zone foraminifera and a *Sphenolithus heteromorphus* Zone nannoflora. Sample 288-11, CC has a lower Miocene N8 foram fauna with *Globigerinoides sicanus* and *Globigerinatella insueta*. Sample 288-11-1, 113-115 cm contains a Radiolaria fauna typical of the *Calocycletta costata* Zone with *C. costata* but no *Dorcadospyris alata*, considered to be of late early Miocene age.

Lower Oligocene-Upper Oligocene Boundary

Sample 288A-5-1, 124-129 cm belongs to a sequence of foram faunas below the *Chiloguembelina cubensis* extinction datum and above the *Pseudohastigerina* extinction datum (i.e., late top of early Oligocene). Sample 288A-6-1, 115-116 cm is tentatively assigned to the lower Oligocene *Reticulofenestra hillae* nanno zone.

The youngest foraminifera element of Core 288-6-1 consists of *Pseudohastigerina barbadoensis* and *Globigerina sellii* of early Oligocene, P19, and the sparse Radiolaria fauna has *Dorcadospyris papilio* var. suggestive of Sample 289-100, CC, known to lie immediately below the early/late Oligocene boundary.

Upper Paleocene-Lower Oligocene Boundary

Sample 288A-6, CC contains a lower Oligocene (Zone P19) component of *Pseudohastigerina barbadoensis* and *Globigerina sellii*, while Sample 288A-8-1, 102-104 cm contains an upper Paleocene P4 Zone foram assemblage with *Globorotalia angulata, G. chapmanni, G. pusilla, G. pusilla laevigata, G. pseudomenardii*, and *G. velascoensis*. Abundant upper Eocene, some lower Eocene, and very rare middle Eocene forams are reworked in Core 288A-6.

Thus, the Paleocene/Oligocene boundary lies between 288A-6, CC and 288A-8-1. Failure of recovery in Core 288A-7 leaves the status of the Eocene in doubt, but it seems possible that thin Eocene sediment is present on the uncored-unrecovered interval and is disconformable upward against early Oligocene.

Intra-Paleocene Disconformity

Sample 288A-8-2, 121-123 cm contains the upper Paleocene foram assemblage quoted above and Sample 288A-8-2, 122-123 cm has a *Cyclococcolithina robusta* Zone nannoflora. Sample 288A-8-2, 138-139 cm contains lower Paleocene nannofossils including primitive *Cruciplacolithus tenuis*, with a foram fauna of *Globorotalia pseudobulloides* and *Chiloguembelina waiparaensis*.

Cretaceous-Paleocene Boundary

The lower Paleocene foram fauna quoted above extends down to Sample 288A-8, CC. Sample 288A-9-1, 71-74 cm contains the middle Maestrichtian *Globotruncana gansseri* Zone fauna with the eponymous species and abundant *Globotruncana elevata*.

Lower Maestrichtian-Middle Maestrichtian Boundary

The *G. gansseri* Zone fauna extends down to Sample 288A-9, CC, to be underlain in Sample 288A-10-1, 111-113 cm by a restricted lower Maestrichtian foram fauna including *Rugotruncana subpennyi*.

Upper Campanian-Lower Maestrichtian Boundary

The restricted Maestrichtian foram assemblage continues to Sample 288A-10, CC and is underlain in Sample 288A-11-1, 116-119 cm by a flora of the *Tetralithus trifidus* Zone, "transitional" between Campanian and Maestrichtian, with a true Campanian *Broinsonia parca*—containing flora, lacking *T. trifidus*, in Sample 288A-11-2, 100-102 cm.

Santonian-Campanian Boundary

The Campanian flora cited above extends to Sample 288A-12-1, 122-125 cm and is underlain in Sample 288A-12, CC by a Santonian-Coniacian flora with *Marthasterites furcatus*. The absence of the late Santonian *Gartnerago obliquum* Zone indicates a hiatus in the depositional record.

Coniancian-Santonian Boundary

Sample 288A-14, CC contains the early Santonian foram fauna of *Globotruncana lapparenti, G. angusticarinata*, and *G. pseudolinneiana*. It is underlain by an uppermost Coniacian foram fauna of *G. imbricata* and *G. pseudolinneiana* in Sample 288A-15-2, 43-48 cm, associated with Santonian-Coniacian nannoplankton.

Coniacian-Turonian Boundary

Sample 288A-18, CC is the lowest sample containing Coniacian foraminifera. An early Coniacian position is based upon the presence of *Marginotruncana renzi, M. imbricata*, and *Globotruncana lapparenti*. The strong lithification and consequently poor preservation of all the microfossil groups in Core 288A-19 through Sample 288A-23, CC hampered detailed age determinations of these intervals; however, Turonian nannoplankton were identified in Sample 288A-20-1, 35-36 cm.

Turonian: Sample 288A-23, CC yielded a foraminifera fauna characterized by *Praeglobotruncana stephani* and *Globotruncana helvetica* and is dated as early Turonian.

Cenomanian: Samples 288A-24, CC and 288A-26-1, 4-7 cm contain Cenomanian foraminifera faunas characterized by *Rotalipora evoluta*.

Albian: Albian foraminifera faunas with *Planomalina buxtorfi* occur in Samples 288A-27-1, 110-115 cm and

288A-29-1, 59-60 cm. Late Albian nannofossils of the *Eiffellithus turriseiffeli* Zone were found in Samples 288A-27-2, 101-102 cm and 288A-28-1, 65-66 cm.

Aptian: Mostly small, *Hedbergella*-assemblage foraminifera including *Hedbergella infracretacea* are present in Sample 288A-30-1, 130-134 cm.

Foraminifera

Planktonic foraminiferal analyses reveal the presence of an incomplete Cenozoic but complete middle Maestrichtian (uppermost Upper Cretaceous) to Aptian (Lower Cretaceous) sequence. Foraminifera are abundant and excellently preserved in the Cenozoic and Maestrichtian section, whereas they are practically absent in the Campanian to upper Santonian section. In the lower part of the sequence from Santonian to Aptian, a progressive, though irregular change in abundance and state of preservation occurs from moderately well preserved but scarce faunas in the Santonian-Coniacian to poorly preserved but common faunas in the Turonian-Aptian. The state of preservation appears to be simply a reflection of the degree of diagenesis, with a higher frequency of occurrence of smashed planktonic foraminifera in indurated limestones of the lower part of the sequence. Recrystallization of foraminifera is also concomitant with increasing lithification, and in the Turonian-Aptian portion of the Cretaceous, foraminifera are almost entirely recrystallized.

Although planktonic foraminifera are common in the indurated limestone, foraminiferal analyses were greatly hampered by difficulties of freeing individual foraminifera specimens from lithified sediments. Therefore, the Cretaceous foraminiferal assemblages, as revealed in this report, are merely a partial representation of the seemingly diverse planktonic faunas, only a fraction of which are reconstructed in this study in the identification of a few taxa fortuitously freed from sediments.

Discussions of foraminifera are given in two parts by dealing separately with the predominantly foraminifera-calcareous nannofossil ooze facies of Cenozoic through Maestrichtian and the chiefly limestone facies of the rest of the Cretaceous.

Quaternary-Maestrichtian: Cores 288-1 to 288A-10

Core 288-1 is in the Quaternary and contains a diverse fauna of planktonic and a few benthonic foraminifera. Planktonic foraminifera are typified by *Globigerina rubescens* and *Globigerinoides ruber*, both retaining the original pink pigments of their test. The absence of *Globoquadrina pseudofoliata* throughout Core 288-1 indicates this section to be younger than 230,000 yr. Sample 288-2-1, 140-142 cm is also of a Pleistocene age and the presence of common *G. pseudofoliata* and *Pulleniatina finalis* (right-coiling population), but scarce *Sphaeroidinella dehiscens* indicates the sample to be no older than the base of the Brunhes Geomagnetic Polarity Epoch (690,000 yr B.P.). An abrupt faunal change exists in Core 288-2 between 24-26 cm and 104-106 cm depth. The higher sample contains an upper Pleistocene assemblage comparable to that of Core 288-2-1, and the lower consists of Pliocene taxa similar to those occurring in Samples 288-2-3, 77-79 cm through 288-5, CC. Sample 288-2-2, 60-62 cm, lying about midway between the faunas of two different ages, includes a mixed assemblage containing elements of both upper Pleistocene and Pliocene faunas. In Core 288-2-2, there is a sediment color change at 50 cm depth which is interpreted as representing a disconformity between the upper Pliocene and upper Pleistocene.

Samples 288-2-3, 77-79 cm through 288-5, CC are characterized by essentially the same planktonic foraminiferal assemblage. Common taxa include *Globigerinoides fistulosus, Globorotalia humerosa, Globorotalia multicamerata, G. tosaensis,* and *Pulleniatina praecursor* (randomly coiled population) are are assigned to an interval near the junction of lower Matuyama-upper Gauss Geomagnetic Polarity Series (approximately 2.4 m.y. B.P.). Numerous reworked species, including *Sphaeroidinellopsis seminulina, Globoquadrina altispira, Globigerina nepenthes,* and *Pulleniatina spectabilis* are also present and suggest an admixture of faunas as old as late early Pliocene (older than 3.8 m.y. B.P.).

Samples 288-6-1, 90-92 cm through 288-7-1, 75-77 cm are all characterized by the conspicuous presence of *Globorotalia plesiotumida*. The occurrence of this species and the fact that these faunas predate the evolutionary first appearance of *Pulleniatina primalis* and *Globorotalia margaritae* are used to assign this interval to the upper Miocene Zone N16. The zonal boundary between the middle Miocene Zones N14 and N13, defined by the first evolutionary appearance of *Globigerina nepenthes*, is placed between Samples 288-8-1, 52-55 cm and 288-8, CC where this evolutionary event takes place. Core 288-9 and Sample 288-10-1, 104-106 cm are in Zone N12 (= *Globorotalia fohsi* Zone) on the evidence of the zonal marker and *Globorotalia fohsi lobata*. Sample 288-10, CC contains diagnostic species of the basal Zone N10 (= *Globorotalia peripheroacuta* Zone). Reworked early Eocene foraminifera, such as *Globorotalia formosa formosa* and Maestrichtian (latest Cretaceous) species, including *Globotruncana contusa* occur sparsely in this sample. Sample 288-11, CC is in the lower Miocene Zone N8 (= *Globigerinoides sicanus/Globigerinatella insueta* zone). Both zonal marker species are present. The fauna also contains abundant reworked taxa of early Miocene, late Oligocene, and Late Cretaceous.

Abundant reworked foraminifera are again encountered in Core 288A-1, and only a minor proportion of the assemblage is autochthonous. Reworked faunas are made up primarily of late Oligocene taxa indicative of the Zone P22 and are characterized by *Globorotalia kugleri* and *Globigerina sellii*. Because of the distinct presence of *Globigerinoides primordius*, an early Miocene (Zone N4) age is assigned to this sample. The fauna of Core 288A-2 consists essentially of the same assemblage as that of Core 288A-1 except for the absence of *Globigerinoides primordius* and is, therefore, correlated with the uppermost Oligocene Zone P22.

Cores 288A-3 through 288A-5 are all assigned to the late Oligocene and represent a biostratigraphic interval below the *Chiloguembelina cubensis* extinction datum but above the *Pseudohastigerina* extinction datum. Core 3 is correlative with Zone P21 and Cores 4 and 5 with Zone P20.

A mixed assemblage comprising at least five distinct faunas of markedly different ages occurs in Core 288A-6. They are: lower Oligocene (Zone P19) fauna characterized by *Pseudohastigerina barbadoensis* and *Globigerina sellii*; upper Eocene (Zones P15-P17) faunas including *Globigerapsis mexicana, Cribrohantkenina inflata, Hantkenina alabamaensis* and *Globorotalia centralis*; a middle Eocene fauna represented by *Truncorotaloides rohri*; and lower Eocene (Zones P6-P7) faunas including *Acarinina mckanni, A. subbotinae*, and *Globorotalia caucasica*. While taxa belonging to the upper Eocene fauna occur in the greatest abundance, middle Eocene species are the rarest in this assemblage.

A faunal discontinuity exists in Core 288A-8 between 105-107 cm and 144-146 cm depth of Section 2. The fauna above the discontinuity to the top of the core is typical of the upper Paleocene Zone P4 and includes commonly *Globorotalia angulata, G. chapmanni, G. pusilla, G. pusilla laevigata, G. pseudomenardii*, and *G. velascoensis*. The fauna below the discontinuity to the bottom of Core 288A-8 consists exclusively of two planktonic foraminiferal taxa, *Globorotalia pseudobulloides* and *Chiloguembelina waiparaensis* and is assigned to the Danian Zone P1c (= *Globorotalia pseudobulloides* Zone). A stringer of chert occurring at 127-130 cm depth of Core 288A-8-2 apparently corresponds to the position of the hiatus involving the missing three planktonic foraminiferal zones, P1d through P3.

Core 288A-9 is in the middle Maestrichtian *Globotruncana gansseri* Zone. *Globotruncana elevata* is abundant, and other species present include *Globotruncana gansseri, G. contusa, Racemiguembelina fructicosa*, and *Rugotruncana subpennyi*. Therefore, the Cenozoic/Cretaceous boundary was crossed in the uncored interval between 542.5 and 574 meters subbottom depth. No data are available to elucidate the nature of the boundary at this site.

In contrast to the well-preserved and abundant planktonic faunas in the two prior cores, planktonic foraminifera become extremely rare in Core 288A-10. The drastic decline of planktonic foraminiferal abundance is concomitant with a marked decrease in amount of sand-size residue retained on a 63 μm size sieve and, in turn, is associated with increasing concentration of benthonic foraminifera. Thus, it appears that the change is due to intensified selective solution of planktonic foraminifera possibly as a result of increasing water depths. Although age-diagnostic, short-ranging species are absent, Core 288A-10 is placed in the lower part of Maestrichtian on account of the presence of *Rugotruncana subpennyi* whose recorded range is restricted to the Maestrichtian.

Campanian-Aptian: Cores 288A-11 to 288A-30

Planktonic foraminifera recovered at intermittent levels from the lower part of the sedimentary sequence at this site suggest the presence of a nearly complete Cretaceous sequence from Campanian to Aptian. Planktonic foraminifera appear to become progressively more abundant downwards, but the state of preservation also worsens towards the lower part of the sequence as the lithification of sediments progressively intensifies. Planktonic foraminifera older than Coniacian are generally all recrystallized.

Planktonic foraminifera are rare or frequently absent in Cores 288A-12 through 288A-21. Specimens of benthonic foraminifera often exceed those of planktonic foraminifera in this interval, suggesting a sedimentation depth close to or below the carbonate compensation depth. Examination of fracture surface and thin section of sediments from Cores 288A-21 to 30 reveals that planktonic foraminifera are contained fairly commonly in the lower part of the Cretaceous sequence. Difficulties of isolating foraminifera from indurated sediments, however, hinder the full revelation of the Cretaceous faunas at this site. Because of a spotty distribution of paleontologically datable assemblages, no attempt has been made to subdivide Cretaceous sediments zonally. Rather, characteristic species identified and ages indicated by them are listed below:

Sample 288A-14, CC—lower Santonian
Globotruncana lapparenti lapparenti
Globotruncana angusticarinata
Globotruncana pseudolinneiana

Sample 288A-15-2, 43-48 cm—uppermost Coniacian
Globotruncana imbricata
Globotruncana pseudolinneiana

Sample 288A-18, CC—Coniacian
Marginotruncana imbricata
Globotruncana lapparenti lapparenti
Marginotruncana renzi

Sample 288A-23, CC—lower Turonian
Praeglobotruncana stephani
Globotruncana helvetica

Sample 288A-24, CC—middle Cenomanian
Rotalipora evoluta
Rotalipora greenhornensis
Rotalipora reicheli

Sample 288A-26-1, 4-7 cm—lower Cenomanian
Rotalipora appeninica
Rotalipora evoluta
Planomalina caseyi

Sample 288A-27-1, 110-115 cm—upper Albian
Rotalipora appeninica
Planomalina buxtorfi
Hedbergella delrioensis

Sample 288A-29-1, 59-60 cm—Albian
Planomalina buxtorfi
Hedbergella delrioensis

Sample 288A-30-1, 130-134 cm—Aptian
Hedbergella infracretacea
several other species of primitive *Hedbergella* and *Praeglobotruncana*

Although coring was not continuous and recovery of sediments was sometimes poor, the following biostratigraphic interpretation of sediments at Site 288 can be inferred on the basis of foraminifera.

Three distinct episodes of a large-scale slumping of sediments are recorded in the Cenozoic sequence. The youngest slumps occurred around latest Gauss-early Matuyama time (ca. 2.4 m.y. B.P.) when denudation and incorporation of much of the latest Miocene and early Pliocene sediment took place. The second slumps took place during early middle Miocene (Zone N.9) time eroding and incorporating mostly late Oligocene and early Miocene sediments. Sediments as old as Late Cretaceous were incorporated in the second slumped sediment mass. The oldest slumping occurred during late early Oligocene (Zone P19) time, eroding and mixing largely Bartonian (late Eocene) sediments. Sediments of early Eocene and middle Eocene were also incorporated during the episode.

If the continuous record of sedimentation was recovered from this site, it is most likely that the base of these slumped sediments would be found to rest disconformably upon older sediments: the first slumped mass of late Pliocene sediments overlying late Miocene sediments; the second slumped mass of middle Miocene resting on early Miocene sediments; and the oldest slumped sediments of early Oligocene lying above Paleocene sediments. It is also very likely that most of the middle Eocene is missing in the vicinity of this site as evidenced by the scarcity of middle Eocene taxa reworked into the slumped sediments.

Faunal discontinuities indicate the presence of two additional stratigraphic hiatuses in the cored sediments. An apparently continuous late Pleistocene column (younger than 690,000 yr) disconformably overlies late Pliocene sediments. Another disconformity separates the Thanetian (late Paleocene) from the Danian.

Abundance and preservation of foraminifera suggest that this portion of the Pacific floor underwent at least one cycle of basinal development: Early Cretaceous sedimentation started at a depth well above the carbonate compensation depth as evidenced by the presence of abundant planktonic foraminifera and *Inoceramus* shell fragments in Aptian and Albian sediments; a general subsidence followed, commencing around Turonian time, culminating with Campanian sea floor below the carbonate compensation depth. A rapid uplift brought the area above the carbonate compensation depth during middle Maestrichtian time, and the area remained above that depth until present.

Calcareous Nannofossils

Examination of the nannofossil assemblages recovered from the cores retrieved at the site reveals a broken sedimentary section ranging in age from Early Cretaceous to Quaternary. However, establishing breaks in the sequence is, in many cases, hindered by noncoring, poor recovery, poor state of preservation of the fossils, and/or presence of reworked elements.

Hole 288

The section consists of 238 meters of Quaternary and Neogene oozes and chalks represented only by 11 cores. Nannofossils recovered are abundant to common; the quality of preservation deteriorates noticeably with increasing depth in the hole.

Core 288-1-1 to Sample 288-2-2, 24-26 cm are assigned to the *Emiliania huxleyi-Gephyrocapsa oceanica* Zone interval. A drop in the quality of preservation accompanied by the incoming of reworked nannofossil elements occurs between Samples 288-2-2, 24-26 cm and 288-2-2, 60-62 cm, suggesting a hiatus; a sediment color change is noticed at the 50-cm level in Core 288-2-2. *Gephyrocapsa caribbeanica* occurs rarely in Sample 288-2-5, 30-31 cm among an admixture of upper Miocene-Pliocene nannofossils sparsely containing Cretaceous forms. A band of feldspar-bearing, magnetite-volcanic glass ash is located between 35 cm and 45 cm in Core 288-2-5 suggesting another hiatus. Core 288-2 as a whole consists primarily of nanno-foram ooze. The sediments bounded by the color change in Core 288-2-2 and the ash band in Core 288-2-5 are tentatively placed in the lower Pleistocene *Gephyrocapsa caribbeanica* Zone.

The segment comprising Samples 288-2, CC to 288-5, CC contains mixed upper Miocene and Pliocene nannofossil taxa. The presence of *Discoaster tamalis* throughout the segment indicates a maximum age of late Pliocene. The segment is placed in the *Discoaster triradiatus-Pseudoemiliania lacunosa* Zone interval; reworking hinders a finer biostratigraphic assessment.

Core 288-6-1 to Sample 288-6-6, 30-31 cm yielded abundant and moderately preserved nannofossil assemblages characterized by the association of *Discoaster quinqueramus, D. berggrenii*, and *Ceratolithus primus*. Therefore, these cores are assigned to the upper Miocene *Discoaster quinqueramus* Zone. The segment including Samples 288-6-6, 120-121 cm to 288-7-1, 132-133 cm contains nannofossil assemblages correlative with the upper Miocene *Discoaster neohamatus* Zone. The first appearance up-sequence of *Minylitha convallis* in Sample 288-7-1, 132-133 cm indicated the *D. neohamatus* Zone despite the presence of *D. hamatus*.

Between the upper Miocene *D. quinqueramus* Zone and the upper Pliocene *Discoaster triradiatus-Pseudoemiliania lacunosa* Zone interval, is a 9.5-meter coring gap, hardly a thickness to accommodate the lower Pliocene, especially if the exceptionally high rate of sedimentation prevailed during the late Pliocene time at the site is taken into consideration. A hiatus is therefore suggested.

The absence of the *Discoaster berggrenii* Zone between the *D. quinqueramus* and *D. neohamatus* Zones indicates a disconformity. A similar disconformity is recorded occurring at a similar level in the South Fiji Basin, Site 285.

The concurrent occurrence of *Discoaster hamatus* and *Catinaster calyculus* in Samples 288-7-2, 120-121 cm to 288-8-1, 118-119 cm indicates a high position in the middle Miocene *D. hamatus* Zone, the *Catinaster calyculus* Subzone. The upper-middle Miocene boundary is between Samples 288-7-1, 132-133 cm and 288-7-2, 120-121 cm.

Common nannofossils of rather poor preservation are encountered in Cores 288-8 to 288-11. The segment including Samples 288-8, CC to 288-10-1, 94-95 cm is assigned to the middle Miocene *Discoaster exilis* Zone. Samples 288-10-2, 123-124 cm to 288-11, CC yielded poorly preserved assemblages containing substantial amounts of reworked fossils as old as the Late Cretaceous. These cores are assigned to the *Sphenolithus heteromorphus* Zone on account of the rare occurrences of the nominate species throughout the cores. A noticeable drop in the abundance of *Discoaster deflandrei* occurs between Samples 288-10, CC and 288-10-2, 123-124 cm. This may suggest a hiatus. Another unclear hiatus may exist between Samples 288-8-1, 118-119 cm and 288-8, CC; poor recovery of Core 288-8 makes establishing a hiatus largely uncertain.

The middle-lower Miocene boundary is tentatively placed between Samples 288-10-2, 123-124 cm and 288-10, CC.

Hole 288A

The section consists essentially of nannofossil chalks and limestones with interbeds of chert and clays. It ranges in age from Early Cretaceous to early Miocene. The Lower Cretaceous and a great part of the Upper Cretaceous sequences yielded extremely poorly preserved nannofossil remains. The Cretaceous-Tertiary boundary lies in a noncored interval.

Core 288A-1 to Sample 288A-2, CC contain abundant and moderately preserved calcareous nannofossils. The assemblages encountered correlate with the lower Miocene *Triquetrorhabdulus carinatus* Zone. A hiatus may occur between 288-11, CC and 288A-1.

Core 288A-3 to Sample 288A-4, CC are rich in their nannofossil contents, but the assemblages extracted are of low diversity. These cores are placed in the upper Oligocene *Sphenolithus distentus* Zone. Sample 288A-3-1, 110-111 cm contains an advanced form of *S. distentus* indicating closeness to the base of the *Sphenolithus ciperoensis* Zone. However, a hiatus may exist in the noncored segment between Cores 288A-2 and 288A-3. Core 288A-5 and Sample 288A-6-1, 9-10 cm contain nannofossil assemblages correlative with the *Sphenolithus predistentus* Zone.

