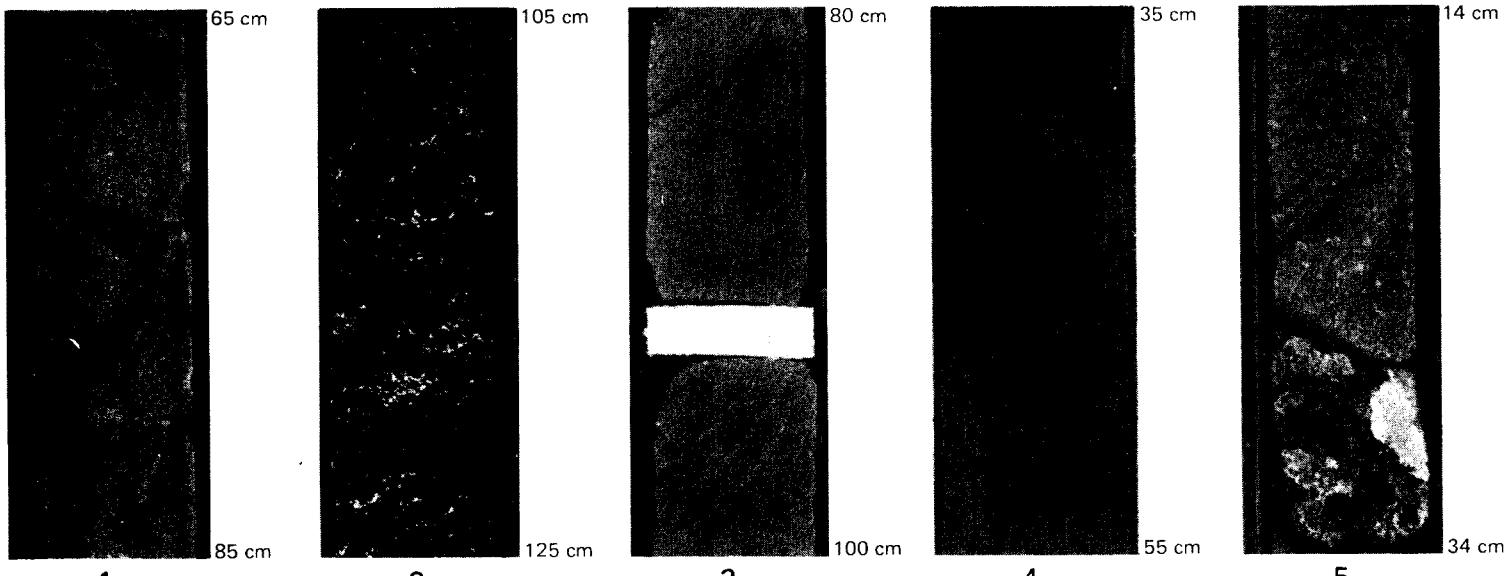
INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 54

EAST PACIFIC RISE AND GALAPAGOS SPREADING CENTER



Prepared for the
NATIONAL SCIENCE FOUNDATION
National Ocean Sediment Coring Program
Under Contract C-482
By the
UNIVERSITY OF CALIFORNIA
Scripps Institution of Oceanography
Prime Contractor for the Project

Captions to Cover Photos

1. 422-7-1, 65-85 cm:
   Fine- to medium-grained aphyric basalt.

2. 424-2-1, 105-125 cm:
   Dark gray to greenish black manganese grains in a deformed matrix composed of gray-green to green foraminifer-nannofossil ooze and hydrothermal deposits.

3. 425-8-1, 80-100 cm:
   Medium- to coarse-grained, weathered basalt containing occasional phenocrysts of plagioclase.

4. 427-7-2, 35-55 cm:
   Olive gray to greenish black siliceous nannofossil ooze, marly foraminifer-nannofossil ooze and pyrite-rich diatom ooze.

5. 428A-5-2, 14-34 cm:
   Coarse-grained, weathered basalt containing glomerocrysts of plagioclase and clinopyroxene.

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Dear Colleague:

This document has been printed and distributed by the Deep Sea Drilling Project for the purpose of sample selection by interested earth scientists. Sample requests are honored after one year following completion of the cruise on which the samples were collected. It is an interim and informal document consisting of site data and sedimentologic and paleontologic data and interpretations as known six (6) months post-cruise. These data, while adequate for most sample selection needs, are subject to slight revision by the time of issue of the corresponding volume of the Initial Reports of the Deep Sea Drilling Project.

The information contained herein is preliminary and privileged, consequently this document is not to be cited or used as the basis of other publications. Data cited or used in a manuscript will be considered a breach of professional ethics.

Thank you for your interest in the Deep Sea Drilling Project.

Sincerely,

David G. Moore
Chief Scientist
Deep Sea Drilling Project

INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 54

29 April — 18 June 1977

A Project Planned by and Carried Out With the Advice of the
JOINT OCEANOGRAPHIC INSTITUTIONS FOR DEEP EARTH SAMPLING (JOIDES)

MEMBER ORGANIZATIONS

Institute of Geophysics, University of Hawaii
Lamont-Doherty Geological Observatory, Columbia University
School of Oceanography, Oregon State University
Graduate School of Oceanography, University of Rhode Island
Rosenstiel School of Marine and Atmospheric Sciences, University of Miami
Scripps Institution of Oceanography, University of California
Department of Oceanography, Texas A & M University
University of Washington
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Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover
Ocean Research Institute, University of Tokyo
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INITIAL CORE DESCRIPTIONS

LEG 54

INTRODUCTION

The 54th cruise of the *Glomar Challenger* began on April 29, 1977, in Panama, and ended on June 18 in San Pedro, California, after completing scheduled operations on the East Pacific Rise and also an unscheduled geothermal drilling program on the southern flank of the Galapagos Spreading Center.

The original objective of the East Pacific Rise program was to establish a "type-section" for fast-spreading young crust by means of multiple re-entry drilling. This quickly proved untenable, and we adopted a secondary set of objectives and strategy. The revised objectives pertained to: 1) temporal variations and timing of eruptive events at the Rise and their relation to axial magma reservoirs; 2) chemical, magnetic, and physical nature of the transition from Rise fabric to transverse volcanic and structural features; 3) cause of apparent greater extent of basalt fractionation observed in dredged rocks compared to basalts of the Mid-Atlantic Ridge; 4) determination of magnetization polarities of drilled rocks and comparison with results of drilling in the Atlantic; and 5) relations of physical properties to degrees of hydrothermal alteration, weathering, crystallinity, and fracturing.

The purposes of the Galapagos drilling included: 1) determination of whether a planned two-leg crustal drilling program in the area was feasible; 2) study of the Galapagos "Mounds Hydrothermal Field"; and 3) Galapagos equivalents of objectives 1, 3 and 5 listed above.

During Leg 54 we occupied 11 sites, attempted drilling at 18 holes, and successfully penetrated basement at 13 holes, in a total of about 20 operational days (17 on-site days). We recovered about 528 meters of sediment and 66 meters of igneous rock at efficiency rates of about 70% and 21%, respectively. A coring summary is given in Table 1. Notable achievements include most sites occupied and largest number of basement holes ever drilled, youngest basement ever drilled, and thinnest sediment cover used for basement spud-in. On the other side of the coin, our deepest penetration into basement (54 m) and average bit life were less than those achieved on any other crustal drilling leg and average hole conditions (i. e., drillability) were the worst ever encountered. It appears that young Pacific crust is intensely fractured and penetration is usually limited to the depth at which frictional binding overcomes rotation of the drill stem or results in the destruction of the bit: a depth of about 30 meters for our drill holes. Even in the few holes where massive basalts or dolerite predominate, bit life limits maximum penetration to about 60 to 70 meters.