Sample 288A-6-1, 115-116 cm may belong to the lower Oligocene *Reticulofenestra hillae* Zone. Samples from the remaining parts of Core 288A-6 contain primarily upper Eocene nannofossil assemblages. However, *Discoaster deflandrei* occurs in these assemblages in abundances characteristic of the lower Oligocene.

No recovery has been obtained for Core 288A-7. The mixing of the fossils in the lower Oligocene Core 288A-6, the nil recovery of Core 288A-7, and the Paleocene age of Core 288A-8 (discussed below) invite the suggestion of a hiatus; about 33.5 meters of sediments are supposed to accommodate the entire Eocene.

Samples 288A-8-1, 102-103 cm to 288A-8-2, 102-103 cm contain rare to common nannofossils of poor preservation and are tentatively assigned to the upper Paleocene *Heliolithus kleinpellii* Zone. Reworked Cretaceous taxa are encountered in Samples 288A-8-1, 141-142 cm and 288A-8-1, 150 cm. Common nannofossils of poor to moderate preservation are recovered from the remaining parts of Core 288A-8. Sample 288A-8-2, 122-123 cm yielded nannofossil assemblage correlative with a high level within the *Cyclococcolithina robusta* Zone. A sharp decrease in the diversity of the nannofossils occurs in Section 2 below the 122-123 cm level. Samples 288A-8-2, 138-139 cm to 288A-8, CC contain assemblages dominated by primitive forms of *Cruciplacolithus tenuis*. These cores are therefore placed low in the *C. tenuis* Zone.

Two hiatuses associated with an increase in reworked taxa are recognized separating the *C. robusta* Zone (288A-8-2, 122-123 cm) from the overlying *H. kleinpellii* Zone (base, 288A-8-2, 102-103 cm) and the underlying *C. tenuis* Zone (top, 288A-8-2, 138-139 cm). The positions of these hiatuses largely coincide with a part of the core over which change in color accompanied by chert development occur.

Sample 288A-9-1, 21-22 cm contains nannofossil assemblages indicative of a late Maestrichtian age. The segment including Samples 288A-9-2, 100-102 cm to 288A-10-1, 29-30 cm contains rich nannofossil assemblages of moderate to good preservation, correlative with the middle Maestrichtian *Lithraphidites quadratus* Zone. Samples 288A-10-1, 113-114 cm and 288A-11-2, 29-30 cm yielded assemblages typical of the *Tetralithus trifidus* Zone. This zone is considered to span the Campanian-Maestrichtian boundary. The nannofossils of these cores are common to abundant and generally of good preservation. Only Sample 288A-11-2, 80-81 cm may belong to the Campanian *Broinsonia parca* Zone suggesting, however, an intra-Campanian hiatus. The segment comprising Samples 288A-11-2, 100-102 cm and 288A-12-1, 122-125 cm contains *B. parca* with the association of *Eiffellithus augustus* and is therefore assigned to the Campanian *Eiffellithus augustus* Zone. The abundance and quality of preservation of the nannofossils recovered from this segment are essentially the same as those from the overlying Cretaceous cores.

Among the scarce and poorly preserved nannofossils contained in Samples 288A-12, CC and 288A-15-2, 129-130 cm, the index fossil of the *Marthasterites furcatus* Zone is noted. These cores are therefore of Coniacian to Santonian age. Between the *E. augustus* Zone (base, 288A-12-1, 122-125 cm) and the *M. furcatus* Zone (top, 288A-12, CC) a hiatus may exist in regard to the apparent absence of the *Gartnerago obliquum* Zone. Poor recovery of Core 288A-12 renders establishing a hiatus uncertain.

Core 288A-16 and the underlying cores contain rare to common, poorly preserved nannofossils. Diagenesis is probably the main cause of the poor state of preservation as well as the reduced abundance. Some of the nannofossil contents of these cores can be dated, but only a few can be assessed zonally.

In containing *Micula decussata* without the association of *Marthasterites furcatus*, Cores 288A-16 and 288A-18 are placed in the *Micula decussata* Zone. A late Turonian age as a maximum for these cores is therefore established. Sample 288A-19-1, 115-116 cm proved to be barren of nannofossils. However, the assemblage recovered from Sample 288A-20-1, 35-36 cm is rich and moderately preserved indicating a Turonian age. Cores 288A-21 to 288A-26 range in age from early Cenomanian to late Turonian. Samples 288-27-2, 101-102 cm and 288A-28-1, 65-66 cm are assigned to the *Eiffellithus turriseiffeli* Zone; their age is therefore late Albian. Cores 288A-29 and 288A-30 are probably of Aptian to Albian age.

Hole 288B

One core was recovered consisting of micarb-foram-bearing, nanno ooze. It contains rich and moderately preserved nannofossil assemblage, typical of the upper part of the middle Miocene *Discoaster exilis* Zone (= the *Discoaster kugleri* Zone of some authors).

Hole 288C

Only one core was retrieved, consisting of glass-shard-bearing, foram-micarb-rich nanno ooze. The core contains nannofossils indicative of middle to late Miocene age. The core is placed very high is the *Discoaster hamatus* Zone.

Radiolaria

Radiolaria are preserved in gray to white foram-nanno oozes and chalks, essentially similar to those encountered at the adjacent Site 289. However, the biostratigraphic range of Radiolaria-containing cores recovered at Site 288 is shorter than at Site 289, and the preservation and diversity of assemblages are considerably poorer. At least four discontinuities occur within the Radiolaria-bearing column.

Core 288-1 through Sample 288-5, CC yielded Radiolaria in abundances ranging from few to trace. Core 288-6-1 through Sample 288A-2, CC contain considerably higher numbers of radiolarians, but compared to Site 289 preservation and diversity is poor. Sample 288A-3-1, 120-122 cm proved completely barren and only a few specimens in poor preservation were found in Sample 288A-3-2, 51-53 cm. Lower samples, down to Core 288A-5-1 yielded comparatively abundant radiolarians, but only traces were found in Core 288A-6. Below this point in the site no biostratigraphically usable specimens were found, and most cores appear to be virtually completely barren.

The extremely sparse fauna of Sample 288A-6-1, 76-78 cm suggests a position within *T. tuberosa* Zone, OS.31. Thus, disappearance of Radiolaria in Hole 288A occurs at a level slightly higher than the major *T. bromia*/*T. tuberosa* Zone discontinuity at Site 289. Whether any part of the Radiolaria-bearing *T. bromia* Zone section of Site 289 is present at Site 288 cannot be determined, as no recovery was achieved between Cores 288A-6 and 288A-8, which belongs to the Paleocene.

Zonal Allocation

Zonal allocation of Hole 288-288A samples is complicated by reworking and poor preservation (see Harker, this volume). Allocations may be summarized:

288-1, CC: *O. tetrathalmus* Zone
288-2, CC: *S. pentas* Zone
288-4, CC: *S. pentas* Zone
288-6-1, 110-112 cm: *O. antepenultimus* Zone
288-6-4, 70-72 cm: *O. antepenultimus* Zone
288-6, CC: *O. antepenultimus* or *C. petterssoni* Zone
288-7, CC: *O. antepenultimus* or *C. petterssoni* Zone
288-8-1, 67-70 cm: *D. alata* Zone
288-10, CC: *D. alata* Zone
288-11-1, 113-115 cm: *C. costata* Zone
288-11, CC: *C. costata* Zone
288A-1-1, 73-75 cm: *C. virginis* Zone
288A-1, CC: *C. virginis* Zone
288A-2, CC: *L. elongata* Zone
288A-3-2, 51-53 cm: *D. ateuchus* Zone
288A-4-2, 92-94 cm: *D. ateuchus* Zone
288A-4, CC: *T. tuberosa* Zone assemblage, anomalously old with respect to nannoplankton.
288A-6-1, 76-78 cm: *T. tuberosa* Zone

SEDIMENTATION RATE

The sedimentation rate curve (Figure 11) and the calculated sedimentation rates (Table 3) reveal that on thicknesses corrected to an initial 70% porosity depositional rates lie between 17 and 77 m/m.y. These extreme rates are both near the top of the sedimentary column. The former low rate possibly reflects current scouring and the latter high rate slumping.

Apart from a short interval of very rapid sedimentation in the middle Miocene (again possibly slumping) the sedimentation rate is more uniform. Good age control in the Cretaceous reveals a possible upward increase in the depositional rate from around 25 m/m.y. to over 40 m/m.y., assuming the time scale to be reliable. This increase in sedimentation rate contrasts with the biostratigraphic data indicating an increase in water depth over most of that time. The form of the sediment accumulation curve indicates a break in sedimentation in the late Cenomanian.

The gap in recovery in the lower part of Unit 1 between the late Paleocene and the early Oligocene could well contain Eocene sediments deposited intermittently as at Site 289.

The early Oligocene to early Miocene sedimentation rate is rather lower than the Cretaceous one even though the evidence given by regional tectonics (Larson and Chase, 1972) and paleomagnetic data (Hammond et al., this volume) is that the Ontong-Java Plateau moved a substantial distance northward during that time.

The high depositional rates in the middle Miocene using the time scale of Vincent (1974) are reduced significantly using the revised Miocene of Saito (shown in Chapter 2, this volume) based on sediment thicknesses at Site 289.

SUMMARY AND CONCLUSIONS

Summary

Site 288 was drilled on the flank of the Stewart Basin, an open-ended feature on the southeastern margin of the Ontong-Java Plateau. The site required use of reentry techniques to change dulled bits. Bit wear was high due to the large amount of chert in the section. A second reentry was also successful, but found the hole plugged below casing depth.

Basement was not reached, but a comparison to Site 289 suggests that the oldest sediments (Aptian) may not have been far above it. A comparison between the two sites is given in the Site 289 report (this volume). Two lithologic units are defined:

Unit 1 (0-466.5 m): Pleistocene to lower Oligocene. Foram-nannofossil ooze and chalk. Nodular chert from Oligocene downwards, with an isolated occurrence in Miocene.

Unsampled interval (466.5-533.0 m): No recovery in this interval.

Unit 2 (533.0-988.5 m): Upper Paleocene to Lower Cretaceous (Aptian). Nannofossil chalk and limestone with interbeds of chert, vitric clay, and siltstone.

Early Cretaceous

Formation of the sea floor at Site 288 probably took place during Early Cretaceous. Perhaps the waning

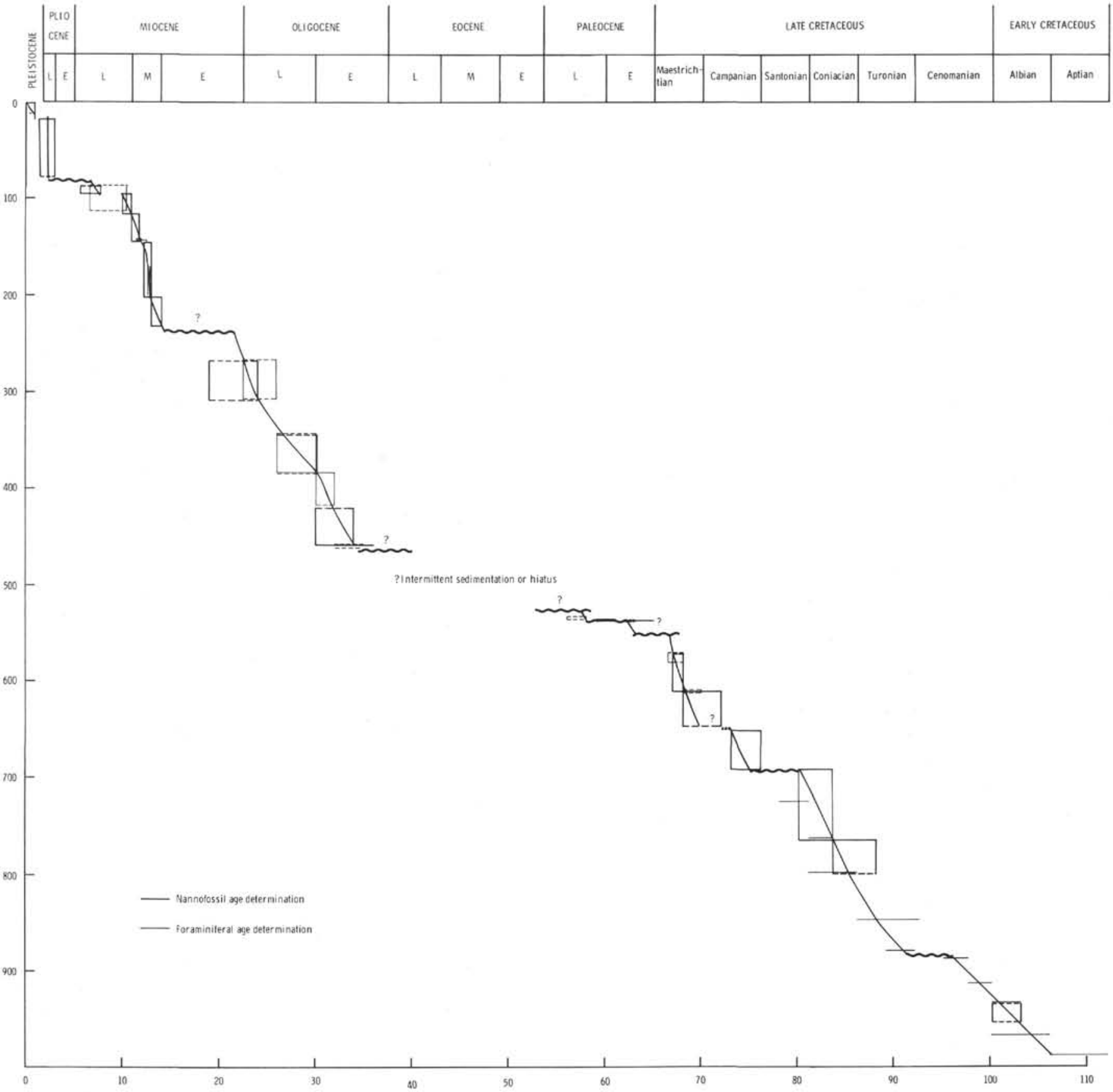

Figure 11. *Sediment accumulation curve for Site 288 based on nannofossil and foraminiferal age determinations. Values in brackets are estimates only. (Time scale after Vincent, 1974 and van Hinte, 1972.)*

phases of volcanism associated with formation of the sea floor are represented by the tuffaceous components of Subunit 2E found in Cores 288A-29 and 30, which are similar to the Aptian sediments, found immediately above basement at Site 289.

Late Cretaceous and Early Tertiary

Periodic influxes of volcanogenic sediments into the carbonate depositional environment occurred during mid Cenomanian through early Turonian time at Site 288, contributing to Subunit 2D. Based on the age of the crust determined at Site 289, the volcanogenic sediments may have been derived from an east-west striking spreading center actively forming the high plateau at this time to the west of an intervening north-south fracture zone. This feature is seen in the profile between Sites 288 and 289 (see Summary chapter). Gradual subsidence occurred from Turonian to Campanian probably initially forming the Stewart Basin at that time, attaining a maximum depth near or below the foram solution depth, but above the nanno solution depth in the campanian (see Paleontology section).

A resurgence of volcanic activity occurred in late Coniacian resulting in the addition of a volcanic component to sediments of Subunit 2B.

The sea floor was elevated above the foram solution depth (or that depth increased) in middle Maestrichtian time as indicated by the presence of well-preserved foraminifera in the upper part of Subunit 2A (discussed in the Paleontology section). Cretaceous-Tertiary, intra-Paleocene, and Paleocene-lower Oligocene(?) hiatuses are all attributed to periodic bottom currents scouring the unstable sloping surface of the western end of Stewart Basin leading to reworking and condensation of the sedimentary section.

Early Oligocene-Late Miocene

Carbonate sediments accumulated during (a) early Oligocene through early late Oligocene, (b) late late Oligocene, and (c) latest early Miocene through early late Miocene. Episodes of accumulation were separated by periods of late Oligocene and early Miocene nondeposition, erosion, or condensation, probably attributable to periodic fluctuations of bottom current activity on the marginal slope of the plateau. The origin of the chert intervals within the incomplete Oligocene sequence (only very slightly developed in contemporaneous sediments at Site 289) may be directly related to the discontinuities in the history of sedimentation. That is, the cherts immediately underlie unconformities. Accumulation may have ceased in the early late Miocene, perhaps due to a recrudescence of current activity.

Fossils as old as cretaceous are reworked into sediments of early Miocene and early Oligocene age immediately above the hiatus.

Late Miocene to Pleistocene

Deposition on the marginal slopes of the plateau continued in late Miocene to Pleistocene times. Late Miocene to Pliocene volcanism along the west end of Stewart Arch and the Roncador Homocline, to the

TABLE 3
Sedimentation Rates, Site 288

Unit	Depth (m)	Interval Thickness (m)	Porosity (%)	Thickness Corrected to 70% Porosity (m)	Age (m.y.)	Duration (m.y.)	Sedimentation Rate (m/m.y.) Observed Thickness	Sedimentation Rate (m/m.y.) Thickness Corrected to 70% Porosity
1A	0-12	12	70	12	0-0.7	0.7	17	17
	12-82	70	69	77	(2.4-2.5)	(1.0)	(70)	(77)
					6.8-7.3[b]	0.6	22	28
1B	82-95	13	61	17	6.6-7.5	0.9	14	19
					9.3-16.4[b]	7.1	20	27
	95-235	140	58	191	9.7-16.2	4.5	31	42
	235-465	230	51	376	21.5-34.5	13	18	21
?[a]	465-525	60	(54)	92	(34.5-57.5)	23	(2.6)	(4)
2A	525-536	11	56	16	(57.5-58)	(0.5)	(22)	(32)
	536-550	14	53	22	(62-63)	(1.0)	(14)	(22)
	550-645.5	95.5	51	156	66.5-69.7	3.2	30	49
	645.5-686.5	41	49	70	73-75	2.0	21	35
	686.5-737	50.5	41	99	(80-82.3)	(2.3)	(22)	(43)
2B	737-775	38	37	80	82.3-84.2	1.9	20	42
2C	775-814	39	39	79	84.2-86	1.8	22	44
2D	814-885	71	27	173	86-91	5.0	14	35
2E	885-908	23	27	56	96-98.2	2.2	10	25

Note: Values in parentheses based on an assumed gradient of the sediment accumulation curve.

[a]Corresponds approximately to interval with no recovery.

[b]Revised Miocene time scale of Saito (unpublished data).

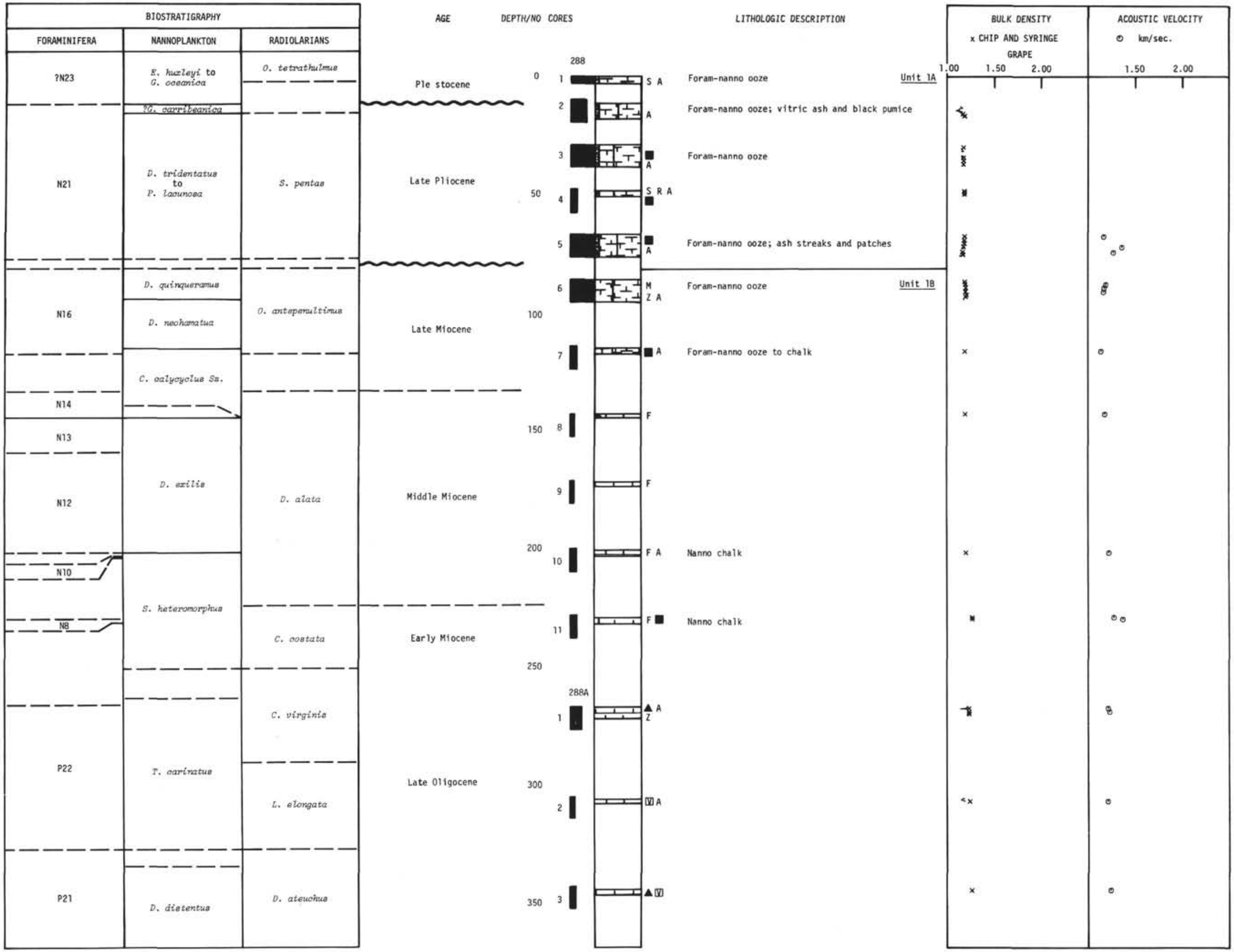

Figure 12. *Composite biostratigraphy, lithology, and physical properties, Site 288.*