East Pacific Rise

In order to achieve our objectives we established an east-west transect of 7 single-bit sites on the western flank of the East Pacific Rise (Figure 1). From east to west the sites and probable basement age in millions of years are 423 (1.6), 422 (1.7), 428 (2.0), 419 (2.6), 421 (3.4), 420 (3.4+), and 429 (4.6). A single-bit hole also was drilled in the deepest known part of the Siqueiros Fracture Zone (Site 427, Figure 1). We continuously cored sediments at all sites except 427 and 429 and recovered basement rocks at all sites except 419. Although located along the transect, Sites 422 and 428 also fall on the transition zone between normal Rise spreading fabric and a transverse structure termed OCP Ridge (after JOIDES'S Ocean Crust Panel), the eastward extrapolation of which roughly coincides with a small transform fault at 9°05'N. In addition to composing part of the transect, Sites 423, 422, 428, 421 and 420 lie close to or on a multichannel seismic-reflection profile collected by Lamont-Doherty Geological Observatory.

The upper 20 meters of sediment of all transect holes, with the possible exception of 429, show cyclic alternations of thin beds of brown calcareous clay with thicker beds of marly foraminiferal-nannofossil ooze and/or nannofossil ooze. These alterations indicate that the sea floor at the Rise sites may have been at or near the lysocline for perhaps 1 million years. The lower parts of the sediment columns consist predominantely of foraminiferal-nannofossil ooze and nannofossil ooze with common but less-extensive occurrences of siliceous nannofossil ooze. Total accumulation rates average about 23 meters per million years, but the variability is large. Also, the site locations tend to be on thicker parts of local sediment ponds or blankets, biasing this rate towards high values. Sediments at Site 427 show a cyclic alternation of 5 sediment types, with pyrite-rich diatom-nannofossil ooze observed near the base of the sediment section. The total accumulation rate here (about 44 m per million years) is anomalously high, but accumulation was relatively uniform due to a ponding effect in the trough.

The igneous rocks recovered at the Rise sites fall within two general categories: fragmented basalts found at all sites on the normal spreading fabric (i. e., Sites 423, base of 422, 421, 420 and 429) and massive basalts or dolerites found primarily in localities characterized by acoustically flat and highly reflective basement. The former rocks are usually angular and

TABLE 1. Leg 54 Coring Summary

Hole	Date (1977)	Latitude	Longitude	Water Depth	Penetration	Number of Cores	Meters Cored	Meters Recovered	% Recovery	Basement Penetration	Basement Recovery
419	May 8-9	08° 55.96'N	105° 41.17'W	3274	35.0	5	35.0	21.64	62	none	none
419A	May 9	08° 55.47'N	105° 41.22'W	3274	46.0	1	8.0	4.74	59	none	none
420	May 10-11	09° 00.10'N	106° 06.77'W	3381	147.0	17	147.0	95.07	65	28.7	1.22
420A	May 11-12	09° 00.50'N	106° 06.32'W	3382	63.0	1	6.0	6.05	100	none	none
421	May 12-13	09° 01.41'N	106° 03.68'W	3339	114.0	4	38.0	11.22	30	19.18	1.63
422	May 14-15	09° 10.59'N	105° 16.27'W	3247	73.0	10	73.0	46.97	64	23.5	9.56
423	May 15-16	09° 08.81'N	105° 06.57'W	3161	53.5	8	53.5	27.98	52	15.5	0.87
424	May 23-24	00° 35.63'N	86° 07.82'W	2685	76.0	8	76.0	36.45	48	38.5	8.45
424A	May 24	00° 35.33'N	86° 07.81'W	2708	34.0	3	34.0	13.13	39	45.01	8.45
424B	May 25	00° 35.82'N	86° 07.82'W	2705	46.5	6	46.5	29.30	63	14.5	2.35
424C	May 25	00° 35.93'N	86° 07.82'W	2699	34.5	3	16.5	7.81	47	3.0	0.48
425	May 26-27	01° 23.68'N	86° 04.22'W	2850	110.0	9	81.5	43.42	53	28.5	5.60
426	June 3	08° 47.28'N	104° 15.27'W	—	0.0	0	0.0	0.00	0	0	0
427	June 4-5	08° 06.79'N	104° 36.35'W	3834	174.5	11	98.5	57.26	58	28.5	12.51
428	June 6-7	09° 02.77'N	105° 26.14'W	3295	76.5	6	54.5	36.34	67	15.5	2.14
428A	June 7-8	09° 02.77'N	105° 26.14'W	3286	115.0	7	52.5	16.37	31	52.50	12.60
429	June 9	09° 02.01'N	106° 46.35'W	3406	31.0	1	5.0	4.67	93	none	none
429A	June 9-10	09° 02.01'N	106° 45.87'W	3426	52.5	3	21.5	2.95	14	21.5	2.95
	Average recovery in basement = 20.6%				Totals	103	847.0	461.37	54	334.39	68.81

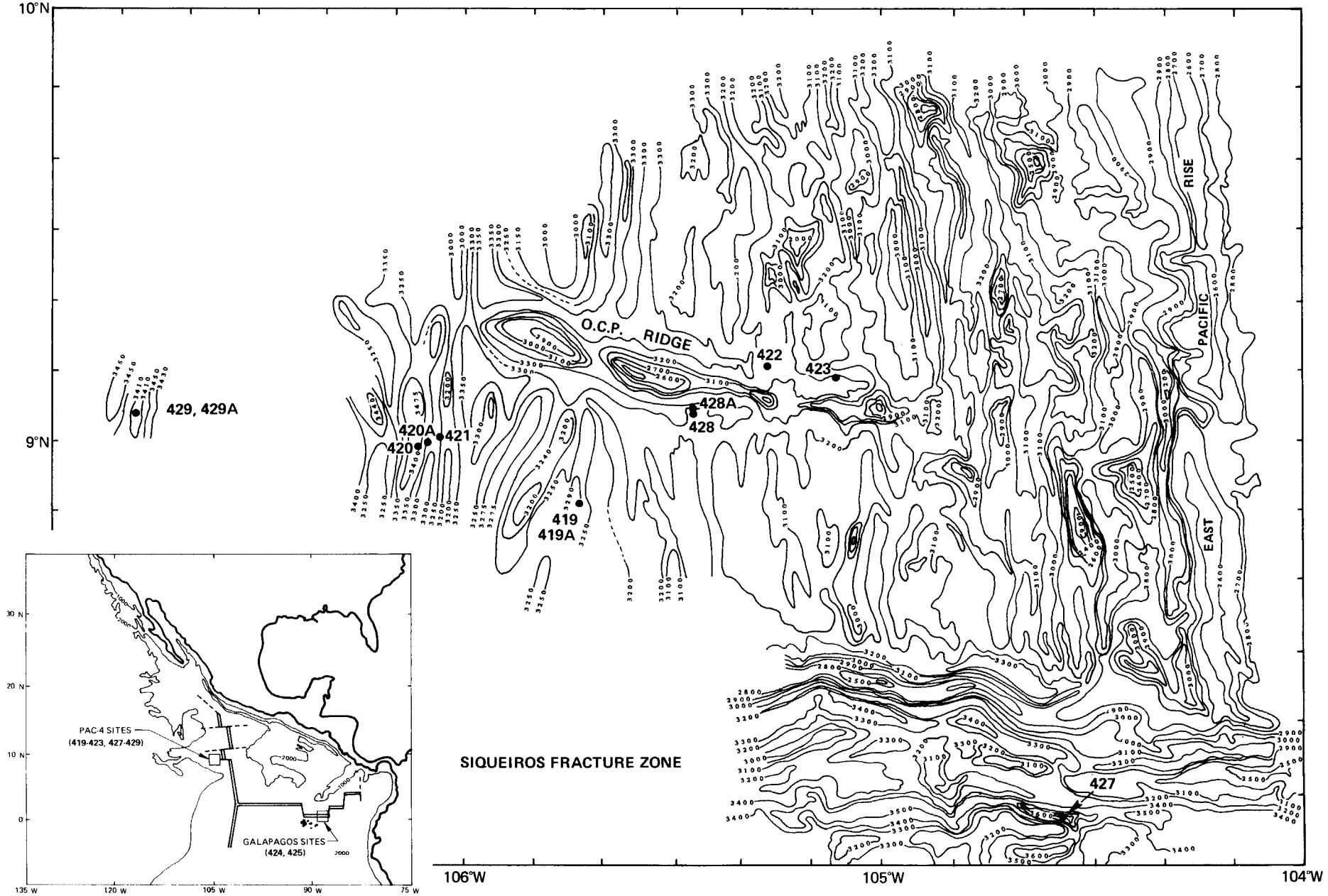

Figure 1. Leg 54 drill sites on the west flank of the East Pacific Rise. Inset: location of Leg 54 principal target areas in the eastern Pacific.

abraded fragments of brittle basaltic cooling units, which probably represent pieces of well-jointed thin flows and talus. The fragmented nature of these rocks apparently typifies the regional mechanical state of the normal fabric, except at the ridge crest, because mean laboratory velocities of the drilled rocks (about 5.5 km/sec) are as much as a 2 km/sec greater than refraction velocities of the uppermost crust in the area. At the ridge crest the refraction velocities approach those of the measured samples, indicating that fracturing and disruption of jointing patterns occur as small blocks are spalled off the edge of the axial block to form the fabric morphology.

Petrographically, most of the fragmented rocks are fine-grained to glassy aphyric plagioclase-pyroxene rocks with occasional microphenocrysts of plagioclase. Olivine is absent in the fabric basalts of all sites except 420, 422, and the upper part of 429. Due to their mechanical state, many of the "free" surfaces of the basalt fragments are weathered, with smectites, iron oxides, and calcite replacing glassy matrix and groundmass and in-filling veins and vesicles. The cores of the fragments are relatively fresh, even at the older sites (e. g., 429). On the basis of preliminary XRF work on the fresher fabric basalts, it appears that except for Site 429 these rocks are moderately to extensively fractionated tholeiites (0.16 - 0.45% K_2O, 1.88 - 2.54% TiO_2, and up to 14% Fe calculated as Fe_2O_3). They are fully comparable to the evolved tholeiites found in numerous dredge hauls from the Siqueiros region and, together with the dredged rocks, form a fairly uniform group of eruptive products in both space and time. We take this to mean that individual eruptions originate from the cooler upper levels of an axial magma reservoir thought to underlie the Rise, and that the magmas reside in the reservoir long enough for rather extensive fractionation to occur. This residence time may be significantly greater than that which occurs in the reservoirs thought to underlie the Mid-Atlantic Ridge, as Ridge lavas are usually less fractionated than Leg 54 basalts. The cause of this may be related to the smaller sizes of Ridge magma reservoirs, which results in a more rapid overturn of magmas as new molten material arrives from greater depths. As near as can be determined now, the parental magmas for the fabric basalts show only small differences in the extent of melting, but some source heterogeneity is indicated with respect to TiO_2, Zr, and P_2O_5. The Site 429 basalts are somewhat anomalous with respect to the other fragmented basalts. They are relatively depleted in K_2O, TiO_2, P_2O_5, and Zr (0.05 - 0.08%, 1.15 - 1.16%, and 0.11 - 0.15%, 80 ppm, respectively) and more closely resemble the Site 425 tholeiites from north of the Galapagos Spreading Center.

In contrast to some of the Atlantic drilling results, magnetic polarities of the East Pacific Rise fabric basalts usually agree with the sign of the observed sea-level magnetic anomalies. The only exception occurs in the upper part of Hole 429, which probably contains a slightly younger flow unit erupted at the time of the adjacent Nunivat event.

The massive basalts or dolerites apparently form in the few places where flows have been ponded in restricted structural depressions or where sills are injected into sediments or fabric. Site 427 rocks represent a single ponded flow showing horizontal jointing and textures grading from intersertal at the chill margins to intergranular and subophitic at the interior. Chemically this ponded flow is enriched in Fe_2O_3, TiO_2, and P_2O_5 and depleted in K_2O relative to the fabric basalts.

Hole 422 contains a doleritic rock unit separated from two more doleritic units by several meters of sediment of uncertain provenance. These olivine-bearing doleritic units may be either sills or ponded flows. The lower unit overlies fractured basalt of the normal fabric variety. Hole 428A contains a single doleritic unit underlying cryptocrystalline to fine-grained basalt. Again, the dolerite could represent either a single flow or a sill. The massive basalts at 422 and probably 428 are chemically different from the fabric basalts. They have higher MgO, much lower K_2O and TiO_2, and lower P_2O_5. They differ from the massive basalts at 427 in having significantly lower Fe_2O_3, TiO_2 and P_2O_5. We believe these rocks are related to OCP Ridge and may reflect lower degrees of partial melting and perhaps different source depths than the fabric tholeiites. The Site 422 magnetic polarities in the doleritic units do not agree with the sign of the observed magnetic anomaly (Olduvai normal event), but the site is close to a transition boundary and may lie upon interlayered Olduvai and Matuyama flows. Basalts of Site 428, within the Matuyama negative epoch, had polarities that agree with the sea-level magnetic anomaly.

The Galapagos Spreading Center

The strategy of the Galapagos program called for relocating and drilling one or more mound-like features in the Northwest Mound Fields near 0° 30'N, 86° W. These mounds are small bathymetric features, on the same scale as the dimensions of the *Challenger* herself (5-20 m high, 20-50 m wide, 50-500 m long), that tend to form semi-continuous and parallel chains aligned above small basement offsets. In addition to protruding above the sea floor, the mounds are highly reflective and disrupt the acoustic continuity of the regional sediment blanket, which averages 28 to 30 meters thick throughout the mounds field. Earlier work indicated that these mounds were sites of localized hydrothermal phenomena.

A four-hole transect (Figure 2), spanning about 20,000 years, was established across the Northwest Mounds Field. Holes 424 and 424A are on or very close to mounds, whereas Hole 424C is close to but not on a mound. Hole 424B was purposely placed between two mound chains and was meant to provide a type-area stratigraphic section. In addition, Site 425 was

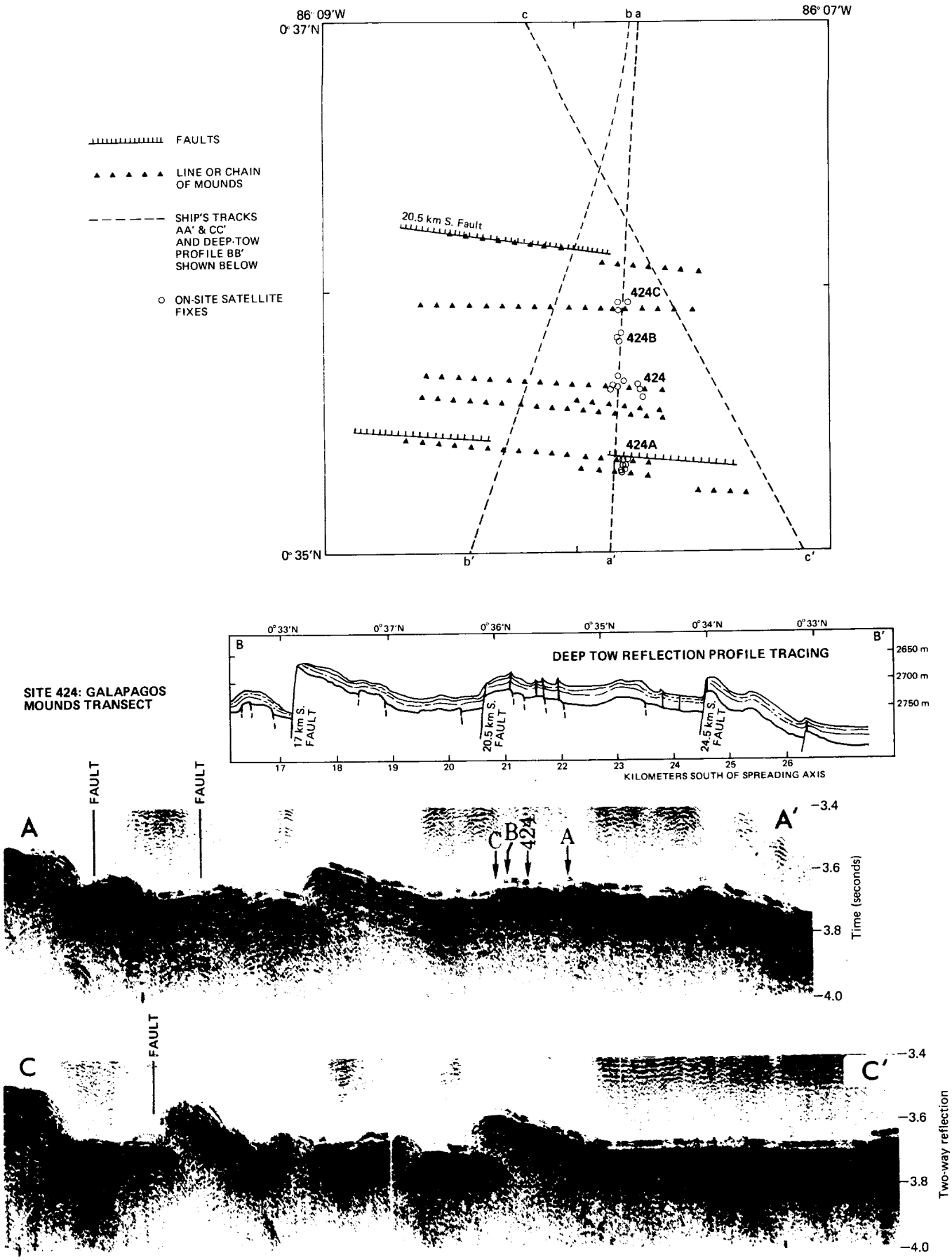

Figure 2. Holes drilled in Northwest Mounds Fields relative to chains of mounds and basement features as revealed by deep-tow and air-gun profiles systems.