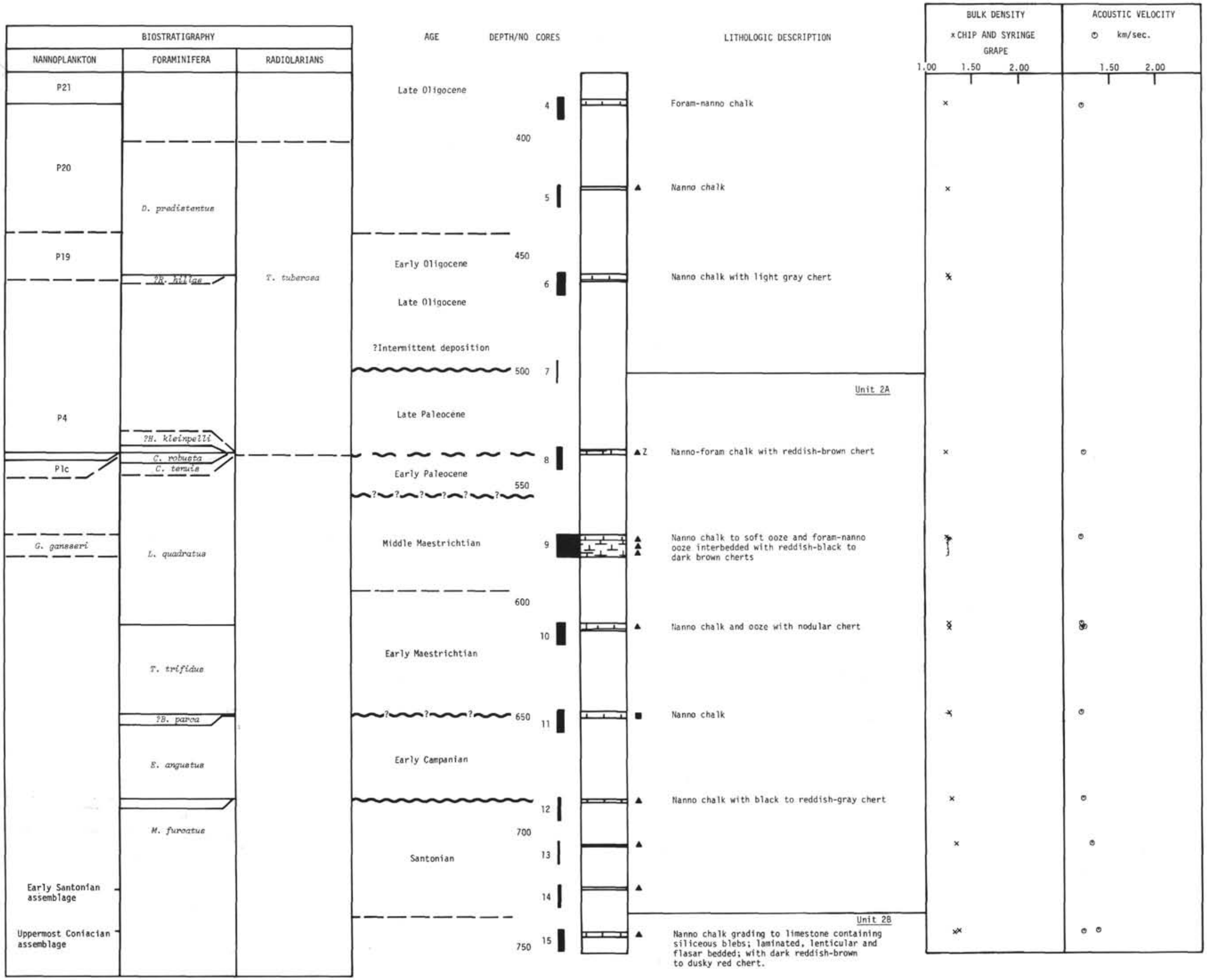

Figure 12. *(Continued).*

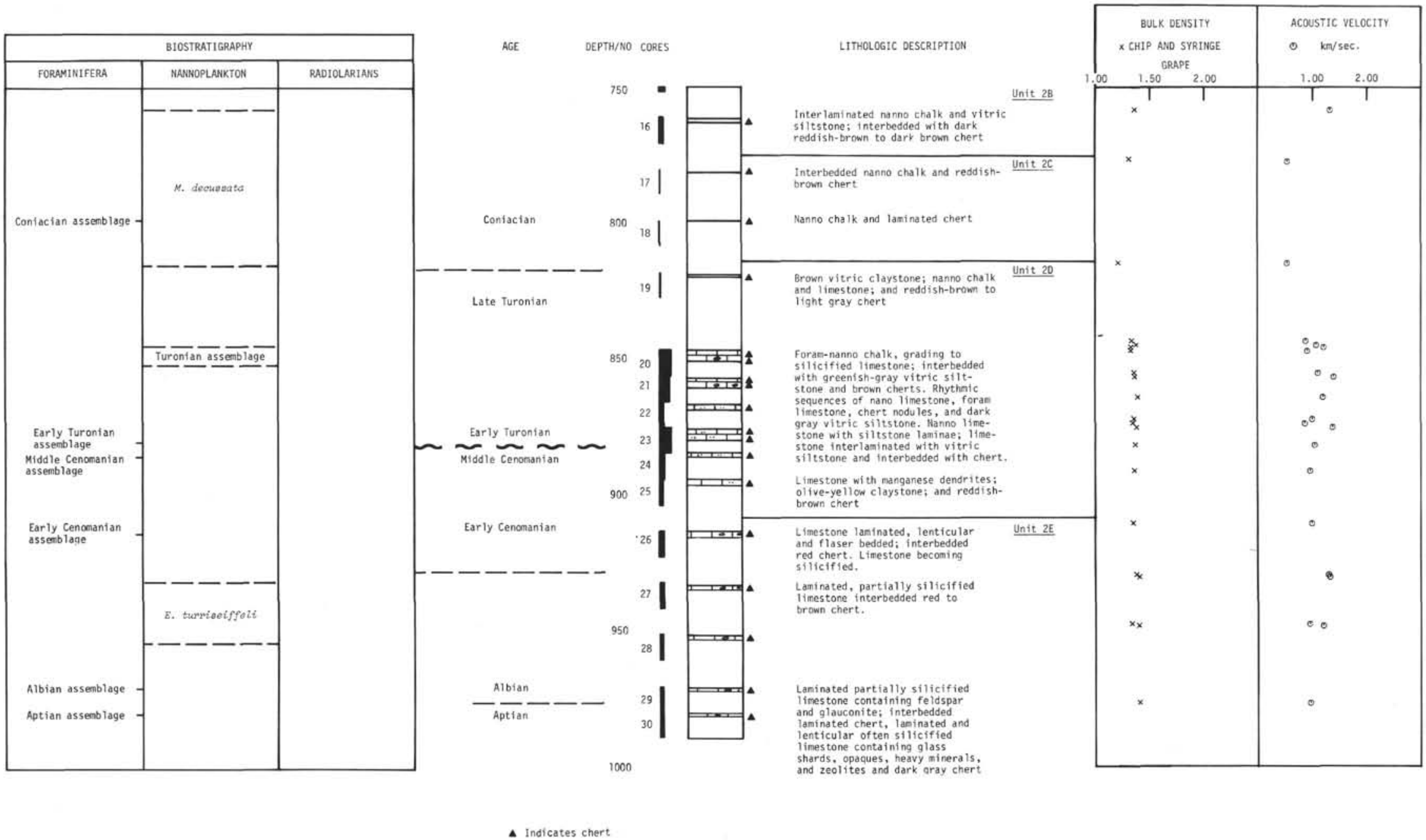

Figure 12. *(Continued).*

south and west of Site 288 (Kroenke, 1972) may have contributed the upper Pliocene ash-rich zones in Subunit 1A. The underlying Miocene-Pliocene hiatus may well represent the last vestiges of tectonic adjustment associated with the formation of the Stewart Arch and the Roncador Homocline. Extensive reworking was associated with deposition of the abnormally thick late Pliocene section.

Younger, regional, transcurrent displacements reported elsewhere on the plateau (Kroenke, 1972) may have caused slumping and subsequent scouring resulting in the Plio-Pleistocene hiatus described near the top of Subunit 1A.

Conclusions

The history of Site 288, at the present day occupying a position on the eastern marginal slope of the Ontong-Java Plateau, is best considered in relation to the history of the main part of the plateau as very fully recorded at Site 289.

Though the age of crustal genesis of the two sites is supposedly closely comparable—Aptian—the subsequent Cretaceous histories are sufficiently dissimilar to suggest that different and conceivably widely separated spreading centers were involved. Whereas at Site 288 all the stages from Aptian (Early Cretaceous) through Maestrichtian (Late Cretaceous) are represented, the Albian (late Early Cretaceous) through Santonian (earlier Late Cretaceous) seems to be absent at Site 289. Presumably the surface of sedimentation came under the influence of erosional or nondepositing bottom currents which did not affect Site 288. The sea floor at Site 289 could have been appreciably shallower, and it is possible that the recommencement of Campanian sedimentation was associated with a phase of rapid subsidence which appears to have carried the floor below the foram solution depth during late Campanian and early Maestrichtian. Curiously, however, synchronous decline in foram preservation is observed at Site 288, and it may be that some control other than depth was affecting planktonic foram preservation during this period. Relatively good preservation had resumed at both sites by middle Maestrichtian and has persisted to the present.

Paleocene histories are comparable at the two sites. At both there is probably a sub-Paleocene disconformity, at both there is a Danian/Thanetian disconformity, at both the preserved Paleocene is notably thin.

In post-Paleocene time the histories of the sites are markedly different but complementary in important respects. The Eocene through Pleistocene history of Site 288 strongly suggests that the bathymetric and physiographic contrasts between the sites which are seen today originated immediately preceding or during the early Eocene. Site 288 and its vicinity became a current-swept slope upon which sediment deposition was intermittent and sometimes associated with extensive resedimentation of material from the plateau surface and margin.

At Site 289 a period of nonpreservation of sediment intervened between Paleocene and early Eocene. The preserved early Eocene is very thin due to a further period of pre-middle Eocene erosion or nondeposition before the onset of sustained Lutetian through Bartonian accumulation. However, the possible condensation, extensive chertification, and complete or virtual absence of opaline fossils can possibly be taken as indicating persisting relatively high bottom current activity throughout the Lutetian. The highest upper Eocene and lower Oligocene are lost in a further and final discontinuity.

Periodic intensification of bottom currents, responsible for the broken and frequently chertified Eocene sequence of the plateau surface, almost certainly had a far more severe effect upon marginal slopes and, therefore, at Site 288. If Eocene sediment is preserved at Site 288 it must be restricted to the uncored interval between Cores 288A-6 and 288A-7, Core 288A-7 (unrecovered), and the subjacent uncored interval above Core 288A-8. A thin sequence may exist, much reduced due to the enhanced effects of the Ypresian/Lutetian and Bartonian/Rupelian current episodes recorded at Site 289. If nonrecovery was, as seems likely, due to extensive chertification, this is a striking example of the association of chert with a compressed interval (see, also, below).

Major loss of Eocene sediment at Site 288 is believed to have been due to the latter of these episodes, and a substantial vacuity is suggested closely below Sample 288A-6, CC. Reasoning depends on the nature of the Eocene/Oligocene discontinuity at Site 289. This break was not the result of "depositional still-stand." There is no evidence in Core 289-102-1 (immediately below the discontinuity) of the Radiolaria solution and chertification elsewhere associated with prolonged periods of reduced sedimentation. Highest Eocene sediments were more probably stripped rapidly during a brief very latest Eocene and/or very lowest Oligocene current erosion phase, followed by immediate recommencement of normal Rupelian (early Oligocene) sedimentation. This break is widespread in the western Pacific (Kennett et al., 1972), and suggestions of an angular unconformity at some localities might suggest pre-Oligocene tectonism. The effect of such an episode at Site 288 would have been one of maximum downcutting into predeposited sediment.

The aftermath of this episode is recorded in Hole 288, Core 6 (Rupelian). Currents continued to flow down the Site 288 slope, but they deposited. The resulting sediment was particularly rich in late Eocene derived foraminifera, with some early and very rare middle Eocene forms, together with middle Eocene nannoplankton. High turbulence at or slightly above the sediment-water interface is believed to have retarded Radiolaria burial and resulted in almost total dissolution of opal.

Conceivably this reworked Rupelian pile extends downwards through the entire Sample 288A-6, CC through Core 288A-8 undocumented interval and rests on Paleocene, the Eocene having been completely removed.

Accumulation appears to have been essentially continuous from early Oligocene through earlier Chattian, though the apparently anomalous old "Radiolaria age" of Sample 288A-4, CC relative to the "nannofossil age" of Sample 288A-5, CC might suggest massive derivation of slightly older fossils. By analogy with Core 288A-6, such derivation could point to a discontinuity below Sample 288A-4, CC.

Further increase in bottom current activity could have halted accumulation in the later Chattian. Intense reworking and leaching supposedly have eradicated opaline fossils in the upper portion of Core 288A-3 and resulted in the intra-late Oligocene discontinuity and compression between Cores 288A-2 and 288A-3.

A further and more prolonged accumulation stillstand again, presumably current-induced, led to the discontinuity or compression between 288-11, CC and 288A-1. Comparatively prolonged, continuous accumulation now set in during the latest early Miocene and persisted through early late Miocene. As in the early Oligocene, recommencement of accumulation was associated with marked incorporation of earlier fossils, some as old as Cretaceous.

It is noticeable that chert is comparatively frequent through the broken Oligocene column of Site 288, and the age of the single, isolated chertified core at Site 289 (289-74) could well correspond with that of the intra-Late Oligocene compression in Site 288. It is also noticeable that the total chertified thickness plus vacuities at Site 288 correlates broadly with a segment of Site 289 in which Radiolaria populations appear to have undergone selective solution (Holdsworth and Harker, this volume).

The Miocene record terminates between Cores 288-6 and 288-5, and there may be a rather precise correspondence between the earlier time represented by the Site 288 Mio-Pliocene discontinuity and that represented at Site 289 by a segment with selectively dissolved Radiolaria faunas (Holdsworth and Harker, this volume). Conceivably, recrudescence of opal solution at Site 289 was genetically connected with cessation of sediment accumulation at Site 288. Late Miocene to Pliocene volcanism recorded along the west of Stewart Arch and in the Roncador Homocline to south and west could also have induced slumping at Site 288.

The thickness of the Site 288 late Pliocene is apparently abnormally great for its zonal range, and an abundance of reworked fossils points to considerable contributions from predeposited late Miocene and early Pliocene.

The period of Pliocene accumulation may have been brief (the deposits being disconformable upwards against Late Pleistocene) and conceivably they represent the slumping of highly fluid Mio-Pliocene sediments. The Plio-Pleistocene discontinuity could be associated with further slumping associated with transcurrent movements recorded elsewhere on the Ontong-Java Plateau.

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APPENDIX A
Smear-Slide Determination, Site 288 (values in percent)

Sample (Interval in cm)	Depth (m)	Grain Size: Sand	Silt	Clay	Quartz	Feldspar	Clay minerals	Heavy minerals	Mica	Calc. thombs	Glauconite	Volc. glass (+ chlorite)	Pyrite and Opaques	Micronodules	Zeolite	Micarb	Calcareous spicules	Forams	Nannos	Radiolaria	Sponge spicules	Diatoms	Silicoflagellates	Ostracode + Shell frags.	Lithologic Unit
1-1, 90	0.90	30	70					1				tr				10		35	45	2	2	1	2		
1-1, 140	1.40	15	85			1		1				1			1	25	1	15	51	2	2				
1-2, 72	2.22	40	60					1						1		10	1	45	35	2	2	1	2		
1-2, 146	2.96	5	95					4								15		7	71	2	1				
1, CC	3.10	10	90					1				tr	1			8		15	65	5	2	1	2		
2-1, 148	11.68	45	55					1				tr	1			10		50	35		1		2		
2-3, 57	13.57	10	90									1				20		10	68	1					
2-3, 130	14.30	40	60					1				1						60	35	1	1		1	tr	
2-5, 36	16.36	90	10		?	10		2				48	40												

APPENDIX A – *Continued*

Sample (Interval in cm)	Depth (m)	Grain Size			Quartz	Feldspar	Clay minerals	Heavy minerals	Mica	Calc. thombs	Glauconite	Volc. glass (+ chlorite)	Pyrite and Opaques	Micronodules	Zeolite	Micarb	Calcareous spicules	Forams	Nannos	Radiolaria	Sponge spicules	Diatoms	Silicoflagellates	Ostracode	Lithologic Unit
		Sand	Silt	Clay																					
2-5, 95	16.95	25	75					tr					1			15		35	47	1	1				
2, CC	17.60	7	93					1				1				15	10	7	66						
3-0, 1	29.01					1						2	tr			10		10	75	1	1				
3-1, 135	30.65	40	60									tr	1			15		60	22	1	1				
3-2, 90	31.70	10	90										1		1	15		20	61	1					
3-2, 140	32.20	20	80										25			10		30	34	1					
3-4, 63	34.63	20	80									1				10		45	41	2	1				1A
3-4, 74	34.54							1			1	2	25		1	10		26	31	1	1		1		
3-4, 106	34.86	20	80					tr				tr				15		30	52	1	2				
3-5, 80	36.10	10	90									tr				15		30	51	2	1		1		
3-6, 105	37.85						10					10	3					30	39	4	1	2	1		
3, CC	38.40	40	60					1				1	1			10		50	35		1		1		
4-1, 100	49.00	25	75					1				11				10		20	48	4	3	2	1		
4, CC	51.10	50	50									tr				10		60	29	1					
5-1, 105	68.55	30	70					1								15		55	29		tr				
5-1, 146	68.96							tr			tr					15		30	55						
5-3, 120	71.70	15	85													20		30	44	5	1				
5-4, 120	73.20	15	85					1					1			15		40	42		1				
5-5, 11	73.61				?	2						42	30			8		3	13	1	1				
5-5, 29	73.79					2		1	1				2			3		40	50			1			
5-5, 140	74.90	15	85										1			15		40	44	tr	tr				
5, CC	76.60		100									1	1					40	55	1	2				
6-2, 140	89.10	20	80													10		50	38	1	1				
6-4, 148	92.18															10		40	48	1	1				
6-6, 10	93.80					tr						60			40										
6-6, 38	94.08	30	70			2		tr				45	45			5			3	tr	tr	tr			
6, CC	95.30	3	97			1						1			1	18		15	60	2	1		1		
7-1, 135	115.85	20	80													8		50	42	tr					
7-2, 115	117.15	5	95									5				10		20	75						
7, CC	117.60		100									1				10		7	72		1				
8-1, 110	114.10	2	98													5		5	89	1					
8, CC	144.60							1							1	15		2	72						
9-1, 127	172.77		100										1			5		3	89	1	1				
9, CC	173.10							tr								15		35	49		1				
10-2, 110	202.60		100			1						5				5		3	84	1	1				
10, CC	203.10	4	96			1									2	18	1	5	73						
11-2, 111	231.11	40	60									5	45	2		7		2	40	1					
11-2, 140	231.40	25	75													5	2	40	51	1	1				
11, CC	231.60		100			1										10		10	77		1		1		
1A-1, 36	267.36																								
1A-1, 60	267.60		100													5	10	2	82		1				
1A-2, 74	269.24					5									10				85						
1A-3, 140	271.40		100													5	20	1	63	1					
1A, CC	271.60	3	97									2			1	7	10	10	69		1				1B
2A-1, 135	306.35														2	1	15	5	75	1	1				
2A-2, 30	306.80		100									4	tr		tr	2	20		78	tr					
2A, CC	308.10																5	2	92	1					
2A, CC	308.10	50	50									94							5	1					
3A-1, 133	344.33	5	95			tr						60	1					tr	39						
3A, CC	346.10		100			1						5				5			87		2				
4A-2, 40	382.90	25	75												tr			40	60	tr					
4A, CC	386.10											1			2	2	10	53	30	2	1		1		
5A, CC	420.60		100			1										5			92	1	1				
6A-2, 40	458.90		100												tr	5		tr	95						
6A, CC	460.10		100			1						1			1	3			94						
8A-1, 120	534.20	40	60									tr						60	40						
8A-1, 143	534.43																								
8A-2, 127	535.77														8	5		25	62						
8A-2, 130	535.80		90	10											15	5		20	60						
8A, CC	536.10	5	95			1							4			3		7	81	1					
9A-1, 102	572.42		100			tr										5	10	2	83						
9A-4, 146	577.36												3		5?	3		15	69					5	

APPENDIX A – *Continued*

Sample (Interval in cm)	Depth (m)	Grain Size: Sand	Silt	Clay	Quartz	Feldspar	Clay minerals	Heavy minerals	Mica	Calc. rhombs	Glauconite	Volc. glass (+ chlorite)	Pyrite and Opaques	Micronodules	Zeolite	Micarb	Calcareous spicules	Forams	Nannos	Radiolaria	Sponge spicules	Diatoms	Silicoflagellates	Ostracode	Lithologic Unit
9A-5, 91	578.31	10	90										5		30?	2		20	38					5	
9A-5, 124	578.64	5	95													2		30	65					3	
9A, CC	580.50																20	5	75						
10A-1, 40	609.40															2		1	97						
10A-1, 100	610.00						100																		
10A-1, 130	610.30									tr						2		2	96						
10A, CC	612.10		90	10		9	5?	1				5	5		25	30?			20						2A
10A, CC	612.10															5	25		72		1				
11A-1, 130	648.30		100										tr		tr		11		89						
11A-2, 69	649.19		100			2		25							20	2			51						
11A-2, 91	649.41						90			3						2			5						
11A, CC	650.10		100										50				15		35						
11A, CC	650.10	2	98							2									98						
12A-1, 84	685.84									1						2			97						
12A-1, 91	685.91					3	30			1			10		4	4			48						
12A-1, 142	686.42		100										3			20			77						
13A-1, 140	705.40	5	95													5	2	10	83						
13A, CC	705.60												tr		tr	5			95						
14A-1, 145	724.45															3	1	1	94		tr				
14A, CC	724.60		100			tr										5	2		93						
15A-1, 132	743.32	2	93	5				1				2	1	1	8	20			67						
15A-2, 105	744.55		90	10									tr			35			65						
15A-2, 116	744.66					2	5	tr				4	3	1	20	30			34						
15A, CC	745.10					5	10	1				15	5		10	6		1	47						
15A, CC	745.10					1							2			3			94						
16A-1, 72	761.72	15	85			3						30	5	1	25	10	1		24		1				2B
16A-1, 96	761.96	2	88	10		4	5?					15	4		10	25			37						
16A-111	762.11		55	45		5	34	tr				5	3	3	50				tr						
16A-1, 131	762.31	25	75			5		7				52	2	1	30				2		1				
16A, CC	772.60												tr			2			98						
18A, CC	800.60					1							1			2	1	3	91						2C
19A-1, 117	819.17		20	80		tr	75					tr	tr		25				tr						
19A-1, 125	819.25	25	25	50	tr	1	57					30	2		10										
20A-1, 101	847.51	10	80	10		tr						tr				25		30	45						
20A-1, 121	847.71	25	75			2		3			5	57			5	25			3						
20A-2, 115	849.15	1	99			tr		tr				1				5		5	89						
20A-3, 139	850.89		25	75				tr			1						3	5	75?	15					
20A, CC	851.10							1		1			1		1			2	87						
21A-1, 148	857.48															3		tr	94	3?					
21A-2, 64	858.14	5	85	10		tr	5	1				2	2	2	10	10			65	3?					
21A-2, 139	858.89	5	85	10			5	1			3	5	5			30			41	10?					
21A-2, 141	858.91	50	30	20		1					8		2			19		50	10	10					
21A, CC	860.60		100					2		1			2			5			90						
22A-3, 49	868.99					2					tr	2	2		2	2			90						2D
23A-2-1	876.51		80	20		1		3		1		40	2		15	5		1	32						
23A-3, 85.5	878.86		100					3			3	61	7		5	5		1	15						
23A-3, 112	879.12										3	1						15	76?	5					
23A-3, 114	879.14	10	40	50		2					2		2					10	79?					5?	
23A, CC	879.60		100			1		1				1	2			5			90						
23A, CC	879.60		100			1						1				5			92		1				
24A-1, 27	886.77	4	20	76							1							5	92?					2	
24A-1, 125	885.75	3	87	10												5			85	10?					
24A, CC	886.10		100			1							2		1	10		7	79						
25A-1, 80	894.80																								
25A-1, 105	885.05			100			100																		
25A, CC	895.60					1			1				1			7			90						
26A, CC	914.60		100					3				20				7			70						2E
27A-1, 140	933.60	3	87	10									1			5		15	76	3?					
27A, CC	935.10											2	1		1	5			91						
28A-1, 80	951.80		100			3		5				32	15			5			40						
29A-1, 139	971.39	5	45	50		3					3		2					15	73?	1				3	2E
29A, CC	971.60											tr	1	1					98?						
30A-1, 129	980.79		100					15				25	10		5	10			35						

Site 288 Hole Core 1 Cored Interval: 0.0 to 3.0 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	DEFORMATION	LITHO.SAMPLE
PLEISTOCENE		Emiliania huxleyi–Gephyrocapsa oceanica	Ommatartus tetrathalmus				0			
							1	0.5, 1.0	5, 3/5	* , *
							2		3, 2	CC, * GZ WC, *
				F, R, N	A, R, A	e, g, g	Core Catcher			* CC

LITHOLOGIC DESCRIPTION

10YR 5/3

SPONGE SPICULE BEARING FORAM-NANNO OOZE, brown with swirls of pale brown (10YR 6/3); soupy; no structures.

SS 1-90

55% N	3% S	2% SI	1% HM
35% F	2% R	1% D	Tr% Gl

10YR 7/2

FORAM-RICH NANNO OOZE, light gray; soft; no structures.

SS 1-140

76% N	2% R	1% HM	1% Z
15% F	2% S	1% Gl	1% Fsp

$CaCO_3$ 2-50 (76)

10YR 7/3, 10YR 7/2, 10YR 7/1

FORAM-NANNO OOZE, pale brown; soupy to soft.