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drilled 62 km north of the Galapagos Spreading Center, or about 83 km due north of Site 424, in a locality known to have high heat flow.

The basal sediments at all 4 holes at Site 424 (Figure 3) are foraminiferal-nannofossil ooze showing no evidence of hydrothermal mineralization. The radiolarian age of this unit falls within the *Amphirhopalum ypsilon* zone, and the presence of *Stylotractus universus* in Holes 424 and 424B indicates an age of 0.4 to 1.2 million years for these sediments. Magnetic basement age is 0.60 to 0.62 million years. This unit varies from 14 to 20 meters thick at Holes 424, 424A, and 424B. Holes 424B and 424C also are capped by foraminiferal-nannofossil ooze, which was probably deposited in the last 200,000 years.

Hydrothermal deposits at Site 424 are of two kinds: 1) an intermixture of Fe-Mn material and green hydrothermal mud that takes the form of a black slurry in split cores; and 2) a relatively "clean" green hydrothermal mud low in Fe-Mn material. Type 1 deposits characterize the top 10 to 15 meters of sediments found at the mound holes (i. e., 424, 424A), and type 2 occurs in the interval between the foraminiferal-nannofossil ooze units in Hole 424B. Chemical analyses of the green-clay fraction within the hydrothermal mud show enrichment in Si and Fe and depletion in Mn and Al. It appears that the top and bottom contacts between the type 2 green hydrothermal muds and the carbonate oozes correlate with two internal seismic reflectors seen on deep-tow profiles throughout the Galapagos hydrothermal field, which covers an area of perhaps 240 km^2. Assuming that this correlation is valid and not a fortuitous coincidence between observed reflectors and reflector-producing lithologic contacts, then the green hydrothermal muds represent an enormous deposit, the origin and source vents of which remain obscure. Uncertainty also surrounds the origin and source(s) of the type 1 hydrothermal deposits, for we were not able to locate the inferred root zones for the two mounds drilled; the underlying basalts and basal carbonate oozes show no evidence of extensive hydrothermal solutions. Hence, if root zones (i. e., basement vents) exist they must be very narrow and are probably very young.

The Site 424 basement rocks are primarily moderately to extensively fragmented basalts that are glassy to fine-grained along the chill margins of cooling units and relatively coarse-grained toward the interiors of flows. Cooling units vary in thickness, from 0.20 to 1.50 meters at Holes 424B and 424C to 0.5 to 5.0 meters at Hole 424. The thinner units appear to be pillow-lava sequences; the thicker are massive flows. All rocks are plagioclase-pyroxene basalts with textures ranging from intersertal and variolitic to hyalopilitic and also subophitic. Plagioclase is a rare phenocryst in the cooling units from most holes; olivine occurs only as a minor constituent at Hole 424. Although the basalts are very young, weathering rims do occur and vesicles, which make up 1% to 3% of most rocks, are often lined or filled with smectites. There is no evidence of hydrothermal alteration in the 424 rocks, beyond perhaps incipient stages in most samples. Combined water ranged from 0.3% to 1.2%, with most samples having less than 0.79%. Preliminary XRF analyses show that all 424 rocks are ferrobasalts showing enrichment in Fe_2O_3 (14.4 - 15.3% total Fe calculated as Fe_2O_3) and TiO_2 (1.85 - 1.92%) and depletion in MgO and K_2O (5.6 - 6.9, 0.001 - 0.18%, respectively) compared to the East Pacific Rise fabric basalts discussed earlier. The very small ranges in the chemistry of the 424 tholeiites suggests that these rocks represent a single eruptive event.

The rocks from Site 425, north of the Galapagos Spreading Center on a heat-flow maximum, are much more varied than those described above, including petrographic units of plagioclase-pyroxene, and plagioclase-pyroxene-olivine basalts and doleritic rocks. Of the seven petrographic units described, each represents at least one cooling unit. Some of these rocks contain numerous alteration products, including phyllosilicates and pyritic material filling vesicles, veinlets, or matrix, or some combination. These products are almost certainly of a hydrothermal origin. From a chemical standpoint, the Site 425 rocks are less fractionated than the 424 tholeiites and are among the most primitive basalts recovered on this leg (0.01 - 0.08% K_2O, 0.97 - 1.42% TiO_2, 0.06 - 0.11% P_2O_5, and 47-67 ppm Zr). In terms of major element abundances, the Site 425 tholeiites are quite similar to the 429 basalts from the western flank of the East Pacific Rise.

Magnetic inclinations in the Galapagos basalts are predictably low, but enough deviation from 0° occurs in the 424 and 425 sites to suggest that tilting or a combination of tilting and eruption has occurred at several holes.

Throughout Leg 54, we made many accurate measurements of velocities and densities on all major rock types recovered. By the end of the cruise it became apparent that velocity-density plots are valuable not only for use in sorting out physical characteristics of rocks (e. g., grain densities, vesicularity, and crystal size), but also because they reflect petrographic parameters, such as olivine and opaque-mineral concentrations, and chemical properties, such as Fe-enrichment. For instance, the Galapagos ferrobasalts (Site 424) show significantly lower velocities than, say, doleritic rocks (e. g., Site 422) of similar density. We think this aspect of shipboard work has been overlooked and should be further developed in future studies.

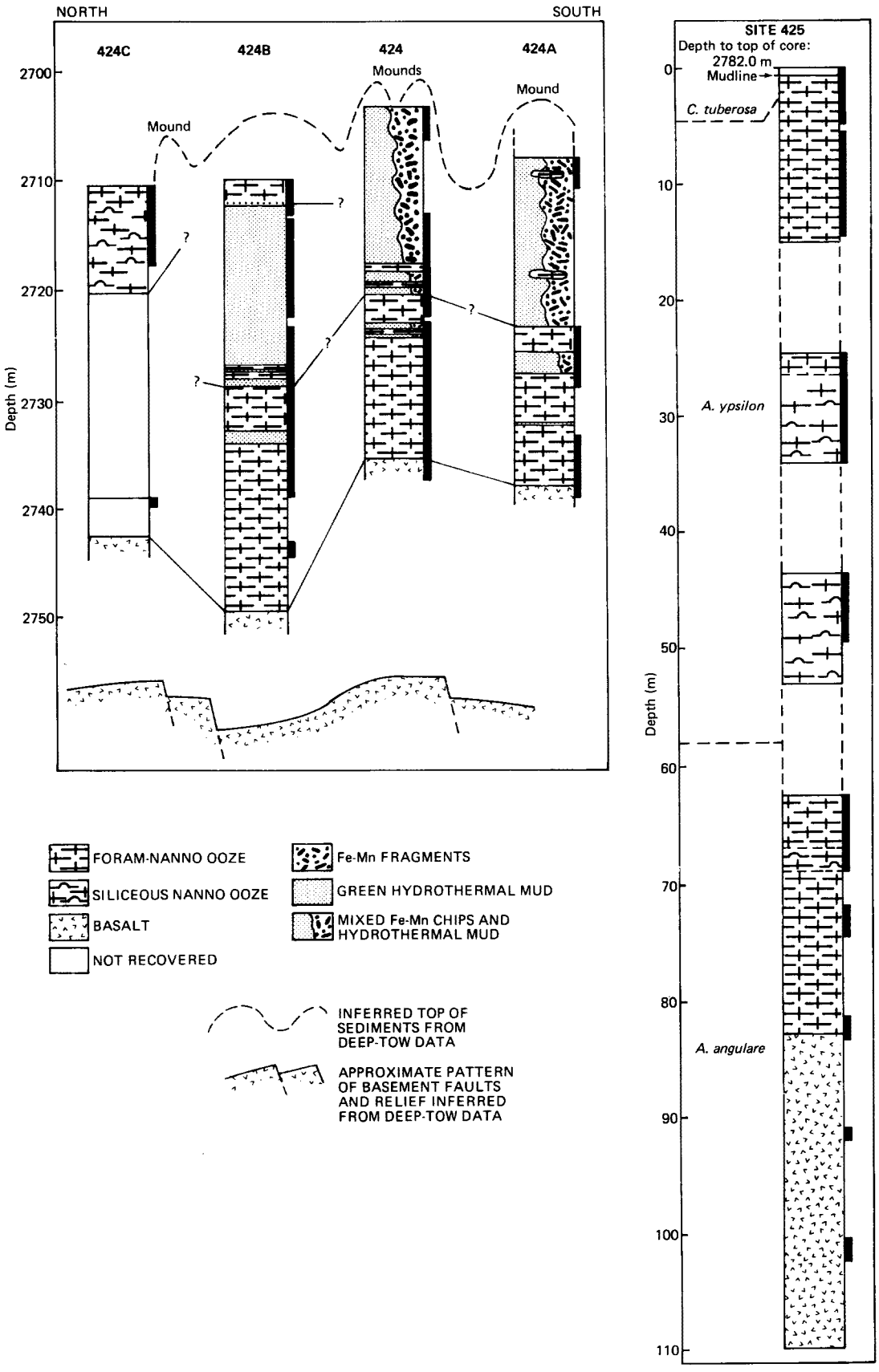

Figure 3. Lithologic columns of Sites 424 and 425 in the Panama Basin.

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EXPLANATORY NOTES

Introduction

Persons wishing to obtain samples are directed to the DSDP-NSF sample distribution policy (reproduced herein, p. 22). Sample requests must be submitted on standard DSDP request forms, which may be obtained from:

The Curator
Deep Sea Drilling Project, A-031
University of California, San Diego
La Jolla, California 92093

The following material is intended as an aid in understanding:

(1) the terminology, labeling, and numbering conventions used by the Deep Sea Drilling Project;

(2) the sediment classification and biostratigraphic framework used on Leg 54;

(3) the igneous rock classification and conventions used on Leg 54; and

(4) the presentation of the lithologic and paleontologic data on the core forms which make up much of this publication.

Numbering of Sites, Holes, Cores, Samples

Drill site numbers run consecutively from the first site drilled by *Glomar Challenger* in 1968; the site number is thus unique. A site refers to the hole or holes drilled from one acoustic positioning beacon. Several holes may be drilled at a single locality by pulling the drill string above the sea floor ("mud line") and offsetting the ship some distance (usually 100 meters or more) from the previous hole.

The first (or only) hole drilled at a site takes the site number. Additional holes at the same site are further distinguished by a letter suffix. The first hole has only the site number; the second has the site number with suffix A; the third has the site number with suffix B; and so forth. It is important, for sampling purposes, to distinguish the holes drilled at a site, since recovered sediments or rocks usually do not come from equivalent positions in the stratigraphic column at different holes.

Cores are numbered sequentially from the top down. In the ideal case, they consist of 9.3 meters of sediment or rock in a plastic liner of 6.6 cm diameter. In addition, a short sample is obtained from the Core Catcher (a multi-fingered device at the bottom of the core barrel which prevents cored materials from sliding out during core-barrel recovery). This usually amounts to about 0.2 meters of sediment or rock. During Leg 54 the Core Catcher sample was split, described, and stored along with the rest of the core, if at all possible, taking care to maintain its proper vertical orientation. This sample represents the lowest stratum recovered in a particular cored interval.

The cored interval is the interval in meters below the sea floor measured from the point at which coring for a particular core was started to the point at which it was terminated. This interval is generally 9.5 meters (nominal length of a core barrel) but may be shorter if conditions dictate. The interval can also be longer if the core barrel was placed in the drill string during a long drilling interval. On Leg 54 almost all core intervals were 9.5 meters, because the drilling program called for nearly continuous coring.

When a core is brought aboard the *Glomar Challenger* it is labeled and the plastic liner and core cut into 1.5-meter sections. A full, 9.5-meter core would thus consist of six sections full and one 0.5-meter section numbered from the top down, 1 to 7. (Section 7 would consist of 0.3 meters of the lowermost sediment from the plastic liner plus the 0.2 meters of Core Catcher material.) The procedure for labeling both full and partially full cores is shown on Figure 4.

In the core laboratory on the *Glomar Challenger*, after routine processing, the 1.5-meter sections of sediment core and liner are split in half lengthwise. One half is designated the "archive" half, which is described by the shipboard geologists, and photographed; and the other is the "working" half, which is sampled by the shipboard sedimentologists and paleontologists for further shipboard and shorebased analysis.

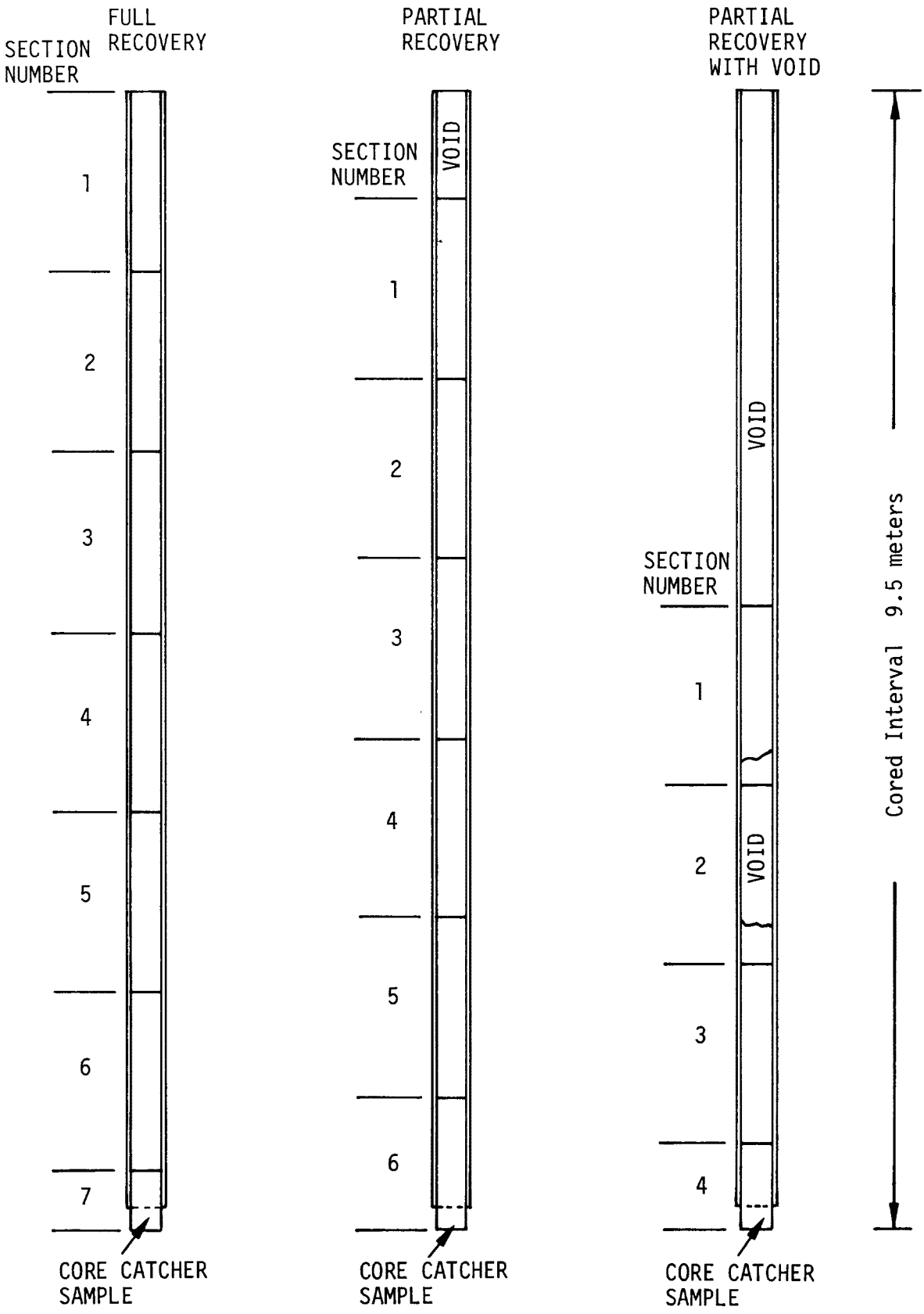


Figure 4. Diagram showing procedure in cutting and labeling of core sections.