SS 2-70

45% F	2% S	2% SI	1% Nod
45% N	2% R	1% HM	1% D

Grain Size 2-83 (7.4, 38.4, 54.2)

X-ray 2-122

32% Amor	97% Calc	2% Plag
68% Cryst	1% Quar	

HEAVY-MINERAL-FORAM BEARING NANNO OOZE, light gray; soft.

SS 2-146

86% N	4% HM	1% S
7% F	2% R	

5Y 7/2

RAD-BEARING, FORAM-RICH NANNO OOZE, light gray.

SS CC

73% N	5% R	2% SI	1% D
15% F	2% S	1% HM	Tr% Gl

Site 288 Hole Core 2 Cored Interval: 10.0-19.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
PLEISTOCENE	N23?	Emiliani huxleyi / Gephyrocapsa oceanica					0				
							1	0.5, 1.0	Empty	5, 2	*
				F, N, F	A, A	e, e					
?				F, N, F	A, A, A	e, g, e	2			3	
LATE PLIOCENE	N21	? Gephyrocapsa carribeanica ?		F, N	A, C	e, f	3			3	*, *
							4		Empty	5, 3	
			Spongaster pentas	N			5			3	*, *
				F, R, N	A, T, A	e, m, g	Core Catcher				*

LITHOLOGIC DESCRIPTION

NANNO-FORAM OOZE, light gray; soft.

SS 1-148

50% F	2% SI	1% HM
45% N	1% S	Tr% Gl

10YR 7/2

10YR 7/1

10YR 8/1 swirled with 5Y 7/1

FORAM-BEARING, NANNO OOZE, light greenish gray; soft.

SS 3-57

88% N	10% F	1% Gl	1% R

N7

NANNO-FORAM OOZE, light gray; soupy.

SS 3-130

60% F	1% HM	1% R	1% SI
35% N	1% Gl	1% S	

5G 8/1

Water Content 4-144 (44.29)

N7.5

X-ray 5-35

64% Amor	1% Quar	3% Augi
36% Cryst	12% Plag	

N7.5

FELDSPAR-BEARING, MAGNETITE-VOLCANIC GLASS ASH, black (5Y 2.5/1), very fine sand layer, black pumice pebble, 1.5 x 1.5 cm.

SS 5-36

48% Gl	40% Mag	10% Fsp	2% HM

N7.5

Water Content 5-93 (40.58)

N7.5 swirled with 5Y 7/1 and N9

Water Content 5-95 (40.69)

FORAM-NANNO OOZE, light gray; soft.

5Y 6/1

SS 5-95

62% N	1% R	Tr% Gl
35% F	1% S	Tr% HM

N8

2.5Y 6/1

swirled

5Y 7/1

FORAM-CALCAREOUS SPICULE-BEARING, NANNO OOZE, light gray.

N7

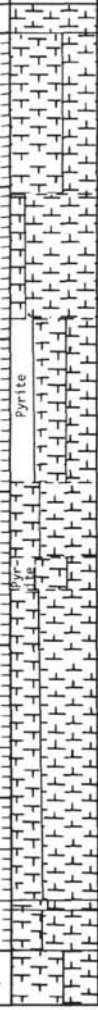
SS CC

81% N	7% F	1% HM
10% Calc S.	1% Gl	

Explanatory notes in Chapter 2

Site 288 Hole Core 3 Cored Interval: 29.0-38.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
LATE PLIOCENE	N21; Discoaster tridentatus - Pseudoemiliania lacunosa; Spongaster pentas	F R N	A F C	e m m	0, 1, 2, 3, 4, 5, 6, Core Catcher	0.5, 1.0	Pyrite; Pyr-ite	5, 3, 3, 3, 3, 3, 3, 3	*, *, *, *, *, *, *, *, *CC



LITHOLOGIC DESCRIPTION

N8 — FORAM-BEARING, NANNO OOZE, light gray; soft.

N7 — SS 0-1
85% N 1% Fsp Tr% Opaq
10% F 1% S

N8 — Water Content 1-98 (42.28)

NANNO-FORAM OOZE, light gray; soft.

5Y 6/1 — SS 1-135
60% F 1% R Tr% Gl
37% N 1% S

N8 — PYRITE RICH, FORAM-NANNO OOZE, light gray to gray; soft.

SS 2-140
44% N 30% F 25% Py 1% R

N9 — NANNO-FORAM OOZE, white; soft.

N8 swirled to 5Y 6/1 — SS 4-63
45% F 2% R 1% Gl
51% N 1% S

5Y 7/1
N8 — PYRITE RICH, FORAM-NANNO OOZE, black streak; pyrite spheres in nanno ooze and pyrite dust.

5Y 7/1 swirled with N7 — SS 4-74
47% N 2% Gl 1% Z 1% SI
26% F 1% HM 1% R
25% Py 1% G 1% S

N8 swirled with N7 — Water Content 4-85 (42.73)

FORAM-NANNO OOZE, greenish gray; stiff; "clay pebbles" at 85 and 105 cm.

N7 swirled with N9 — SS 4-106
67% N 2% S Tr% HM
30% F 1% R Tr% Gl

5Y 6/1 swirled with N6 — Water Content 5-63 (43.57)

N7-N9 swirled — Grain Size 6-22 (4.8, 29.5, 65.7)

$CaCO_3$ 6-26 (92)

Grain Size 6-50 (10.1, 35.9, 54.0)

N7

N8 — $CaCO_3$ 6-53 (66)

5Y 7/1 swirled with N7 and N8 — Water Content 6-72 (42.59)

PYRITE, RAD-CLAY-VOLCANIC GLASS-SHARD-BEARING FORAM-NANNO OOZE, light olive gray "brown streak."

N8 — SS 6-105
39% N 10% Cl 2% D
30% F 4% R 1% S
10% Gl 3% Py 1% SI

5Y 7/1 and N8 swirled

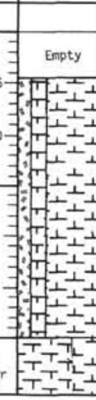
NANNO-FORAM OOZE, light gray.

SS CC
50% F 1% HM 1% S
45% N 1% Gl 1% SI

N7

Site 288 Hole Core 4 Cored Interval: 48.0-57.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
LATE PLIOCENE	N21; Discoaster tridentatus - Pseudoemiliania lacunosa; Spongaster pentas	R; F R N	R; A R C	p; e p m	0, 1, 2, Core Catcher	0.5, 1.0	Empty	3	*, *CC



LITHOLOGIC DESCRIPTION

Water Content 1-92 (41.19)

N8 — SPONGE-SPICULE, RADIOLARIAN-BEARING, VOLCANIC GLASS-FORAM-RICH, NANNO OOZE, gray; soft.

SS 1-100
58% N 11% Gl 3% S 1% HM

N8 swirled with 5Y 6/1 — 20% F 4% R 2% D 1% SI

Water Content 1-144 (41.41)

N7 swirled with N8

Black pyrite streak Section 2-115 to 120.

Water Content 2-66 (40.02)

NANNO-FORAM OOZE, light gray.

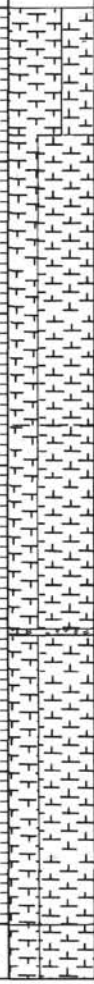
SS CC
60% F 39% N 1% R Tr% Gl

N7

Explanatory notes in Chapter 2

Site 288 Hole Core 5 Cored Interval: 67.0-76.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
LATE PLIOCENE	N21 / Discoaster tridentatus - Pseudoemiliania lacunosa / Spongaster pentas				0				
					1	0.5, 1.0		3	* *
					2			3	
					3			3	*
					4			3	*
					5			3	*. * *
					6			3	
		F R N	A T C	e m f	Core Catcher				* CC



N7

Water Content 1-60 (39.48)

NANNO-FORAM OOZE, light gray; stiff; pumice pebble at Section 1-80.

SS 1-105
55% F 55% N 1% HM Tr% S

FORAM-NANNO-RICH OOZE (patch) - greenish gray (5G 4/1).

SS 1-146
70% N 30% F Tr% G Tr% HM

7.5YR 6/1 swirled with 7.5YR 7/1

FORAM-NANNO-OOZE, light gray; stiff.

Black pyritic streaks at Section 2-50 to 55, 60, 65 to 70 cm.

7.5YR 7/1

Water Content 2-75 (38.30)

Water Content 3-50 (39.85)

$CaCO_3$ 3-85 (77)

N6, N7, 10YR 6/1 swirled together

Grain Size 3-87 (9.9, 31.8, 58.4)

Greenish gray (5G 4/1) streaks at Section 3-62, 70.

RAD-BEARING, FORAM-NANNO-OOZE, medium to light gray; stiff.

SS 3-120
65% N 30% F 5% R 1% S

Grayish green (5G 5/2) patch at Section 4-10.

N6, N7, 5Y 6/1 swirled together

Water Content 4-40 (40.15)

X-ray 4-67
19% Amor 98% Calc 1% Plag
81% Cryst 1% Quar

FORAM-NANNO-OOZE, medium to light gray, light gray; stiff.

SS 4-120
67% N 1% HM 1% S
40% F 1% Py

FORAM-BEARING, NANNO-RICH OPAQUE VOLCANIC ASH, black (streaks).

5GY 6/1 swirled

SS 5-11
42% Gl 21% N 2% Fsp 1% S
30% Opaq 3% F 1% R

N7

Water Content 5-122 (42.22)

FORAM-NANNO-OOZE, gray; stiff.

SS 5-140
59% N 1% Py Tr% S
40% F Tr% R

Water Content 6-80 (42.96)

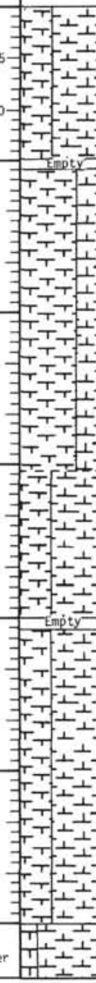
FORAM-NANNO OOZE, light gray.

SS CC
55% N 2% S 1% Gl
40% F 1% R 1% Opaq

5Y 7/1

Site 288 Hole Core 6 Cored Interval: 86.0-95.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
LATE MIOCENE	N16 / Discoaster quinqueramus / Ommartus antepenultimus / D. neohamatus				0				
		F R	A C	e g	1	0.5, 1.0	Empty	5, 3	
					2			5, 3	*
					3				
		R	C	g	4		Empty	3, 3	*
					5				
		N	A	f-	6				* *
		N	A	f-					
		F R N	A R C	e g f	Core Catcher				* CC



N7

FORAM-NANNO OOZE, same lithology as above, light gray; soupy.

Water Content 1-121 (37.17)

Grain Size 2-60 (6.9, 41.2, 51.9)

Water Content 2-70 ((37.30)

$CaCO_3$ 2-100 (95)

X-ray 2-120
8% Amor 92% Cryst 100% Calc

NANNO-FORAM OOZE, light gray; soft.

SS 2-140
50% F 48% N 1% R 1% S

Water Content 3-65 (35.72)

Grain Size 4-44 (6.8, 41.2, 52.0)

Water Content 4-88 (37.63)

Grain Size 4-120 (7.0, 48.1, 44.9)

N9

N8

FORAM-NANNO OOZE, very light gray; soft.

SS 4-148
58% N 40% F 1% R 1% S

Water Content 5-74 (35.13)

Water Content 5-144 (35.99)

ZEOLITE AND CHLORITE-ALTERED VOLCANIC ROCK FRAGMENT, green granule at Section 6-10.

SS 6-10
60% Gl 40% Z Tr% Fsp

NANNO AND CLEAR GLASS-SHARD-BEARING, ALTERED GLASS-SHARD OPAQUITE (black), patch at Section 6-39.

SS 6-38
45% Opaq 5% Gl Tr% D
40% A. Gl 2% Fsp Tr% R
8% N Tr% HM Tr% S

Water Content 6-85 (41.71)

FORAM-RICH NANNO OOZE, white.

SS CC
78% N 2% R 1% Gl 1% S
15% F 1% Fsp 1% Z 1% Sl

5Y 8/1

Explanatory notes in Chapter 2

Site 288 Hole Core 7 Cored Interval: 114.5-124.0 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE MIOCENE	N16	Discoaster neohamatus / Discoaster hamatus / Catinaster calyculus Szone	Ommatartus antepenultimus / ?	F / R / N	A / A / —	e / g / —	0, 1	0.5, 1.0	Empty	4 + 5		N8
				R / N	A / —	g / —	2			5, 4, 3	*	
				F / R / N	A / A / C	e / g / f	Core Catcher				* CC	5Y 8/1

NANNO-FORAM CHALK, very light gray, semi-lithified; very faintly mottled.

SS 1-135
50% F 50% N Tr% R

Light gray (10YR 7/2) slurry at top of Section 2.

Pyrite-bearing band, very pale purple (5P 7/2) at Section 2-83 to 85.

Water Content 2-93 (38.52)

GLASS-SHARD-BEARING, FORAM-RICH, NANNO OOZE, very light gray; stiff to crumbly.

SS 2-115
75% N 20% F 5% Gl

FORAM-BEARING, NANNO-OOZE, white.

SS CC
92% N 7% F 1% Gl 1% S

Site 288 Hole Core 8 Cored Interval: 143.0-152.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MIOCENE	N14	D. hamatus●	Dorcadospyris alata	F / R	A / C	g / p	0, 1	0.5, 1.0		5 to 4		N8
	N13	Discoaster exilis		N	C	g				4	*	
				F / R / N	A / C / C	g / m / p	Core Catcher				* CC	5Y 8/1

Water Content 1-3 (35.87)

Water Content 1-44 (37.19)

FORAM BEARING, NANNO-CHALK, very light gray; semilithified; slightly mottled.

SS 1-110
94% N 5% F 1% R

NANNO OOZE, white.

SS CC
96% N 2% F 1% Z 1% HM

● Catinaster calyculus Szone

Site 288 Hole Core 9 Cored Interval: 171.5-181.0 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MIOCENE	N12	Discoaster exilis	Dorcadospyris alata	F / R	A / C	g / m	0, 1	0.5, 1.0	Empty			N8-N9
											*	N7-N8 / N8-N9
	N12			F / R / N	A / C / C	g / m / p	Core Catcher				* CC	5Y 8/1

$CaCO_3$ 1-41 (93)

Grain Size 1-43 (2.7, 43.8, 53.6)

FORAM BEARING, NANNO CHALK, very light gray to white, slightly mottled (bioturbated); semilithified.

FORAM-BEARING NANNO CHALK, light gray to very light gray; semilithified, parllel laminated, interval is 9 cm thick.

SS 1-128
94% N 1% Opaq 1% S
3% F 1% R

FORAM BEARING NANNO CHALK, very light gray to white; semilithified.

FORAM-NANNO OOZE, white.

SS CC
64% N 35% F 1% S Tr% HM

Site 288 Hole Core 10 Cored Interval: 200.0-209.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MIOCENE	N12	Discoaster exilis	Dorcadospyris alata	F / N / R	A / C / A	e / p / g	0, 1	0.5, 1.0	Empty	5		N8- N9
	?	Sphenolithus heteromorphus		F / R / F	A / A / A	g / g / g	2				*	
				N	C	p-						
	N10			F / R / N	A / A / C	g / m / p	Core Catcher				* CC	5Y 8/1

NANNO CHALK, very light gray to white, very slight bioturbation; semilithified, lithology as above.

Water Content 1-144 (33.06)

Water Content 2-66 (35.96)

FORAM, GLASS-SHARD-BEARING, NANNO CHALK, very light gray to white; semilithified, slightly mottled.

SS 2-110
89% N 3% F 1% R
5% Gl 1% Fsp 1% S

FORAM, BEARING, NANNO-CHALK, white.

SS CC
91% N 2% Z 1% Calc S.
5% F 1% Fsp

Site 288 Hole Core 11 Cored Interval: 228.5-238.0 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
?		Sphenolithus heteromorphus	Calocycletta costata	R	a	g	0, 1	0.5, 1.0	Empty			N8 to N9
EARLY MIOCENE	N8			F	C	g	2				* / *	
	N8			F / R / N	A / A / C	g / m / p	Core Catcher				* CC	5Y 8/1

NANNO CHALK, lithology as above, very light gray to white, slightly mottled.

Water Content 1-111 (24.83)

Water Content 1-144 (22.81)

Water Content 2-40 (24.50)

GLASS-SHARD, BEARING, OPAQUE-PYRITE RICH NANNO CHALK, black-green (patch at Section 2-110); semilithified.

SS 2-110
47% N 20% Opaq 2% F 1% R
25% Py 5% Gl 2% Nod

FORAM, NANNO CHALK, very light gray to white; semilithified, slightly mottled.

SS 2-140
56% N 2% Calc S. 1% S
40% F 1% R

FORAM-BEARING NANNO CHALK, white.

SS CC
87% N 1% S 1% Fsp
10% F 1% SI

Explanatory notes in Chapter 2

Site 288 Hole A Core 1 Cored Interval: 267.0-278.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	P22	Triquetrorhabdulus carinatus	Calocycletta virginis	F R N	A A C	f g m	0, 1, 2, 3, Core Catcher	0.5, 1.0	Empty; Calc. Spicules	5, 0, 4, 0, 4, 0, 0, 0	*, *, *, *, *CC	

N9

Chert pebble, yellowish brown (10YR 5/4) to dark brown (10YR 4/3), translucent, at Section 1-35.

ANDESITE GRANULE, well-rounded, at Section 1-35.

SS 1-35
85% Plag (AN_{30-40}) 15% Pyrox

CALCAREOUS SPICULE-BEARING NANNO CHALK, white; semilithified, slightly mottled with very light gray.

SS 1-60
87% N 10% Calc S. 2% F 1% S

Water Content 1-122 (29.77)

FELDSPAR-ZEOLITE-BEARING CLAY LUMP, dark grayish brown (10YR 4/2).

SS 2-75
85% M 10% Z 5% Fsp

Water Content 2-127 (29.37)

Water Content 3-66 (29.63)

CALCAREOUS SPICULE-RICH, NANNO CHALK, white, slightly mottled, parallel laminae at Section 3-80 and 100.

SS 3-140
78% N 20% Calc S. 1% F 1% R

10YR 8/1

CALCAREOUS SPICULE-FORAM-BEARING, NANNO-CHALK, white.

SS CC
76% N 10% Calc S. 1% Z
10% F 2% Gl 1% S

Site 288 Hole A Core 2 Cored Interval: 305.0-314.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	P22	Triquetrorhabdulus carinatus	Lychnacanoma elongata	F; F R N	A; C A C	g; f m m	0, 1, 2, Core Catcher	0.5, 1.0	Empty; Calc. Spic.; Calc. Spicules	0, 5, 0	*, *, *CC¹, *CC²	

N9

N8-N9

FORAM-BEARING, CALCAREOUS SPICULE-RICH NANNO OOZE, white; semilithified, moderate mottling.

SS 1-130
75% N 5% F 1% M 1% SI
15% Calc S. 2% Z 1% R

Water Content 1-144 (23.38)

ASH, dark gray (N3)

CALCAREOUS SPICULE-RICH, NANNO CHALK, very light gray; semilithified, intensely mottled (very light gray and light gray).

SS 2-30
80% N Tr% Gl Tr% R
20% Calc S. Tr% Py

Water Content 2-134 (29.05)

CALCAREOUS SPICULE-BEARING NANNO CHALK, white (N9).

SS CC[1]
92% N 5% Calc S. 2% F 1% R

NANNO-BEARING GLASS SHARD TUFF, black.

SS CC[2]
93% Gl 5% N 1% Chlo. 1% R

Site 288 Hole A Core 3 Cored Interval: 343.0-352.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	P21; P21	Discoaster distentus	Dorcadospyris ateuchus	R F F; R; F R	C C; C; C A	g g; p; g g	0, 1, 2, Core Catcher	0.5, 1.0	Empty	0, 0	*, *CC	

N9

N9

CHERT, very dark gray (10YR 3/1-3/3) to light to dark gray to dark brown (10YR 6/1-4/1), very thin parallel laminae.

GLASS SHARD-BEARING, NANNO CHALK, white, faintly mottled.

NANNO GLASS-SHARD TUFF, grayish black; semilithified; intensely mottled (with light gray), occurs as streaks.

SS 1-133
60% Gl 1% Opaq Tr% F
39% N Tr% Py

Water Content 1-144 (25.75)

NANNO CHALK, white; semilithified, intensely mottled.

Water Content 2-119 (26.67)

$CaCO_3$ 2-132 (95)

GLASS-SHARD-BEARING, NANNO CHALK, white.

SS CC
92% N 5% Gl 2% S 1% Fsp

Site 288 Hole A Core 4 Cored Interval: 381.0-390.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE OLIGOCENE	P21; P21; P20	Discoaster distentus	Dorcadospyris ateuchus; Theocyrtis tuberosa	F R; F; F N	C A; C; C C	f g; f; g m	0, 1, 2, Core Catcher	0.5, 1.0	Empty		*, *CC	

N9

FORAM-NANNO CHALK, white; semilithified, intensely mottled, steeply dipping at ~50° on cut surface (true dip >60°).

N9

FORAM-NANNO CHALK, white; semilithified, thin parallel laminae (dipping 45°) overlain by dewatering structure (pipe) at Section 2-35 to 47. Thin laminae at Section 2-85.

SS 2-40
60% N 40% F Tr% Z Tr% R

Water Content 2-112 (30.92)

CHERT fragment, core badly scored.

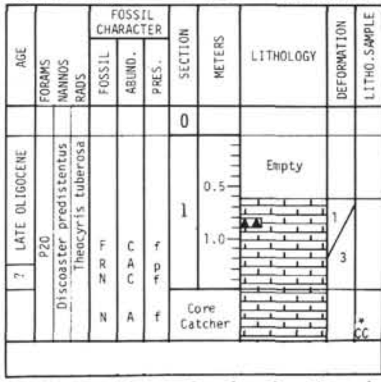
N9

CALCAREOUS SPICULE-BEARING, NANNO-FORAM CHALK, white.

SS CC
53% F 10% Calc S. 2% Z 1% S
32% N 2% R 1% Gl 1% SI

Explanatory notes in Chapter 2

Site 288 Hole A Core 5 Cored Interval: 419.0-428.5 m



LITHOLOGIC DESCRIPTION

N7
N8

NANNO CHALK, white, light gray, very light gray, parallel laminae at Section 1-70; intense bioturbation cut with low-angle fractures, and displacements, producing breccia at Section 1-82 to 93, mottled.

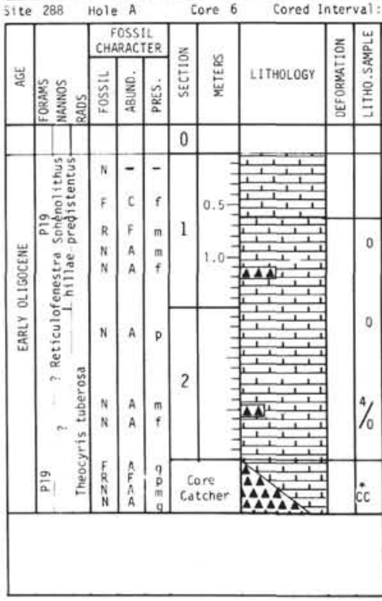
CHERT, fragment, at Section 1-80, olive brown.

Water Content 1-118 (25.98)

NANNO CHALK, white (N9).

SS CC
97% N 1% R 1% S

Site 288 Hole A Core 6 Cored Interval: 457.0-466.5 m



LITHOLOGIC DESCRIPTION

N9+

NANNO-CHALK, white (N9), semilithified; mottled, light gray at Section 1-10 and dark gray at Section 1-40, bioturbated at Section 1-105.

$CaCO_3$ 1-71 (97)

X-ray 1-77
7% Amor 93% Cryst 100% Calc

Water Content 1-83 (28.26)

CHERT fragment, light gray (N7) at Section 1-120.