Samples taken from core sections are designated by the interval in centimeters from the top of the core section from which the sample was extracted; the sample size, in cc, is also given. Thus, a full sample designation would consist of the following information:

Leg (Optional)
Site (Hole, if other than first hole)
Core Number
Section Number
Interval in centimeters from top of section

Site 428A-4-3, 61-63 cm (10cc) designates a 10cc sample taken from Section 3 of Core 4 from the second hole drilled at Site 428. The depth below the sea floor for this sample would then be the depth to the top of the cored interval (3382.5 meters in the example above) plus 4.5 meters for Sections 1, 2 and 3, plus .61 meters (depth below the top of Section 3), or 3387.61 meters. Note, however, that subsequent sample requests should refer to a specific interval within a core section (in centimeters) rather than depth in meters below the sea floor.

Core Disturbance

Unconsolidated sediments are often quite disturbed by the rotary drilling/coring technique, and there is a complete gradation of disturbance style with increasing sediment induration. An assessment of degree and style of drilling deformation is made onboard ship for all cored material, and shown graphically on the core description sheets. The following symbols are used:

— — — — Slightly deformed; bedding contacts slight bend.

— — — Highly deformed; bedding completely disturbed, often showing symmetrical diapir-like structures.

O O O Soupy, or drilling breccia; water-satured intervals that have lost all aspects of original bedding and sediment cohesiveness.

O-O-O Biscuit structure; a drilling "breccia" wherein the broken core material retains some or all aspects of original bedding.

Consolidated sediments and rocks seldom show much internal deformation, but are usually broken by drilling into cylindrical pieces of varying length. There is frequently no indication if adjacent pieces in the core liner are actually contiguous or if intervening sediment has been lost during drilling.

Smear Slides

The lithologic classification of sediments is based on visual estimates of texture and composition in smear slides made onboard ship. These estimates are of areal abundances on the slide and may differ somewhat from the more accurate laboratory analyses of grain size, carbonate content, and mineralogy. Experience has shown that distinctive minor components can be accurately estimated (± 1 or 2%), but that an accuracy of ± 10% for major constituents is more common. Carbonate content is especially difficult to estimate in smear slides, as is the amount of clay present. Smear slide analyses at selected levels as well as averaged analyses for intervals of uniform lithology are given on the core description sheets.

Carbonate Data

Samples were taken for DSDP shorebased carbon-carbonate analysis using the LECO 70-second Analyzer. These and organic carbon values are also listed on the core description sheet.

The LECO data was used to update the carbonate content (mostly shown as nannofossil, foraminifer oozes or marls) depicted in the graphic lithology column. No attempt was made to adjust smear slide estimates or sediment names to reflect this correction.

Sediment Induration

The determination of induration is highly subjective, but field geologists have successfully made similar distinctions for many years. The criteria of Moberly and Heath (1971) are used for calcareous deposits; subjective estimate or behavior in core cutting is used for others.

a) Calcareous sediments

Soft: Oozes have little strength and are readily deformed under the finger or the broad blade of a spatula.

Firm: Chalks are partly indurated oozes; they are friable limestones that are readily deformed under the fingernail or the edge of a spatula blade.

Hard: Cemented rocks are termed limestones.

b) The following criteria are used for other sediments:

If the material is soft enough that the core can be split with a wire cutter, the sediment name only is used (e. g., silty clay; sand).

If the core must be cut on the band saw or diamond saw, the suffix "stone" is used (e. g.,silty claystone; sandstone).

Sediment Classification

The sediment classification scheme used on Leg 54 is basically that devised by the JOIDES Panel on Sedimentary Petrology and Physical Properties and adopted for use by the JOIDES Planning Committee in March, 1974, with minor modifications. The classification is outlined below.

I. General rules for class limits and order of components in a sediment name.

A. Sediment assumes the names of those components present only in quantities greater than 15%.

B. Where more than one component is present, the component in greatest abundance is listed farthest to the right, and other components are listed progressively to the left in order of decreasing abundance.

C. The class limits are based on percentage intervals given below for various sediment types.

II. Pelagic clay

> 10% authigenic components
< 30% siliceous microfossils
< 30% $CaCO_3$
< 30% terrigenous components

III. Pelagic siliceous biogenic sediments

> 30% siliceous microfossils
< 30% $CaCO_3$
< 30% terrigenous components (mud)

Radiolaria dominant: radiolarian ooze (or radiolarite).
Diatoms dominant: diatom ooze (or diatomite).
Sponge spicules dominant: sponge spicule ooze (or spiculite).
Where uncertain: siliceous (biogenic) ooze (or chert, porcellanite).

When containing 10-30% $CaCO_3$: modified by nannofossil---, foraminiferal---, calcareous---, nannofossil-foraminiferal---, or foraminiferal-nannofossil---, depending upon kind and quantity of $CaCO_3$ component.

IV. Transitional biogenic siliceous sediments

10-70% siliceous microfossils
30-90% terrigenous components (mud)
<30% $CaCO_3$

If diatoms < mud: diatomaceous mud (stone).
If diatoms > mud: muddy diatom ooze (muddy diatomite).
If $CaCO_3$ 10-30%: appropriate qualifier is used (see III).

V. Pelagic biogenic calcareous sediments

>30% $CaCO_3$
<30% terrigenous components
<30% siliceous microfossils

Principal components are nannofossils and foraminifers; qualifiers are used as follows:

Foram %	Name
<10	nannofossil ooze (chalk, limestone)
10-25	foraminiferal-nannofossil ooze
25-50	nannofossil-foraminiferal ooze
>50	foraminiferal ooze

Calcareous sediment containing 10-30% siliceous fossils carry the qualifier radiolarian, diatomaceous or siliceous depending upon the identification.

VI. Transitional biogenic calcareous sediments

>30% $CaCO_3$
>30% terrigenous components
<30% siliceous microfossils

If $CaCO_3$ 30-60%: marly is used as a qualifier:

soft: marly calcareous (or nannofossil, etc.) ooze.
firm: marly chalk (or marly nannofossil chalk, etc.).
hard: marly limestone (or marly nannofossil limestone)

If $CaCO_3$ >60%.

soft: calcareous (or nannofossil, etc.) ooze.
firm: chalk (or nannofossil chalk, etc.).
hard: limestone (or nannofossil limestone, etc.).

NOTE: Sediments containing 10-30% $CaCO_3$ fall in other classes where they are denoted with the adjective "calcareous", "nannofossil", etc.

VII. Terrigenous Sediments

> 30% terrigenous
< 30% $CaCO_3$
< 10% siliceous microfossils
< 10% authigenic components

Sediments in this category are subdivided into textural groups on the basis of the relative proportions of three grain-size components, i. e., sand, silt and clay. Sediments coarser than sand-size are treated as "Special Rock Types". The size limits are those defined by Wentworth (1922) (Figure 5). The textural classification is according to the triangular diagram of Shepard (1954) (Figure 6). The suffix "-stone" is used to indicate hard or consolidated equivalents of the unconsolidated sediments.

If $CaCO_3$ is 10-30%: calcareous, nannofossil, etc. is used as a qualifier.

Other qualifiers (e. g., feldspathic, glauconitic, etc.) are used for components > 10%.

VIII. Volcanogenic sediments

a) Pyroclastic rocks are described according to the textural and compositional scheme of Wentworth and Williams (1932). The textural groups are:

Volcanic breccia 32 mm
Volcanic lapilli 32 mm
Volcanic ash (tuff, if indurated) 4 mm

Compositionally, these pyroclastic rocks are described as vitric (glass), crystal or lithic.

b) Clastic sediments of volcanic provenance are described in the same fashion as the terrigenous sediments, noting the dominant composition of the volcanic grains where possible.

At Site 424, we encountered a variety of Fe-Mn-rich sediments and green muds which probably are a product of near sea-floor hydrothermal activity in the oceanic crust. These we call "Fe-Mn deposits" and "green hydrothermal (?) muds", respectively.

Lithologic Symbols

Figure 7 shows the graphic symbols used to depict the lithologies encountered on Leg 54.

Core Forms

The core forms provide a variety of data and a sample core form is given in Figure 8. Shipboard paleontological determinations are provided in appropriate columns along the left hand margin. In the column headed "Graphic Lithology", appropriate symbols are used to depict lithologies found in the cores. The columns titled "Drilling Disturbance" and "Sedimentary Structures" provide information on these aspects of the cores according to the conventions previously described. Drilling disturbance symbols were shown on page . Conventions relating to sedimentary structures are shown on Figure 9. All smear slides made aboard the ship are appropriately located in the column headed "Lithologic Samples".

The broad column headed "Lithologic Description" provides a variety of data. Along the left margin are found the color descriptions according to the Munsell color designations. All smear slides (abbreviated SS) are identified by a centimeter designation corresponding to that shown in the "Lithologic Sample" column. The percentage occurrence of each constituent is indicated, based on visual estimates. The estimates of the carbonate constituents may vary by small or large amounts from that determined by the LECO.

Biostratigraphy

At the time of this compilation, biostratigraphic studies of Leg 54 sediment are still in progress. Radiolarian studies (R. M. Goll) use the equatorial Pacific Quaternary zonation (Nigrini, 1971). Coccolith and silicoflagellate studies

	Millimeters		Phi (ϕ) units	Wentworth size class
	2.00	2	- 1.0	Granule
	1.68		- 0.75	
	1.41		- 0.5	Very coarse sand
	1.19		- 0.25	
	1.00	1	0.0	
	0.84		0.25	
	0.71		0.5	Coarse sand
	0.59		0.75	
	0.50	1/2	1.0	
	0.42		1.25	
	0.35		1.5	Medium sand
SAND	0.30		1.75	
	0.25	1/4	2.0	
	0.210		2.25	
	0.177		2.5	Fine sand
	0.149		2.75	
	0.125	1/8	3.0	
	0.105		3.25	
	0.088		3.5	Very fine sand
	0.074		3.75	
	0.0625	1/6	4.0	
	0.053		4.25	
	0.044		4.5	Coarse silt
	0.037		4.75	
SILT	0.031	1/32	5.0	
	0.0156	1/64	6.0	Medium silt
	0.0078	1/128	7.0	Fine silt
	0.0039	1/256	8.0	Very fine silt
	0.0020		9.0	
	0.00098		10.0	Clay
MUD	0.00049		11.0	
	0.00024		12.0	
	0.00012		13.0	
	0.00006		14.0	

Figure 5. Terminology and class intervals for grade scales.

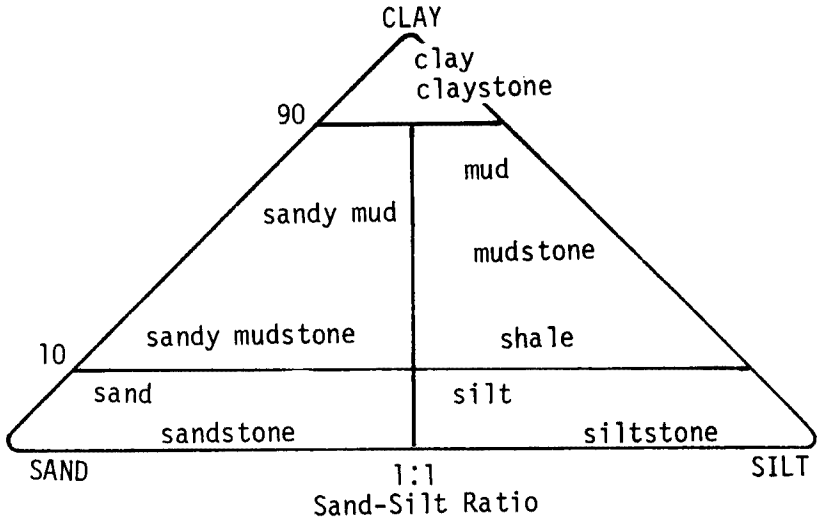


Figure 6. Textural Groups - Terrigenous Sediments.

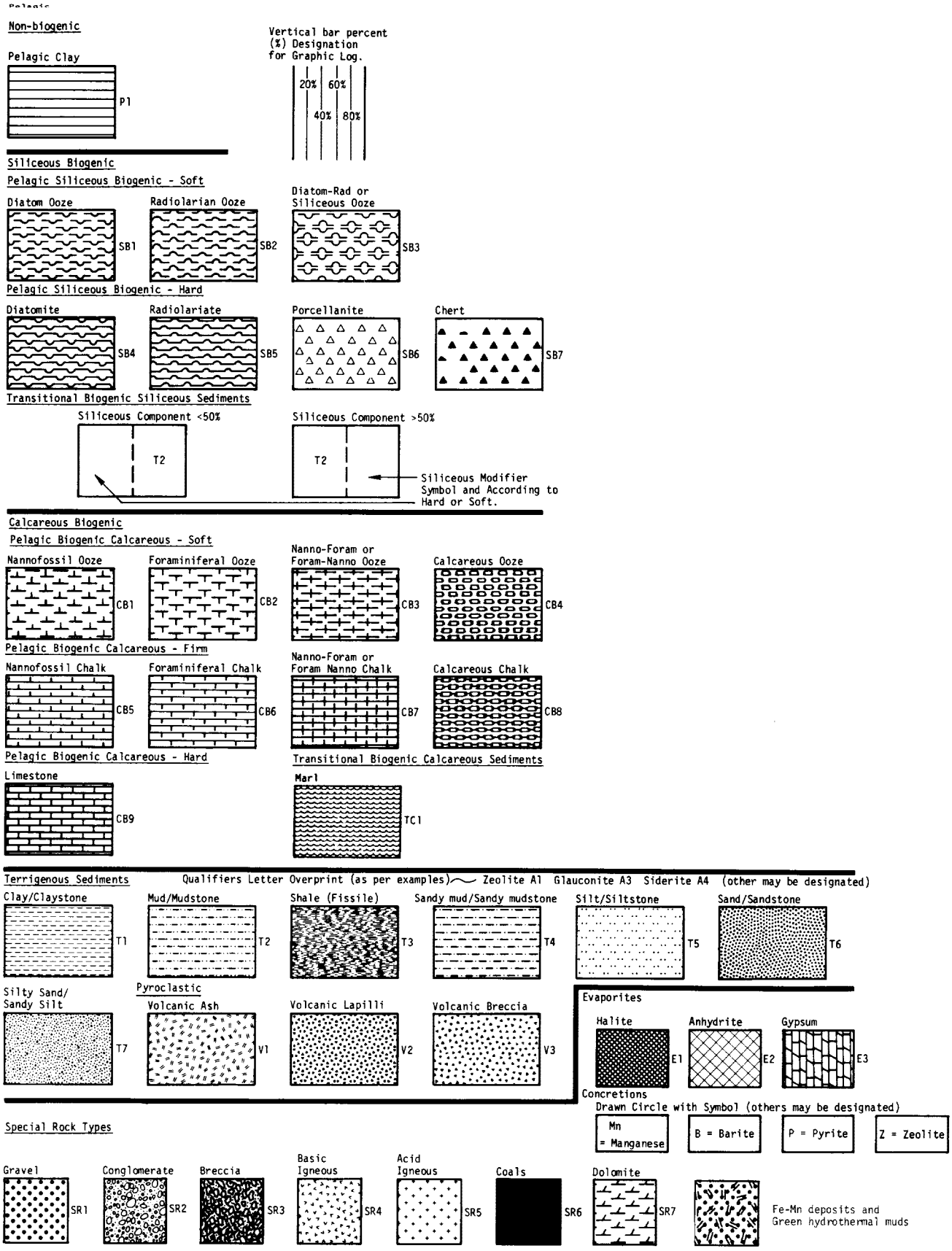


Figure 7. Key to Lithologic and Biostratigraphic Symbols.