Water Content 1-144 (27.50)

N9

NANNO CHALK, intense white (N9+), semi-lithified.

SS 2-40
99% N Tr% Z Tr% F

Water Content 2-56 (25.70)

CHERT cap, medium light gray (N6) at Section 2-100.

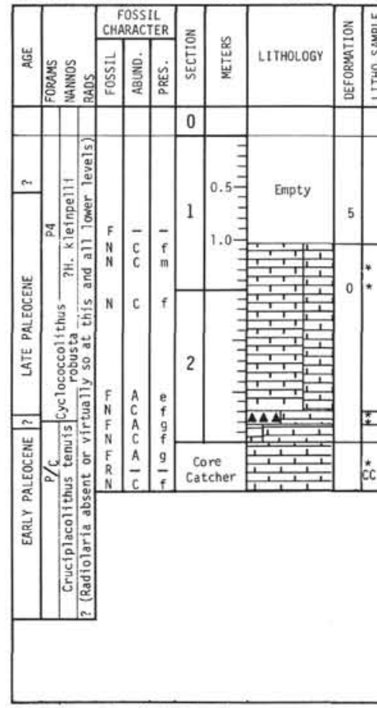
NANNO CHALK, white (N9).

SS CC
97% N 1% Z 1% Gl 1% Fsp

CHERT, Pale dark gray (N3).

Site 288 Hole A Core 7 - 495.0-504.5 m: EMPTY.

Site 288 Hole A Core 8 Cored Interval: 533.0-542.5 m



LITHOLOGIC DESCRIPTION

N9+

NANNO-FORAM CHALK, intense, white; semi-lithified.

SS 1-120
60% F 40% N Tr% Gl

Crystalline, brown, translucent particles at Section 1-143 (smear slide), (hematite?).

Water Content 2-56 (31.73)

$CaCO_3$ 2-63 (98)

X-ray 2-65
6% Amor 94% Cryst 100% Calc

N9+

ZEOLITE-BEARING, FORAM-RICH NANNO CHALK; light brownish gray (10YR 6/2) with white blebs; semilithified.

SS 2-127
67% N 25% F 8% Z

N9+

ZEOLITE-FORAM-RICH NANNO CHALK, light brown (7.5YR 6/3), with white blebs; semilithified.

SS 2-130
65% N 20% F 15% Z

CHERT, dark reddish brown (5YR 2.5/2) with light reddish brown blebs (5YR 6/4).

$CaCO_3$ 2-144 (97)

X-ray 2-146
10% Amor 90% Cryst 100% Calc

FORAM-RICH NANNO CHALK, white.

FORAM BEARING, NANNO CHALK, white (N9).

SS CC
87% N 2% Py 1% Fsp
7% F 2% Opaq 1% R

Explanatory notes in Chapter 2

Site 288 Hole A Core 9 Cored Interval: 571.0-580.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE		LITHOLOGIC DESCRIPTION
MIDDLE MAASTRICHTIAN	? Globotruncana gansseri	Lithraphidites quadratus					0						
				N F	C A	m g	1	0.5 1.0			*	N9 N9	Water Content 1-66 (27.73) CALCAREOUS SPICULE-BEARING, NANNO CHALK, white; semilithified. SS 1-102 88% N 10% Calc S. 2% F Tr% Fsp CHERT fragment, 4 cm in diameter, black (5YR 2.5/1) to reddish black (10R 2.5/1) with dark brown blebs at Section 1-115. NANNO CHALK, white; semilithified. Water Content 1-144 (28.24)
				N	A	g	2					N9	CHERT, very dark brown (10YR 3/2) and brown to grayish brown (10YR 5/3 to 5/2). NANNO OOZE, white (N9), grades from stiff at Section 2-20 to soft at Section 2-150.
							3					N8	$CaCO_3$ 3-20 (98) FORAM-BEARING NANNO OOZE, white, medium gray streaks at Section 3-95, 123, 138, soft. CHERT fragment, brown, at Section 3-137.
							4			2 3		N9	OPAQUE-ZEOLITE AND SHELL-FRAGMENT-BEARING, FORAM RICH NANNO OOZE occurring as medium gray to medium light gray streaks, at Section 4-85, 100, 110, and 120 to 150. SS 4-146 72% N 5% Shell 3% Opaq 15% F 5% Z(?)
				N	A	m	5			2 3	* * *	10YR 8/1	X-ray 5-114 4% Amor 96% Cryst 100% Calc SHELL FRAGMENT-BEARING, FORAM-NANNO OOZE, white; soft. SS 5-124 67% N 30% F 3% Shell X-ray 6-85 2% Amor 98% Cryst 100% Calc
							6						FORAM-BEARING, CALCAREOUS-SPICULE-RICH, NANNO-CHALK, white (N9).
				F N	A A	g g	Core Catcher		Calc. Spic.		* CC		SS CC 75% N 20% Calc S. 5% F CHERT, olive brown (2.5Y 3/4).

Site 288 Hole A Core 10 Cored Interval: 609.0-618.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE		LITHOLOGIC DESCRIPTION
? EARLY MAASTRICHTIAN		Lithraphidites quadratus Tetralithus trifidus					0						
				N N	— —	— —	1	0.5 1.0	Empty	5 0	* * *	N9 10YR 8/2	CHERT, nodule 8 x 6 x 2.5 cm, black (5YR 2.5/1) slightly mottled. Water Content 1-6 (27.46) NANNO CHALK, white; semilithified. SS 1-40 97% N 2% M 1% F $CaCO_3$ 1-86 (96) X-ray 1-89 1% Amor 99% Cryst 100% Calc CLAY, dark grayish brown (10YR 4/2), lamina. SS 1-100 100% Clay
							2						NANNO CHALK, white, mottled with very pale brown (10YR 7/3); semilithified. SS 1-130 96% N 2% F 2% M Tr% Calc R.
				F R N	R — A	p — p	Core Catcher		Calc. Spicules		* CC		NANNO CHALK + NANNO OOZE, interbedded and arranged on cyclic color bands in interval Section 2-30 to 100. Color bands alternate white (10YR 8/2) and light gray (10YR 7/1). A typical alternation starts with a basal sharp contact overlain by white ooze or chalk which grades up into light gray chalk or ooze; soft to stiff. Nine such cycles occur, averaging >.5 cm in thickness. Upper 30 cm consists of light gray (2.5Y 7/2) whereas lowest 20 cm consists of intense white (N9+) ooze. Water Content 2-106 (26.45) Intense mottled zone at Section 2-115. CALCAREOUS SPICULE RICH, NANNO OOZE, white (N9). SS CC 72% N 25% Calc S. 2% M 1% S

Explanatory notes in Chapter 2

Site 288 Hole A Core 11 Cored Interval: 647.0-656.6 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
? CAMPANIAN	T. trifidus; ? Broinsonia parca; Eiffellithus angustus	F N	R A	p g	0, 1	0.5, 1.0	Empty; Calc. Spic.		*	10YR 8/1 to 10YR 8/2
		N	—	—	2		H.M.		* *	10YR 8/1, N9, 10YR 7/1, 10YR 8/2, 10YR 8/1
		N	C	g			H.M.			
		F R N	T — A	p — g	Core Catcher				CC[1] CC[2]	

CALCAREOUS SPICULE-RICH, NANNO CHALK, white; semilithified; small fault at Section 1-70 to 75, vertical dark streaks at Section 1-75 to 100.

SS 1-130
89% N 11% Calc S. Tr% Z Tr% Opaq

Water Content 1-135 (27.41)

Water Content 1-144 (26.64)

NANNO CHALK-OOZE, white, to light gray; bioturbated at Section 2-70 to 77.

ZEOLITE-HEAVY MINERAL RICH NANNO CHALK, black spot.

SS 2-69
51% N 20% Z 2% M
25% HM 2% Fsp

AUTHIGENIC CARBONATE AND NANNO BEARING CLAY, black.

SS 2-91
90% Cl 5% N 3% A. Carb 2% M

X-ray 2-92
48% Amor 2% Dolo 3% Mont
52% Cryst 6% Quar 60% Paly
22% Calc 6% Mica 1% Clin

NANNO CHALK, white (N9).

SS CC[1]
98% N 2% Ca

CALCAREOUS SPICULE-BEARING, PYRITE-RICH, OPAQUE-NANNO OOZE, black, occurs as a black spot.

SS CC[2]
35% N 30% Opaq 20% Py 15% Calc S.

Site 288 Hole A Core 12 Cored Interval: 685.0-694.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN	E. augustus	F N N	T A C	f g f	0, 1	0.5, 1.0	Empty	0, 4	* * *	10YR 7/1, N9, 10YR 7/1
SANTONIAN ?	Marthasterites furcatus	F N	— R	— p	Core Catcher					

Water Content 1-82 (24.75)

NANNO CHALK, light gray; semilithified.

SS 1-84
97% N 2% M 1% A. Carb

FELDSPAR-ZEOLITE, CARBONATE AND OPAQUE-BEARING CLAY NANNO CHALK, very dark gray fragment 1.5 x 1.0 cm.

SS 1-91
48% N 10% Opaq 4% Carb 1% Calc R.
30% Cl 4% Z 3% Fsp

OPAQUE-BEARING, NANNO CHALK, grayish brown (10YR 5/2) fragment 4 x 4 cm.

SS 1-142
97% N 3% Opaq

CHERT, black.

CHERT, dark reddish gray (5YR 4/2), black (2.5Y 2/1).

Site 288 Hole A Core 13 Cored Interval: 704.0-713.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
SANTONIAN	Marthasterites furcatus	N N	R A	p g	0, 1	0.5, 1.0	Empty		*	
		F R N	— C R	— p p	Core Catcher				* CC	N9

NANNO-CHALK, white (N9), and very light gray (N8); semilithified, disturbed laminae at Section 1-145.

SS 1-140
88% N 10% F 2% Calc S.

Alternates with pieces of CHERT, dark grayish brown (10YR 4/2) at Section 1-130, medium dark gray (N4) at Section 1-135, black (5YR 2.5/1) at Section 1-140, and dark reddish brown (5YR 3/2) at Section 1-148 where it interdigitates with overlying chalk.

Water Content 1-144 (17.37)

NANNO OOZE, white, with green spots.

SS CC
99% N Tr% Z Tr% Opaq

CHERT, dark brown (7.5 YR 3/2).

Site 288 Hole A Core 14 Cored Interval: 723.0-732.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
EARLY SANTONIAN	Marthasterites furcatus	N	A	g	0, 1	0.5, 1.0	Empty		*	N9+, N8, N8, N9+
		F N	R C	f p	Core Catcher				* CC	

$CaCO_3$ 1-106 (88)

NANNO CHALK, intense white (N9+) to very light gray (N8); semilithified to stiff.

SS 1-145
97% N 1% F 1% Calc S. Tr% S

CHERT, very dark gray (N2) at Section 1-95 to 98.

NANNO CHALK, white (N9).

SS CC
98% N 2% Calc S.

Explanatory notes in Chapter 2

Site 288 Hole A Core 15 Cored Interval: 742.0-751.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					0					
?					1	0.5 / 1.0	Empty		*	2.5Y 8/2-7/2
LATE CONIACIAN	*Marthasterites furcatus*	F / N	R / R	f / p	2		Empty		* / *	2.5Y 8/2-8/3 10YR 5/2
		F / R / N	— / — / v.R.	— / — / v.p.	Core Catcher				CC[1] / CC[2]	

CHALK, grading to LITHOGRAPHIC LIMESTONE at Section 1-115 to 120, pale yellowish white (5Y 5/2) to white (5Y 8/1); yellowish brown lamina areas incipient silicified zone.

Water Content 1-129 (15.97)

ZEOLITE-BEARING, NANNO CHALK, pale yellow-white to light pale yellow gray; semi-lithified, intensely mottled and bioturbated.

SS 1-130

87% N	2% Gl	1% Opaq
8% Z	1% HM	1% Nod

Water Content 1-145 (13.97)

Water Content 2-42 (21.33)

CHALK; pale yellow white (2.5Y 8/2) to light-pale yellowish gray, white, very pale brownish white; semilithified, laminated, flaser-bedded, lenticular-bedded, mottled, bioturbated.

NANNO CHALK, burrow fill in white limestone.

SS 2-105

99% N	Tr% Opaq

VOLCANIC GLASS, OPAQUE AND CLAY BEARING ZEOLITE RICH NANNO CHALK, lamina, dark brown.

SS 2-116

64% N	3% Opaq	2% Fsp
20% Z	3% Gl	1% Chlo
5% Cl	2% Nod	Tr% HM

CHERT, dark reddish brown (2.5YR 3/4) at Section 2-41 and Section 2-105 to 107.

LITHOGRAPHIC LIMESTONE, very pale brownish white (10YR 8/2) to pale brown (10YR 8/4) band, dense, lithified, with siliceous blebs at Section 2-92 to 98.

FELDSPAR-CHLORITE-PYRITE, CARBONATE, CLAY, GLASS-SHARD-ZEOLITE-BEARING NANNO LIMESTONE, brown (10YR 4/3 to white (10YR 8/2).

SS CC[1]

47% N	10% Gl	5% Chlo	1% F
10% Cl	6% Carb	5% Py	
10% Z	5% Fsp	1% HM	

CHERT, dusky red (10R 3/3), weak red (10R 4/4).

NANNO CHALK, white (N9).

SS CC[2]

97% N	2% Py	1% Fsp

v denotes very

Site 288 Hole A Core 16 Cored Interval: 761.0-770.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					0					
CONIACIAN	*Micula decussata*				1	0.5 / 1.0	Empty		* / * / * / *	
		F / R / N	— / F / C	— / P / m	Core Catcher				* CC[1] / * CC[2]	

CHALK, pale brownish white (10YR 8/2) to dark brown (10YR 4/3), with ASH-SILTSTONE laminae (darker hue), interbedded throughout; semilithified, parallel laminae, irregular laminae, Section 1-50 to 85.

FELDSPAR-OPAQUE-BEARING, NANNO-ZEOLITE-RICH GLASS-SHARD SILTSTONE, laminae, dark brown.

SS 1-72

30% Gl	34% N	3% Fsp	1% Calc S.
25% Z	5% Opaq	1% Nod	1% S

Water Content 1-94 (14.59)

X-ray 1-97

53% Amor	3% Quar	4% Paly
47% Cryst	10% Plag	20% Clin
56% Calc	4% Mont	3% Bari

At Section 1-85 to 120: interlaminated CHALK and ASH-SILTSTONE, pale brown to very dark grayish brown; semilithified, thin laminae, irregular laminae, bioturbated (slight), FELDSPAR, PYRITE, CLAY + ZEOLITE-BEARING, VOLCANIC GLASS RICH, NANNO SILTSTONE, laminae, dark brown.

SS 1-96

62% N	10% Z	4% Py
15% Gl	5% Cl	4% Fsp

$CaCO_3$ 1-99 (68)

X-ray 1-100

18% Amor	88% Calc	2% Bari
82% Cryst	10% Quar	

At Section 1-120 to 150: interbedded NANNO CHALK, white (10YR 8/1), and GLASS-SHARD SILTSTONE, dark gray; semilithified, laminated, slightly graded, FELDSPAR-HEAVY MINERAL-BEARING ZEOLITE-RICH GLASS-SHARD, SANDY SILTSTONE, dark gray, laminae.

SS 1-131

52% Gl	7% HM	2% N	1% S
30% Z	5% Fsp	2% Opaq	1% Nod

X-ray 1-131

56% Amor	4% Quar	15% Mont	8% Bari
44% Cryst	17% Plag	14% Paly	
3% Calc	4% Mica	35% Clin	

CHERT at Section 1-55 (reddish brown-dark reddish brown), Section 1-80, 135, and 145 (dark reddish brown).

CHERT, light yellowish brown (10YR 6/4) and dark brown (10YR 4/3).

NANNO CHALK, light gray (5Y 7/2) to light olive gray (5Y 6/2).

SS CC[1]

98% N	2% M	Tr% Opaq

CLAY-CHLORITE-PYRITE-FELDSPAR-BEARING, NANNO-ZEOLITE RICH CARBONATE SILTSTONE, dark gray laminae.

SS CC[2]

30% Carb U.	20% N	5% Chlo	1% HM
25% Z	9% Fsp	5% Py	

Explanatory notes in Chapter 2

Site 288 Hole A Core 17 Cored Interval: 780.0-789.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
					0				
CONIACIAN	Micula decussata				1	0.5, 1.0			
		F / N	— / A	— / m	Core Catcher				

LITHOLOGIC DESCRIPTION

Water Content 1-9 (19.13)

Fragments of CHERT and CHALK.
CHERT, reddish brown (5YR 5/2) to dark reddish brown (5YR 3/2), thinly laminated and graded with light angular inclusions; at Section 1-120 to 127; very dark grayish brown, (10YR 3/2) at Section 1-140 to 150.
CHALK, very light gray (N8); semilithified, thinly-laminated at Section 1-127 to 140.

Site 288 Hole A Core 18 Cored Interval: 799.0-808.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
					0				
CONIACIAN?	Micula decussata	F R N	R t R	f p p	Core Catcher				*

LITHOLOGIC DESCRIPTION

FORAM-BEARING NANNO CHALK, white.

SS CC
91% N 2% M 1% Opaq
3% F 1% Calc S. 1% Fsp

CHERT, pink gray (7.5YR 6/2) with laminae of brown (7.5YR 5/2), and dark reddish brown (5YR 3/3).

Site 288 Hole A Core 19 Cored Interval: 818.0-827.5 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
					0				
?					1	0.5, 1.0	Empty		
		F / N	— / R	— / P	Core Catcher				

LITHOLOGIC DESCRIPTION

Water Content 1-34 (30.07)

ZEOLITE RICH CLAYSTONE, dark grayish brown (10YR 4/2) to light reddish brown (5YR 6/4).

SS 1-117
75% Cl Tr% Fsp Tr% N
25% Z Tr% Chlo

ZEOLITE-BEARING ALTERED VOLCANIC GLASS CLAYSTONE, light yellowish brown (10YR 6/4), laminated.

SS 1-125
57% Cl 10% Z 1% Fsp
30% Gl 2% Opaq Tr% Q

NANNO-LIMESTONE, pinkish white, (7.5YR 8/2), NANNO CHALK, very light gray (N8), and CHERT, dark reddish brown (2.5YR 2.5/4) to reddish brown (2.5YR 4/4), to light gray (N7).

Site 288 Hole A Core 20 Cored Interval: 846.5-856.0 m

AGE	FORAMS / NANNOS / RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
					0				
TURONIAN		N	A	m-	1	0.5, 1.0	Empty		* *
		F	—	—					
?		F	—	—	2				*
					3				*
		N	R	p	Core Catcher				* CC

LITHOLOGIC DESCRIPTION

FORAM-NANNO CHALK, white (N9+) to light gray (N8); semilithified, interbedded with CHERT, dark reddish brown (2.5YR 3/4), and light gray (5Y 6/1.5).

Water Content 1-53 (16.47)

FORAM-NANNO CHALK, light greenish gray (5G 7/1), laminated with SILTSTONE, greenish gray (5G 6/1), thinly laminated, slight grading.

SS 1-101
70% N 30% F Tr% Chio Tr% Fsp

HEAVY MINERAL, NANNO-ZEOLITE-GLAUCONITE-BEARING, NANNO RICH, GLASS-SHARD, SILTSTONE, greenish gray (5G 6/1) lamina.

SS 1-121
57% Gl 5% G 3% HM
25% N 5% Z 2% Fsp

CHERT, dark reddish brown (5YR 3/3), dark brown (2.5YR 3/2), dark grayish brown (10YR 4/2).

Water Content 1-144 (11.49)

At Section 1 140 to 147 interedded CHERT, dark brownish gray (10YR 4/2), gray (10YR 5/5), dusky (2.5YR 4/2), light olive gray (5Y 7/1), dark reddish brown (5YR 3/2), laminated, lenticular, or as a cap on chalk at Section 2-16 to 22, 80 to 93, and 149 with,
FORAM BEARING NANNO CHALK, white (N9), very light gray (N8); lithified, laminated, with dark greenish gray (5G 4/4) and greenish gray (5G 6/1) SILTSTONE laminae.

Water Content 2-46 (11.66)

$CaCO_3$ 2-71 (83)

Water Content 2-134 (13.49)

SILICIFIED LIMESTONE, light gray (N8); lithified, dense, aphanitic, with parallel laminae (dark greenish gray) at Section 3-35 to 50 and 95 to 100. Chert bleb at Section 3-68.

Water Content 3-116 (16.72)

X-ray 3-129
65% Amor 80% Calc 6% Cris 1% Bari
35% Cryst 11% Quar 2% Trid

NANNO LIMESTONE, light gray (N6), and medium gray (N5); semilithified, laminated at Section 3-110 to 126 and 140 to 150.

NANNO LIMESTONE, yellowish gray (5Y 8/1) with dark greenish gray laminae.

CHERT, dark reddish brown (5YR 3/3), grayish brown (10YR 5/2).

Explanatory notes in Chapter 2

Site 288 Hole A Core 21 Cored Interval: 856.0-865.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE		LITHOLOGIC DESCRIPTION
							0						
?				R	T	vp	1	0.5 1.0			*		LIMESTONE, very light bluish gray (5B 8/1), medium light gray (N6), very light gray (N8); lithified, thinly-laminated, slightly-laminated, faintly mottled. CHERT caps on limestone at Section 1-130, 133, 146, dark reddish brown (5YR 3/2), light gray (N7). SILICOSPHERE-BEARING NANNO LIMESTONE, very light gray; lithified. SS 1-148: 97% N, 3% S. sphere, Tr% F
							2				*	N8 N7	X-ray 2-61: 38% Amor, 62% Cryst, 70% Calc, 4% Plag, 4% Mont, 17% Clin, 5% Bari. $CaCO_3$ 2-111 (80). Water Content 2-127 (12.44)
							3				*		PARTLY-SILICIFIED, GLAUCONITE-NANNO AND RAD-BEARING FORAM LIMESTONE, light gray (N7). SS 2-140: 50% F, 37% N, 10% R, 2% Opaq, 1% Fsp. At Section 3-39 to 40, 61 to 64, 91 to 93, coarse foram limestone. At Section 3-50 to 57, 94 to 105, 115, intense parallel laminae. At Section 3-140 to 150, wavy laminae. Water Content 3-132 (11.97)
				F N	T R	p p	Core Catcher				* CC		NANNO LIMESTONE, very light gray (N8). SS CC: 95% N, 2% Opaq, 2% HM, 1% Calc R. CHERT

NOTE: In Cores 20 and 21, volcanic ashes and limestones are arranged in rhythmic sequences, as follows:
a) Top
b) NANNO-LIMESTONE, light gray, uniform.
c) FORAM-LIMESTONE, grades from fine sand at base to silty carbonate, light gray (N7) with medium gray (N6) laminae of GLAUCONITIC-ALTERED VOLCANIC GLASS SILTSTONE, parallel-laminated, with clay drapes, wavy and flaser bedding, lenticular bedding, small burrows. Contains CHERT nodules, replacing limestone, dusky red (2.5YR 3/2).
d) GLASS-SHARD SILTSTONE, dark gray (N3), thinly laminated, contains fresh zeolite, heavy minerals and ash. Shows slight grading, fissile, sharp base.

Site 288 Hole A Core 22 Cored Interval: 865.5-875.0 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE		LITHOLOGIC DESCRIPTION
							0						
?							1	0.5 1.0	Empty			5B 9/1	LIMESTONE, very light bluish gray (5B 8/1), light pinkish gray (5YR 7/1), lenticular, parallel laminated. NANNO LIMESTONE, bluish white (5B 9/1), with slight greenish gray siltstone laminae, micro-cross-laminae at Section 2-50, wavy bedding. SS 2-49: 90% N, 2% Fsp, 2% Gl, 2% Py, 2% Z, 2% M, Tr% G. Water Content 2-78 (9.54). $CaCO_3$ 2-141 (46)
							2					N8.5	CHERT, dusky red at Section 2-5 cm; laminated at Section 2-65, reddish brown at Section 2-110, laminated gray (N6) to greenish gray (5GY 6/1) enclosing and capped by limestone, at Section 2-120; dark grayish brown (10YR 3/2) grading to olive gray (5Y 4/3) with calcite vein, at Section 2-145.
				N	R	p	Core Catcher		Empty				

Explanatory notes in Chapter 2

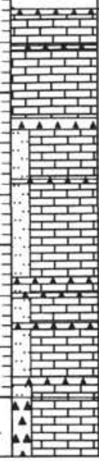
Site 288 Hole A Core 23 Cored Interval: 875.0-884.5 m

AGE: ? (Sections 1–3); EARLY TURONIAN (Core Catcher)

FOSSIL CHARACTER (Core Catcher): FORAMS F R p; NANNOS R t p; RADS N R p

SECTION: 0; 1 (0.5, 1.0 m); 2; 3; Core Catcher

LITHOLOGY: Section 1 upper part: Empty



LITHO. SAMPLE: * (Section 2); * * * (Section 3); * CC[1]; * CC[2]

LITHOLOGIC DESCRIPTION

Water Content 1-5 (11.49)

LIMESTONE, bluish white, light greenish gray, laminated.

Water Content 1-79 (12.31)

5B 9/1
5GY 8/1

CHERT, dark brown, capping limestone at Section 1-75, very dark brown at base of limestone core at Section 1-104, showing horizontal offset; gray, capping limestone at Section 1-125.

N8
N8
N6

LIMESTONE, very light gray with greenish gray (5G 6/1) parallel laminated, wavy laminae, laminae are dark gray, laminae consist of: HEAVY MINERAL-BEARING ZEOLITE RICH, NANNO GLASS-SHARD SILTSTONE.

SS 2-1

40% Gl	15% Z	2% Py	1% A. Carb R.
37% N	3% HM	1% F	

N9

X-ray 2-19

9% Amor	54% Calc	23% Cris	5% Trid
91% Cryst	14% Quar	2% Mont	2% Bari

5YR 6/2

Water Content 2-90 (14.99)

N8

CHERT, dark grayish brown (10YR 4/2) and dark red brown (7.5YR), capping limestone, dark reddish brown (5YR 3/4).

5YR 7/3
N9

LIMESTONE, very light gray, with pinkish gray (5YR 7/3 to 5YR 6/3) at Section 3-15 and 120 to 127, thinly-laminated, with green or dark gray lamina of siltstone.

HEAVY MINERAL, GLAUCONITE-ZEOLITE-BEARING, NANNO-RICH, ALTERED GLASS-SHARD SILTSTONE, dusky green (5G 3/2) lamina.

SS 3-85.5

61% Gl	7% Opaq	3% HM	1% F
30% N	5% Z	3% G	Tr% Vol. R F

Water Content 3-92 (10.30) $CaCO_3$ 3-99 (74)

CHERT Section 3: 30 to 35 dark reddish brown (2.5YR 3/4), banded; 45 dark gray (5YR 6/1), capped with limestone; 75 and 99 dark reddish brown bleb, on limestone; 130 reddish gray (5YR 5/1) banded, with light olive brown (2.5YR 7/2); 132 reddish gray capping limestone; and 137 light brownish gray (10YR 6/2), dusky green (5G 3/2), dark grayish brown (10YR 4/2), banded, with irregular laminae.

GLAUCONITE-RAD-BEARING, FORAM-RICH NANNO LIMESTONE, thin section at Section 3-111 to 113: 74% N, 15% F, 5% R, 3% G, 1% Gl

PRISM AND FORAM-BEARING, NANNO LIMESTONE, thin section at Section 3-113 to 116: 79% N, 10% F, 5% S, 2% Fsp, 2% Opaq, 2% G

NANNO LIMESTONE, white (10YR 8/2).

SS CC[1]

97% N	1% Fsp	1% Gl	1% S

NANNO LIMESTONE, pink (5YR 8/3).

SS CC[2]

95% N	5% Opaq	1% HM	1% Gl

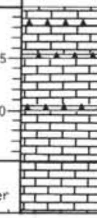
CHERT, reddish brown (2.5YR 4/4).

Site 288 Hole A Core 24 Cored Interval: 884.5-894.0 m

AGE: ? (Section 1); MID CENOMANIAN (Core Catcher)

FOSSIL CHARACTER (Core Catcher): FORAMS F C f; NANNOS N T p

SECTION: 0; 1 (0.5, 1.0 m); Core Catcher



LITHO. SAMPLE: * * (Section 1); * CC

LITHOLOGIC DESCRIPTION

10YR 7/4
5YR 7/3

As above-partial sequences of ashy-siltstone-limestone rhythms described in Core 21, this site: sharp base, overlain by graded volcanic siltstone, overlain by silty limestone with flaser, wavy and lenticular bedding, wavy bedding and altered volcanic siltstone, capped by nanno, aphanitic limestone.

2.5YR 3/4

X-ray 1-28

16% Amor	72% Calc	2% Bari
84% Cryst	26% Quar	

Water Content 1-87 (11.95)

SECONDARY SILICA-BEARING NANNO LIMESTONE, grades from moderate orange pink (10R 7/4), yellowish white (10YR 8/1.5), pinkish white (7.5Y 8/2), pink (5YR 7/3), pinkish gray (7.5YR 7/2), silty to aphanitic (at Section 1-30), lithified, parallel laminated, lenticular, wavy and flaser bedding at Section 1-17 to 30, 47 to 59, 80.

SS 1-125

90% N	10% Sec. SiO_2

CHERT at Section 1: 15 dark reddish brown (10YR 5/8), with yellowish brown band; 35 reddish brown (5YR 4/3) capping limestone; 45 reddish brown, at base of limestone; 108 reddish brown; and 115 dark reddish brown.

FORAM-BEARING-NANNO LIMESTONE, thin section at Section 1-26 to 29: 92% N, 5% F, 2% Calc S., 1% G

FORAM-MICARB BEARING NANNO LIMESTONE, pinkish white (7.5YR 8/2).

SS CC

79% N	7% F	1% Z
10% M	2% Opaq	1% Fsp

Explanatory notes in Chapter 2

Site 288 Hole A Core 25 Cored Interval: 894.0-903.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
? CENOMANIAN							0				
							1	0.5, 1.0	Empty		* *
				F	C	p	Core Catcher				* CC
				N	R	p					

5YR 8/2

10YR 8/2

10YR 7/2

LITHOLOGIC DESCRIPTION

Lithology same as above.

LIMESTONE, pinkish to pinkish gray to light reddish brown, to light gray. Mn dendrites.

CALCITE VEIN CONTAINING BLACK OPAQUE MINERAL, radiating fibers (mn) in pinkish white limestone, with manganese dendrites.

SS 1-80
Opaque-minerals in calcite fibers.

Water Content 1-90 (13.15)

X-ray 1-105
17% Amor 79% Calc 1% Mont
83% Cryst 17% Quar 3% Bari

$CaCO_3$ 1-107 (62)

CLAYSTONE, olive yellow (5Y 6/6), lamina (nontronite?) fracture fill.

SS 1-115
100% Cl

Zone of manganese dendrites (pyrolusite?) at Section 1-82 to 95.

CHERT Section 1: 98 reddish brown, (5YR 4/4) laminated, capped by light reddish brown limestone (5YR 6/4); and 130 yellowish red (5YR 4/6), laminated, caps pinkish white limestone.

MICARB-BEARING, NANNO LIMESTONE, pinkish white (7.5YR 8/2).

SS CC
91% N 1% Opaq
7% M 1% Fsp

Site 288 Hole A Core 26 Cored Interval: 913.5-922.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
EARLY CENOMANIAN							0				
				F	C	f	1	0.5, 1.0			
				N	R	p	Core Catcher				* CC

7.5YR 8/2
↓
7.5YR 6/2
5YR 8/2
↓
5YR 6/2
10YR 8/2
↓
7.5YR 4/3

LITHOLOGIC DESCRIPTION

X-ray 1-58
24% Amor 54% Calc 10% Cris 2% Trid
76% Cryst 32% Quar 1% Plag 1% Clin

Water Content 1-119 (12.24)

NANNO LIMESTONE, pinkish white grading to pinkish gray, to reddish brown, to grayish brown, parallel laminae, lenticular bedding, flaser bedding, wavy bedding; silicified at Section 1-137, where it is also black; Mn-filled fracture at Section 1-45, calcite vein at Section 1-128.
Interbedded with CHERT at Section 1: 9 dusky red (2.5YR 3/4), capped with limestone (silicified); 84 very dusky red (2.5YR 2.5/2) capped pinkish limestone (silicified); and 105 to 115 dark reddish brown (5YR 3/4), capped with limestone (silicified).

HEAVY MINERAL-MICARB-BEARING, GLASS-SHARD-RICH, NANNO LIMESTONE, very pale brown (10YR 8/3).

SS CC
70% N 20% Gl 7% M 3% HM

CHERT, reddish brown (5YR 4/3).

Site 288 Hole A Core 27 Cored Interval: 932.0-941.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
?							0				
LATE ALBIAN, Eiffellithus turriseiffeli				F	R	f	1	0.5, 1.0	Empty		*
				N	T	p	2				
							Core Catcher				* CC

5YR 8/2

7.5YR 8/2

LITHOLOGIC DESCRIPTION

Water Content 1-124 (10.54)

SECONDARY SILICA-BEARING, FORAM-RICH NANNO LIMESTONE, pinkish white (7.5YR 8/2) to pink (5YR 7/3), laminated, lithified.

SS 1-140
81% N 15% F 3% Silica 1% Opaq

Water Content 2-61 (8.31)

$CaCO_3$ 2-69 (73)

X-ray 2-71
14% Amor 68% Calc 2% Bari
86% Cryst 30% Quar

Limestone becomes more silicified in Section 2 particulary at 82 to 87.

CHERT Section 2: 33 reddish brown (5YR 4/4), capped with limestone; 36 dark red (2.5YR 3/6); 50 yellowish red (5YR 6/6); 55 reddish brown (5YR 4/4), capping limestone; 70 yellowish red (5YR 4/6); 101 brown (7.5YR 5/4); and 122 and 134 yellowish red (5YR 4/6); containing light reddish brown (2.5YR 6/4) limestone lenses.

CHERT, red (2.5YR 4/4.

NANNO-LIMESTONE, white (2.5Y 8/2).

SS CC
96% N 2% Gl 1% Z 1% Opaq

Site 288 Hole A Core 28 Cored Interval: 951.0-961.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
LATE ALBIAN, Eiffellithus turriseiffeli							0		Empty		
				N		-	1	0.5, 1.0			*
				F	R	p					

5Y 7/1
↓
10Y 7/1

5YR 7/2

N6-N7

LITHOLOGIC DESCRIPTION

Water Content 1-39 (13.92)

LIMESTONE, light gray, medium light gray and pinkish gray (only at Section 1-90 to 100); lithified, laminated, silicified immediately below chert horizons. Black laminae at Section 1-78 to 82.

FELDSPAR-HEAVY MINERAL-BEARING, OPAQUE-RICH, GLASS-SHARD NANNO LIMESTONE, black, lamina.

SS 1-80
45% N 15% Opaq 3% Fsp
32% Gl 5% HM

Water Content 1-106 (6.83)

$CaCO_3$ 1-125 (37)

X-ray 1-127
13% Amor 49% Calc 23% Cris 2% Bari
87% Cryst 21% Quar 5% Trid

Interbedded with CHERT, Section 1: 18 reddish brown (2.5YR 4/4) capping silicified limestone; 32 dark red (2.5YR 3/6); 35 to 37 reddish brown (5YR 4/3), capping silicified limestone; 82 to 90 dark red (2.5YR 3/6) with black (N1) bands, are one white (N9) lens; 110 reddish brown (5YR 4/3); 130 dark brown (7.5YR 4/2); 138 brown (7.5YR 5/2) to dark brown (7.5YR 3/2) with green flecks; and 145 dark brown.

Explanatory notes in Chapter 2

Site 288 Hole A Core 29 Cored Interval: 970.0-979.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
							0					
ALBIAN				F	R	f	1	0.5, 1.0	Empty		*	N8; N4
?				N	R	p	Core Catcher				* CC	

LIMESTONE, very light gray, to medium dark gray, thinly laminated, lenticular bedded. (N8)

CaCO$_3$ 1-114 (30)

X-ray 1-116
15% Amor 32% Calc 28% Cris 1% Clin
86% Cryst 38% Quar 1% Plag

FELDSPAR, GLAUCONITE, SPICULE-BEARING, FORAM-RICH NANNO LIMESTONE, thin section at Section 1-138 to 140: 73% N, 15% F, 3% G, 3% S, 3% Fsp, 2% Opaq, 1% R (N4)

Interbedded with CHERT, Section 1: 47 to 50 dark grayish brown (10YR 4/2), laminated (scalloped), lenticular-bedded; and 87 to 88 dark grayish brown (10YR 4/2), scalloped.

LIMESTONE, greenish gray (5GY 6/1).

SS CC
98% Carb U. 1% Opaq 1% Nod

Site 288 Hole A Core 30 Cored Interval: 979.5-988.5 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
							0					
? / APTIAN				F	C	p	1	0.5, 1.0	Empty		*	N7; 5G 7/1; N4

LIMESTONE, light gray to medium dark gray, laminated, lenticular, often silicified. (N7, 5G 7/1)

Water Content 1-92 (8.20)

CaCO$_3$ 1-102 (28)

X-ray 1-103
27% Amor 42% Quar 2% Plag 1% Clin
73% Cryst 10% Cris 1% Mica
38% Calc 4% K-spar 2% Mont

ZEOLITE-OPAQUE-BEARING HEAVY MINERAL-GLASS SHARD RICH NANNO LIMESTONE, dark gray. (N4)

SS 1-129
45% N 15% HM 5% Z
25% Gl 10% Opaq

CHERT, Section 1: 147 to 150 dark gray, with silicified limestone cap.

Site 288 Hole B Core 1 Cored Interval: 147.0-150.0 m

AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
							0					
MIDDLE MIOCENE	N12	Discoaster exilis					1	0.5, 1.0		4, 2	*	N9
							2		Unopened			
				F / N	A / C	e / f	Core Catcher					Core catcher missing.

MICARB-FORAM-BEARING, NANNO OOZE, white; stiff. (N9)

SS 1-111
79% N 10% F 10% M 1% Z

Pumice fragment at Section 1-111.

Core catcher missing.

Site 288 Hole C Core 1 Cored Interval: 112.5-117.0 m

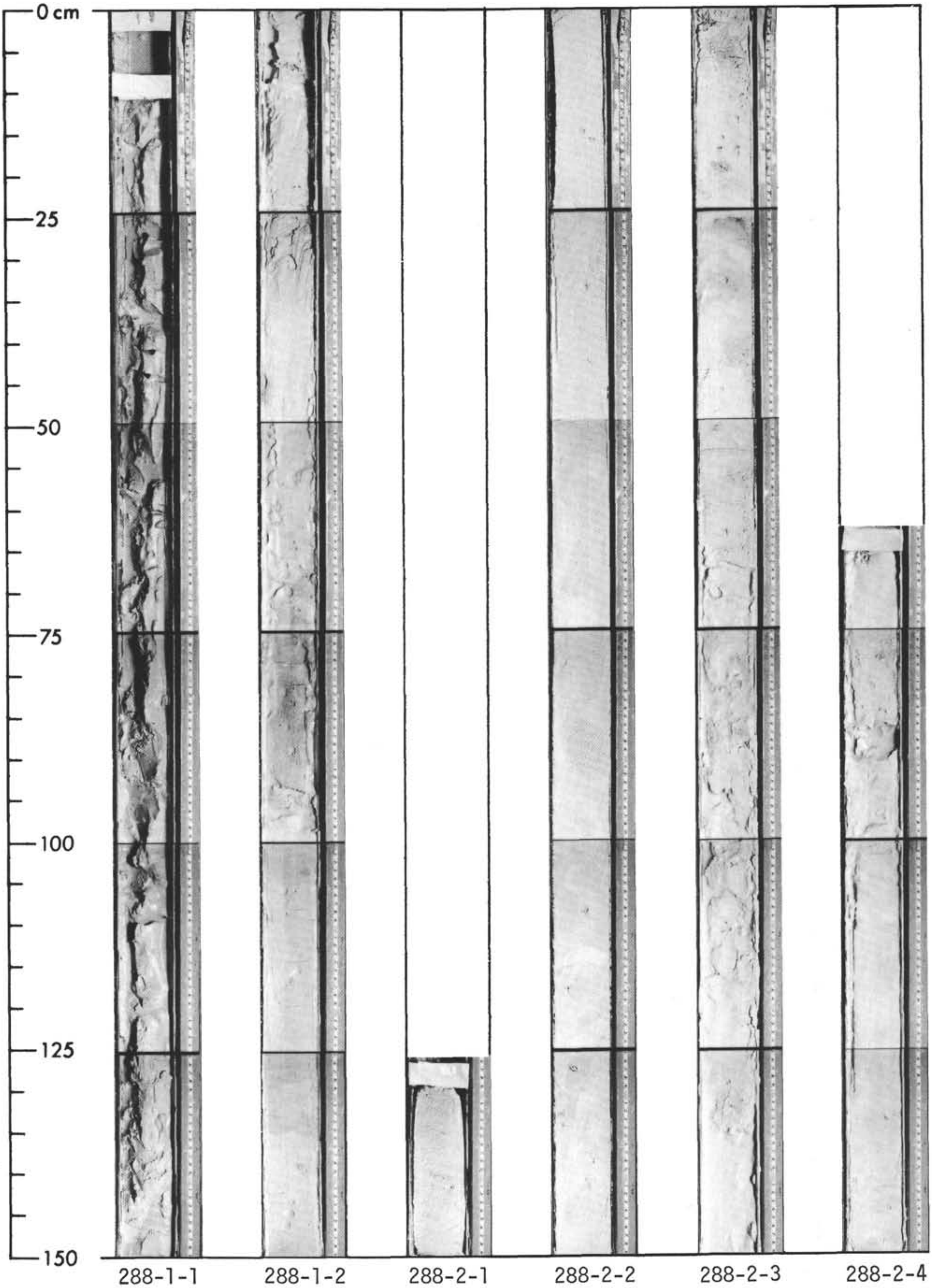
AGE	FORAMS	NANNOS	RADS	FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
							0					
LATE PLIOCENE	N21	Discoaster hamatus					1	0.5, 1.0		2	*	N8
							2		Unopened			N8
							3					
				F / N	A / C	g / p	Core Catcher					

GLASS-SHARD-BEARING, FORAM-MICARB-RICH NANNO OOZE, light gray; soft to stiff. (N8)

SS 1-33
57% N 15% M 1% Z
15% F 2% Gl 1% S

NANNO OOZE, light gray; soft to stiff. (N8)

Explanatory notes in Chapter 2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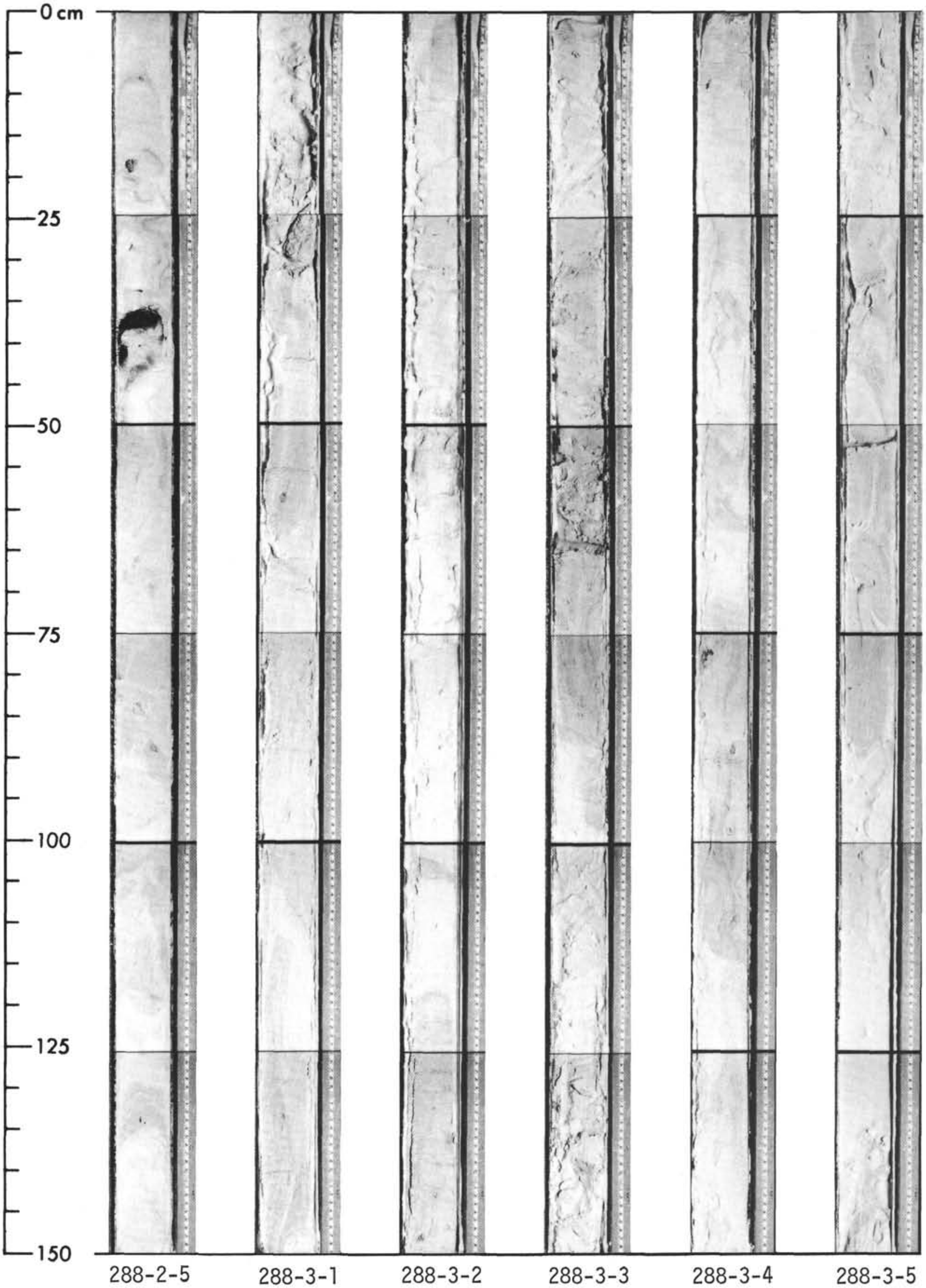
288-2-3
288-2-4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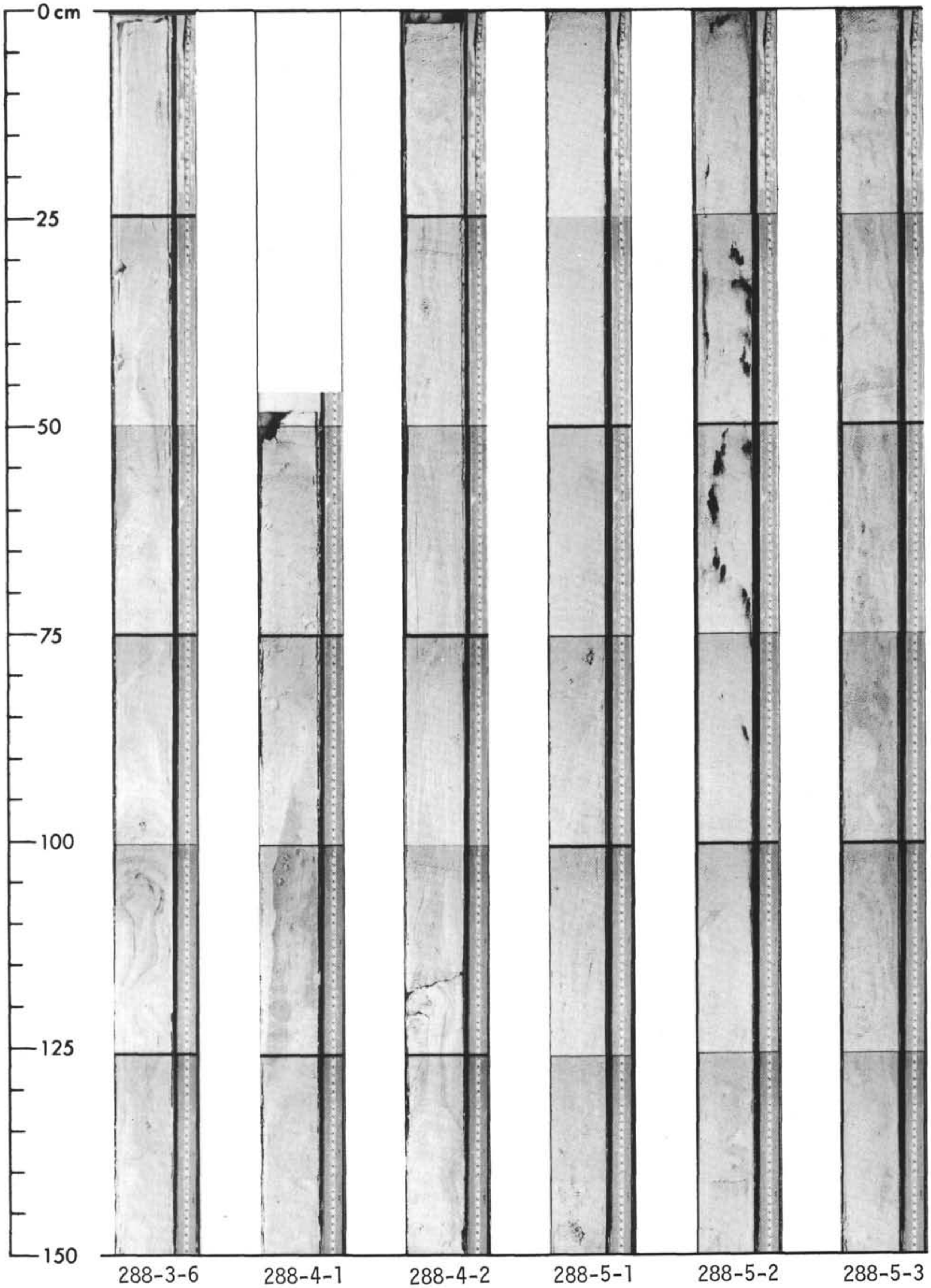
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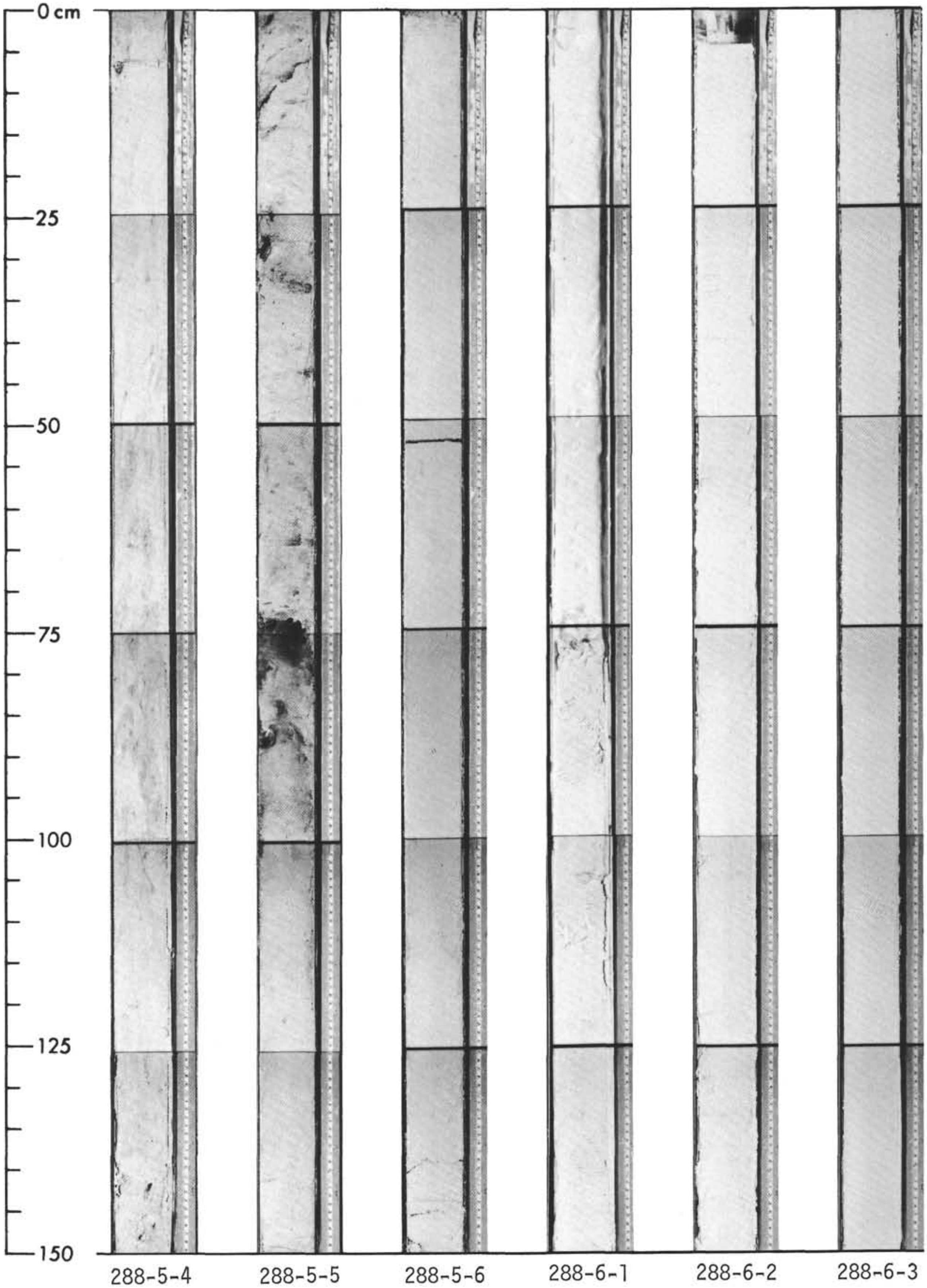
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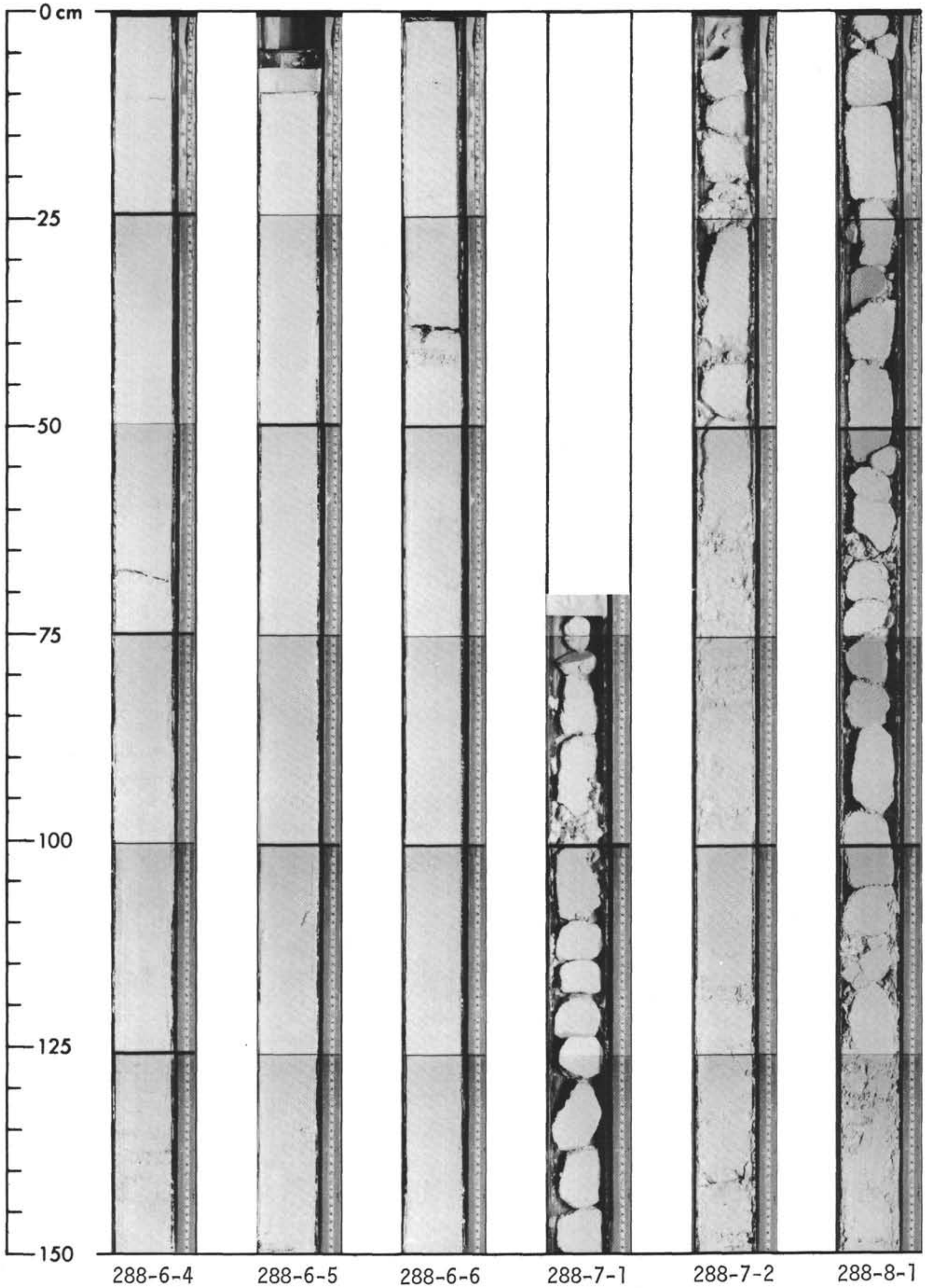
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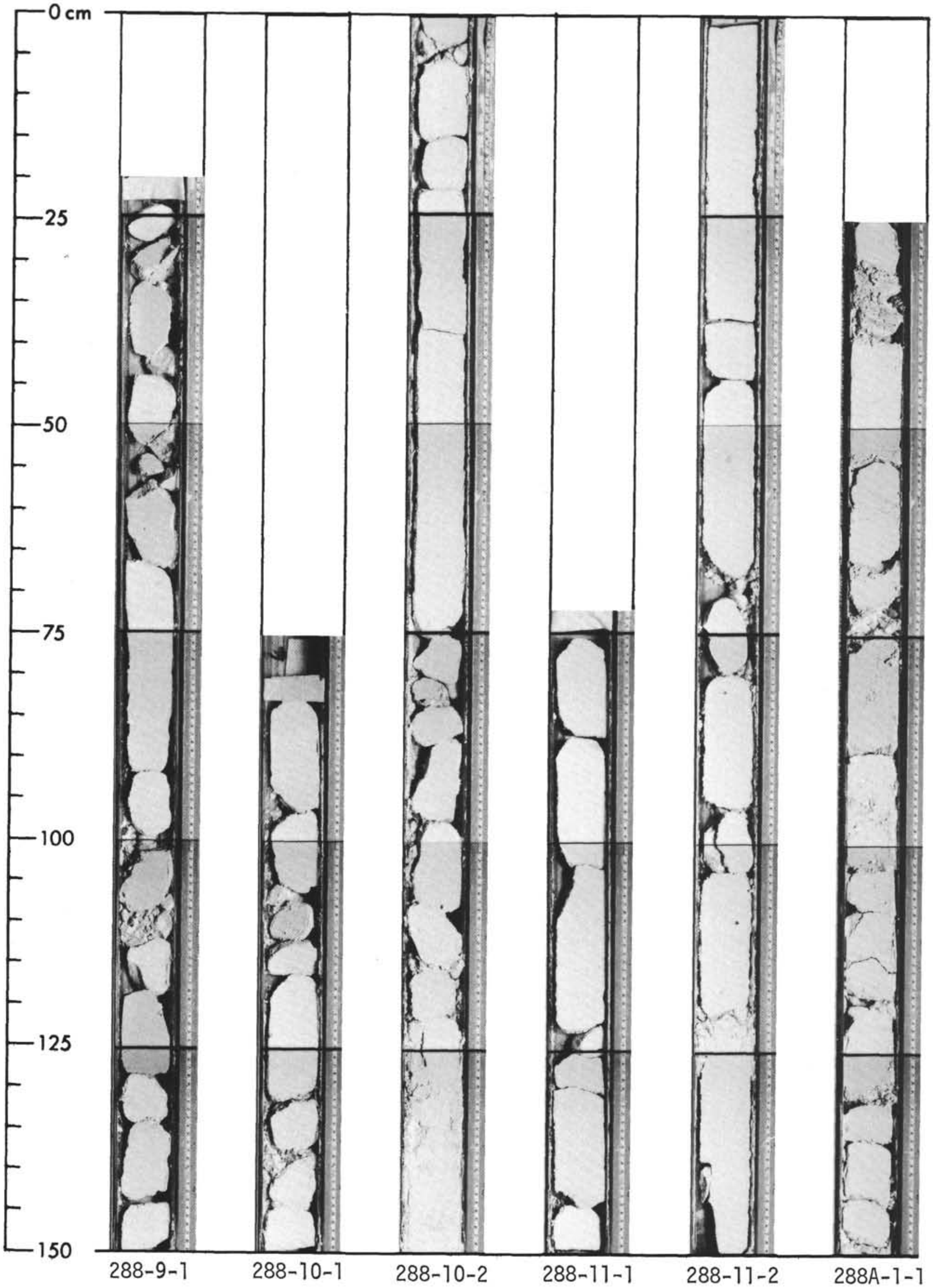
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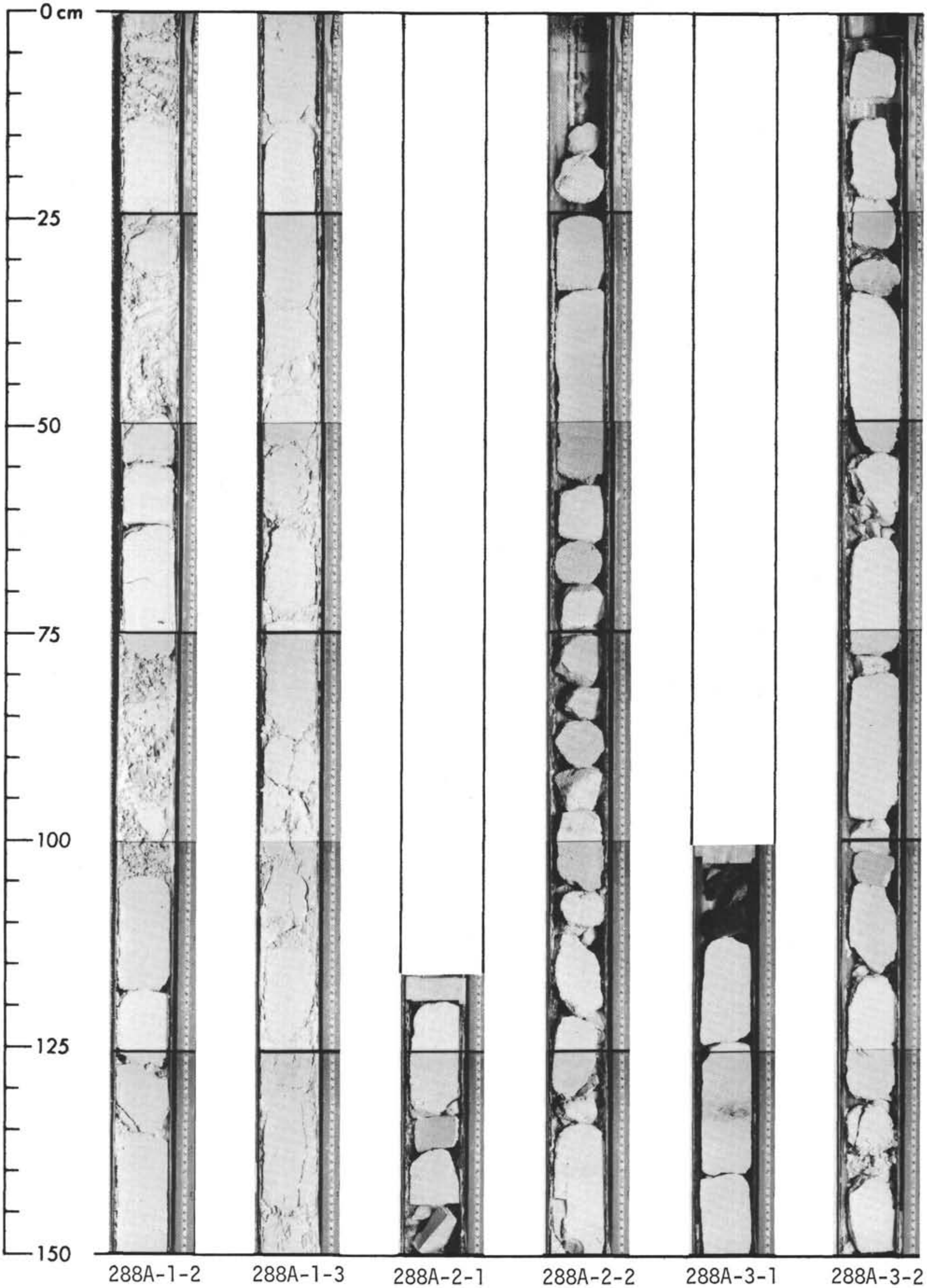
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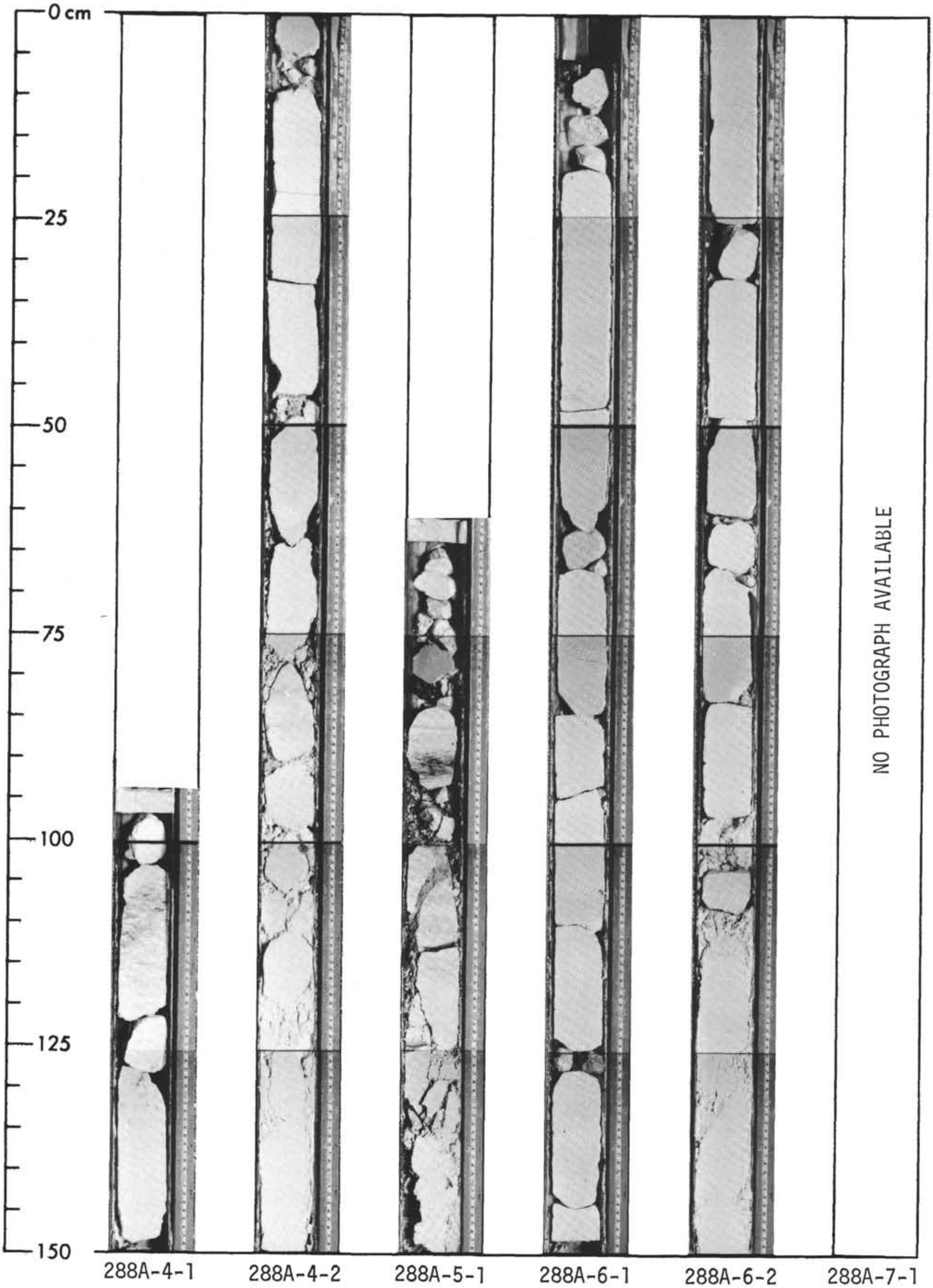
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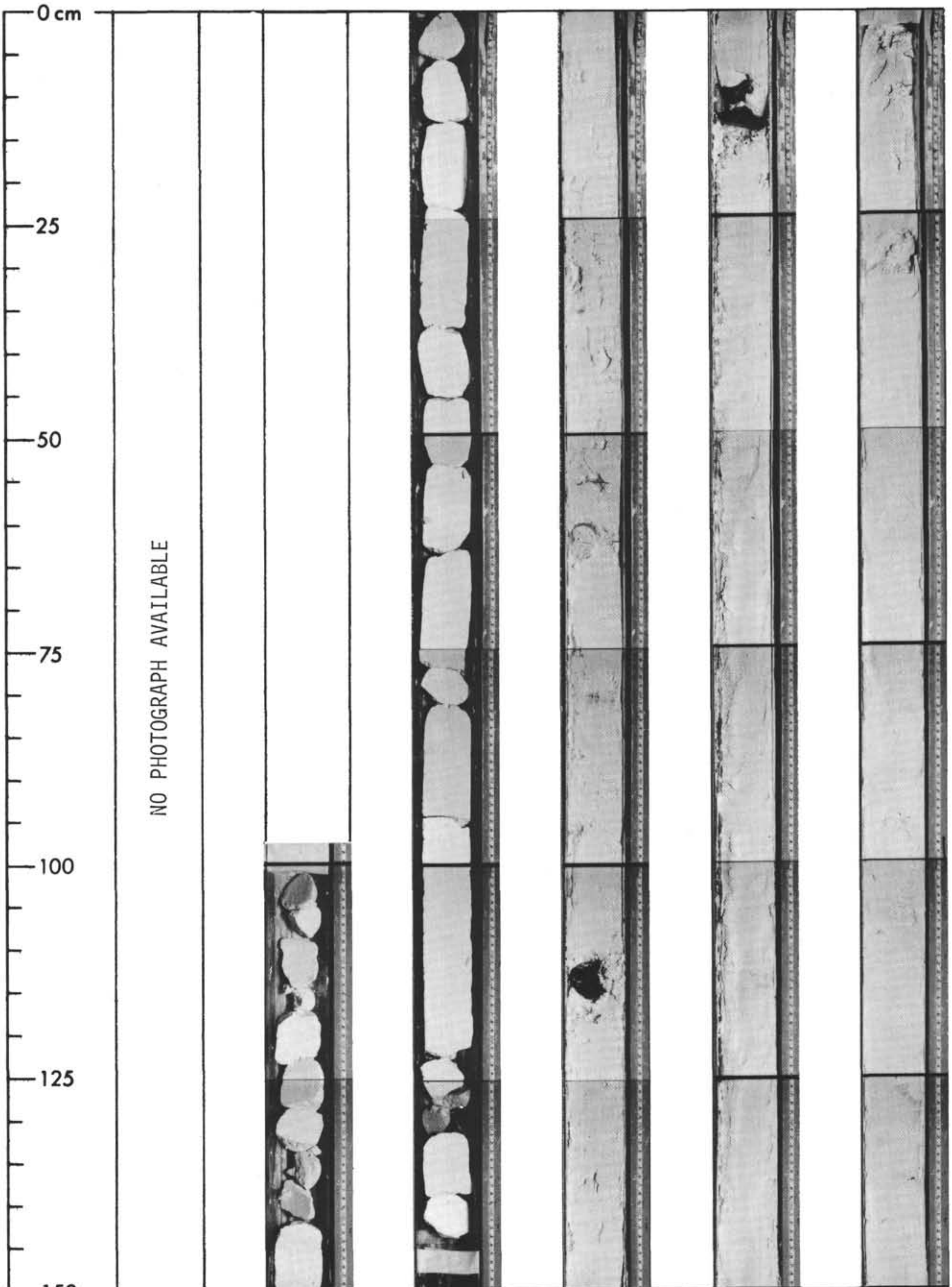

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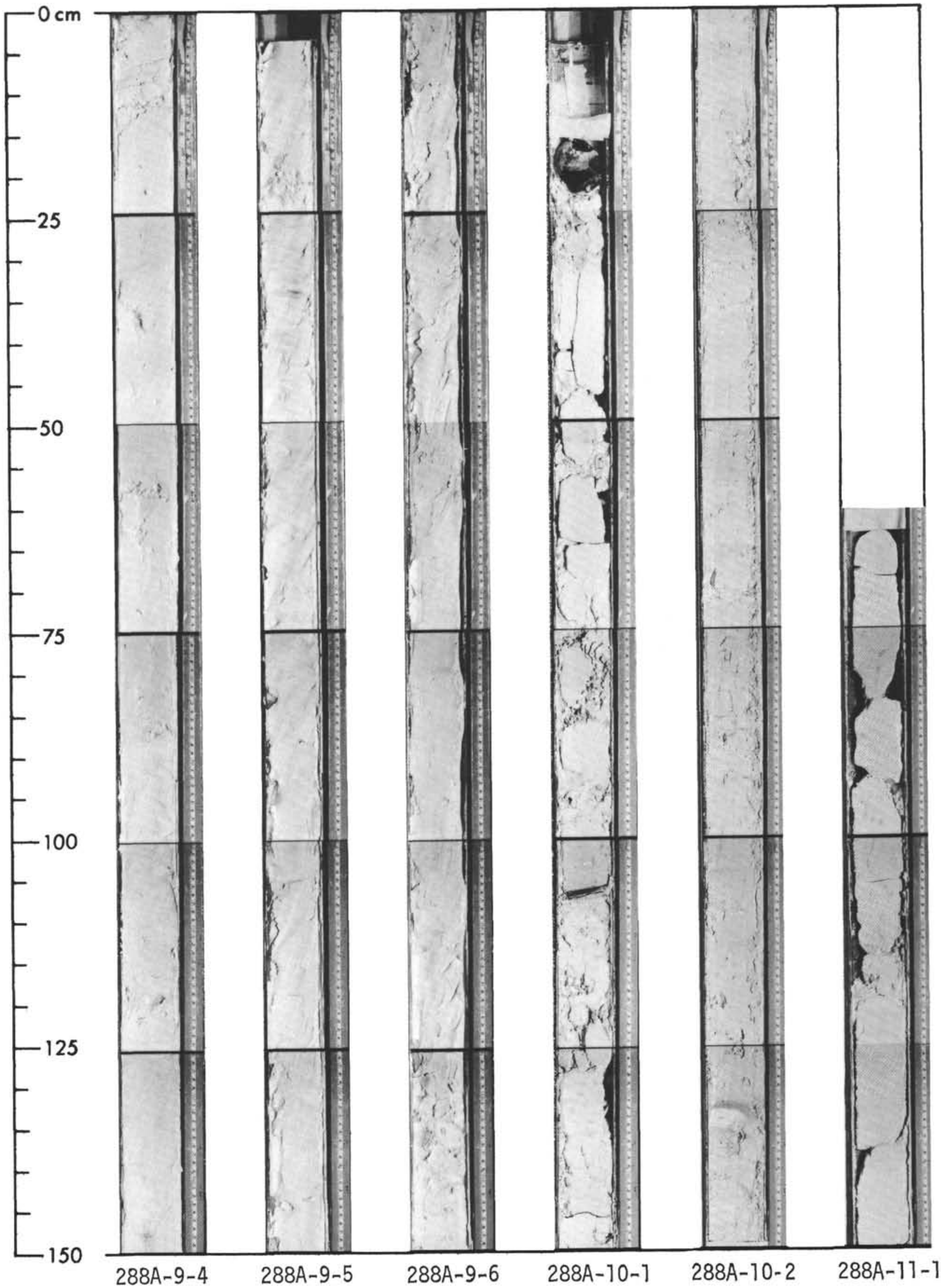
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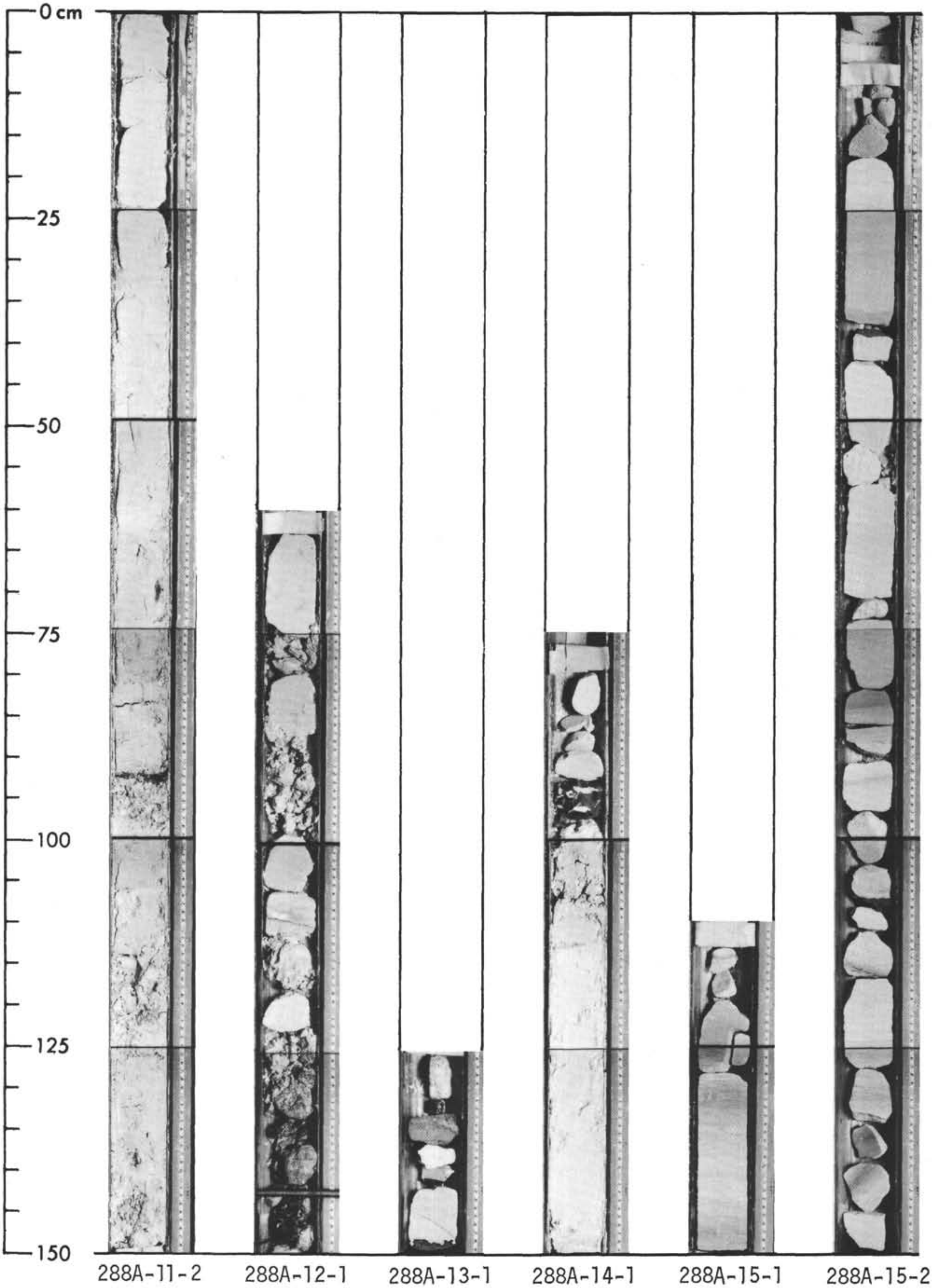
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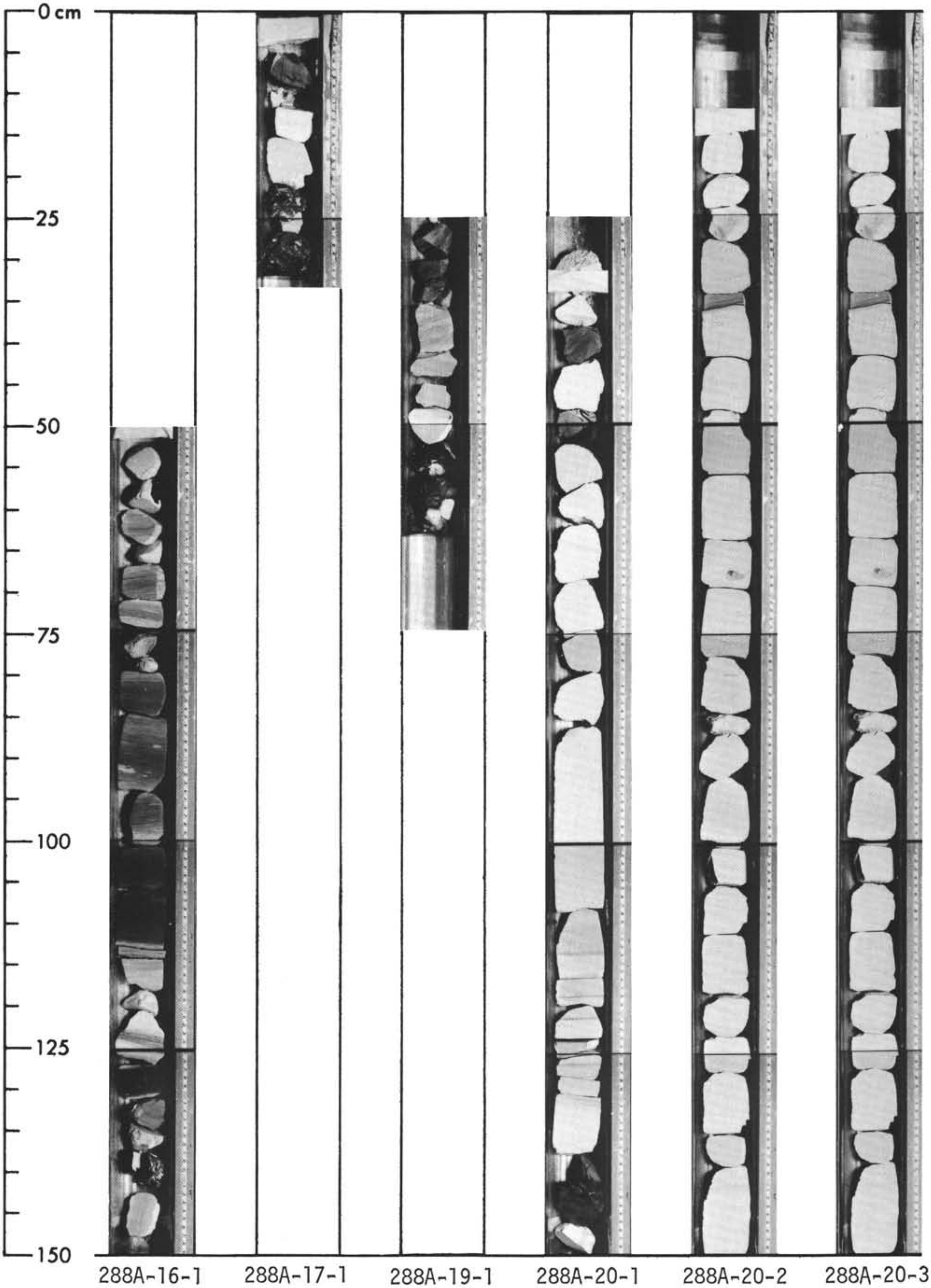
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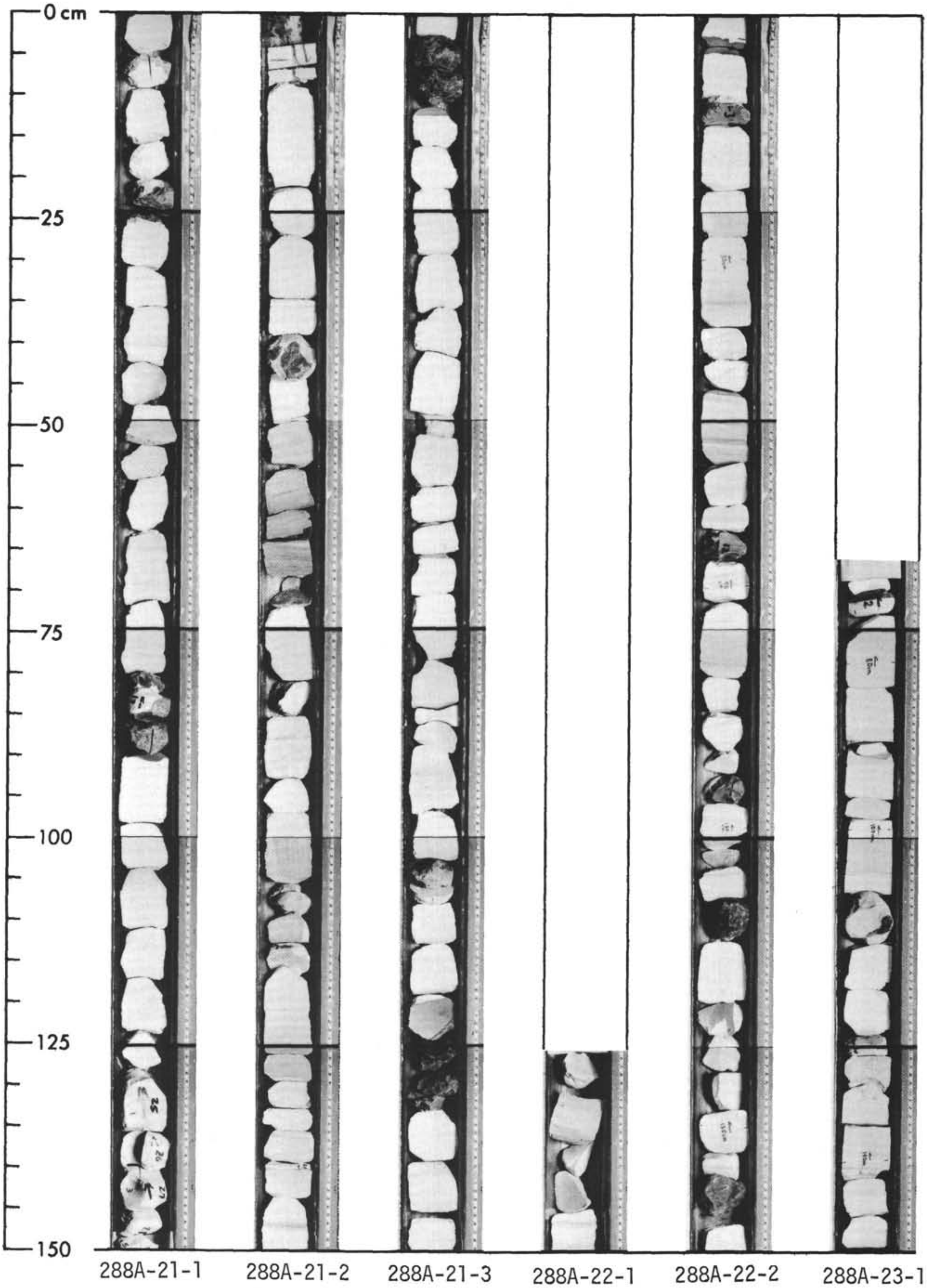
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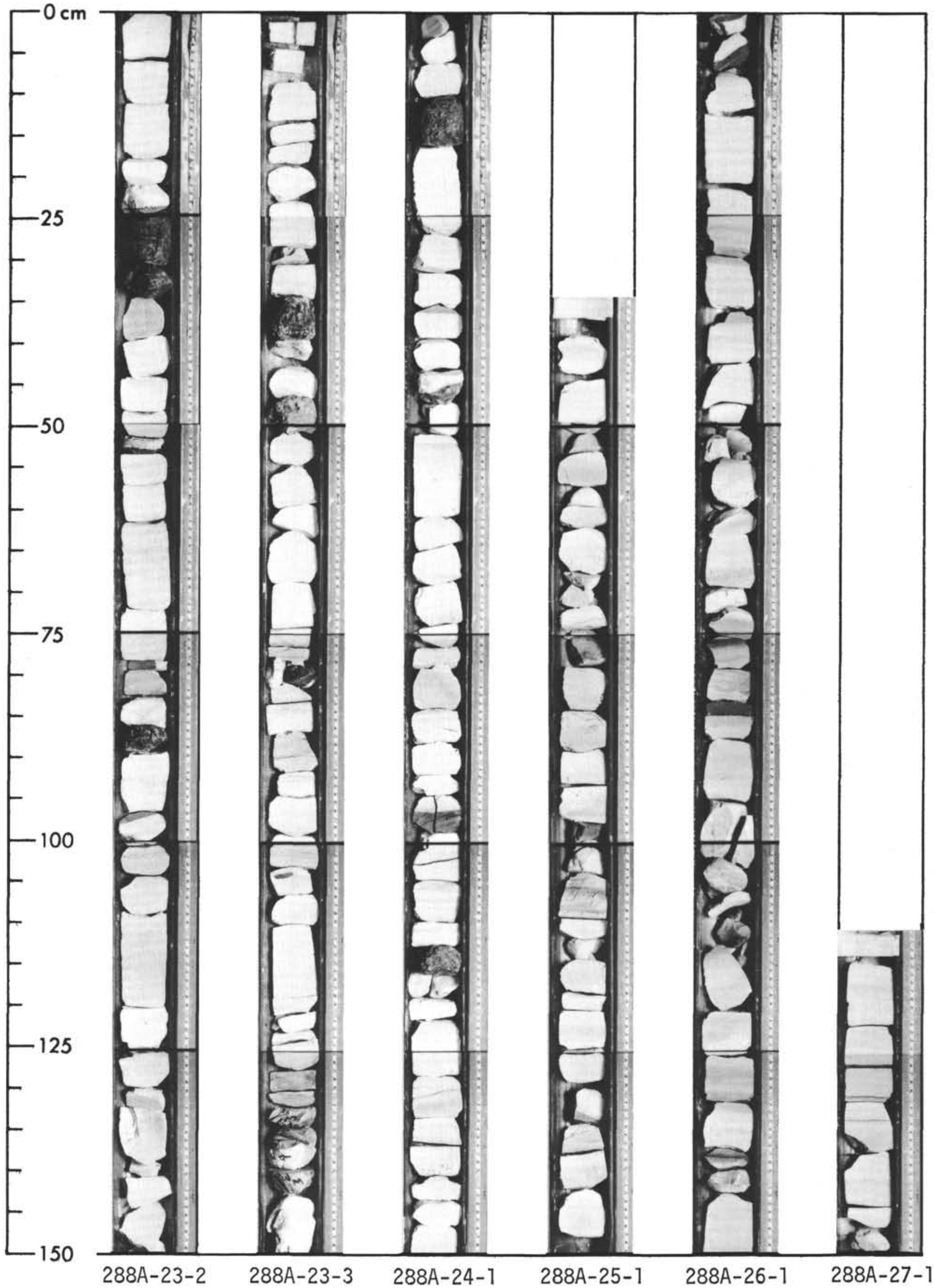
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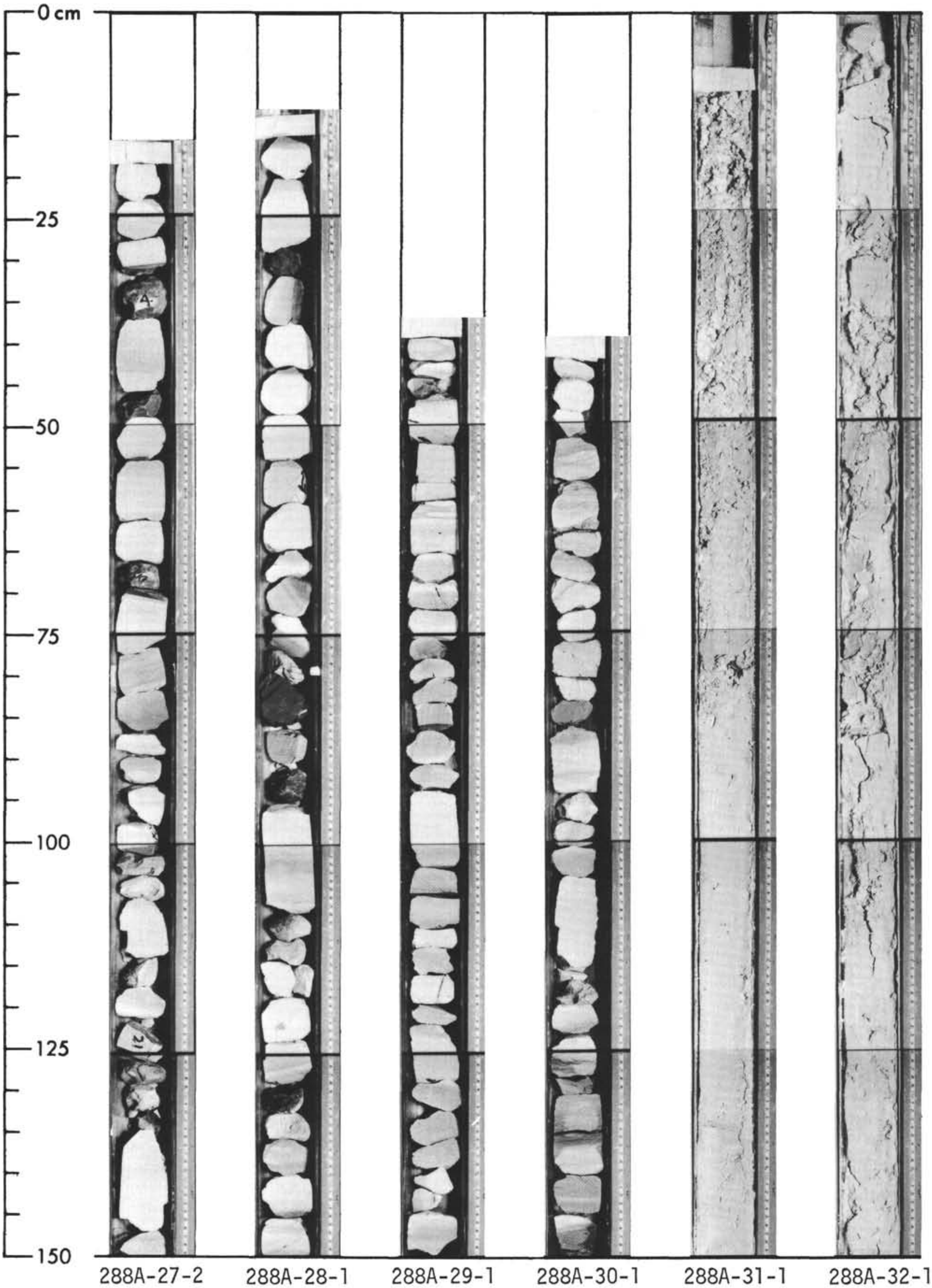
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