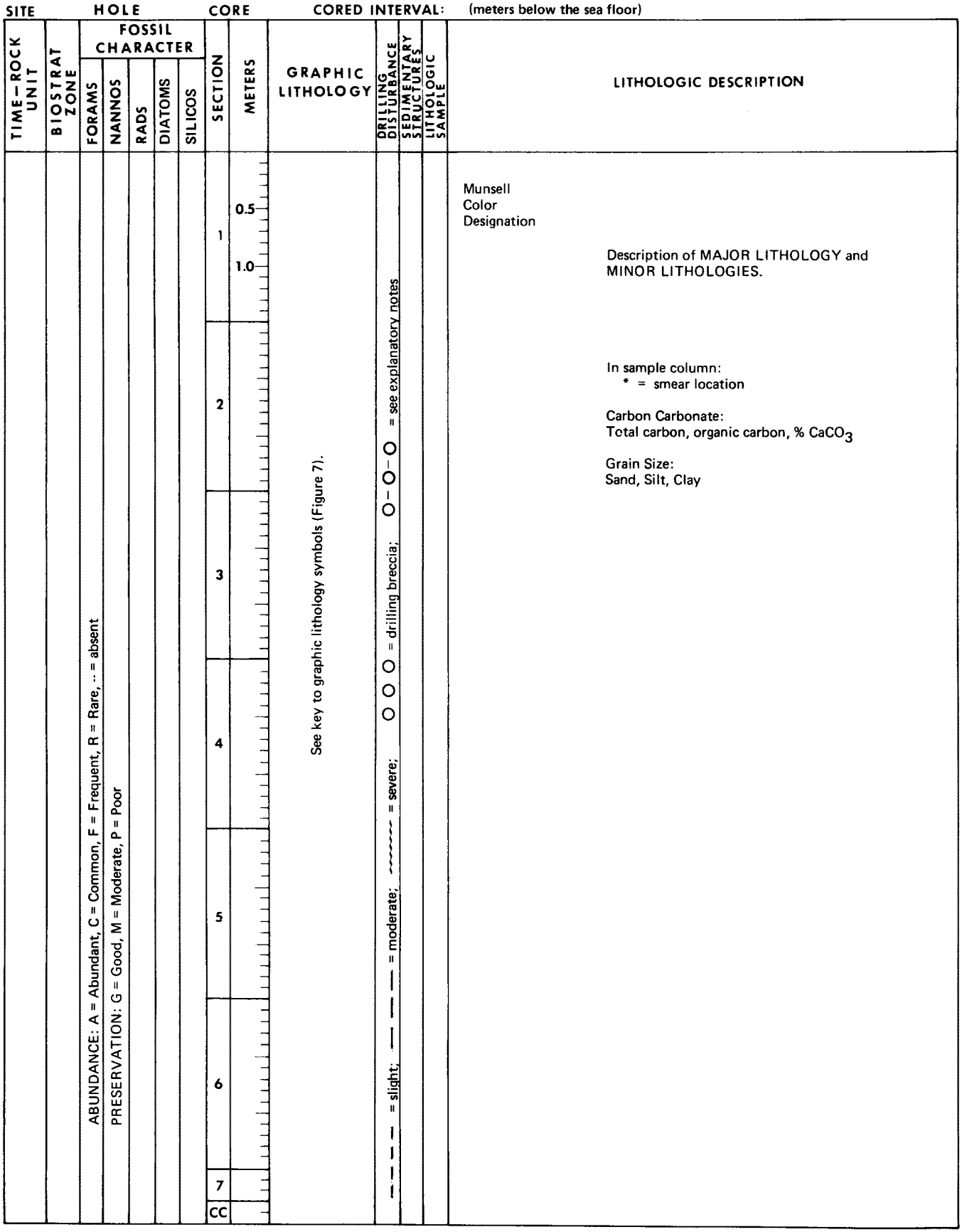


Figure 8. Sample Core Form.

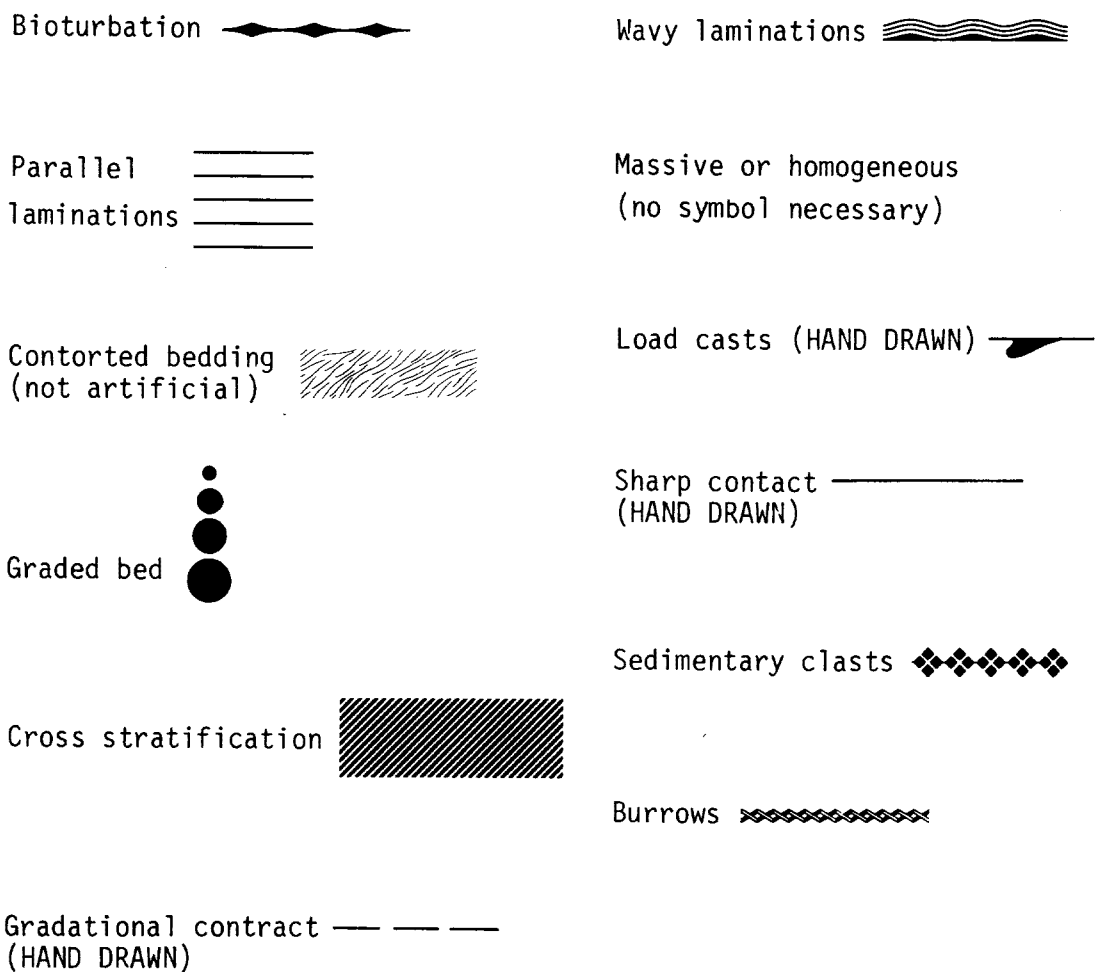


Figure 9. Sedimentary Structure Symbols

(D. Bukry) employ low-latitude and eastern Pacific zonations (Bukry, 1975, 1976; Bukry and Foster, 1973). Diatom studies (J. A. Barron) use the tropical Pacific zonation (Burckle, 1972; Burckle and Updyke, 1977). Lettered diatom subzones appear in parentheses following the zone name. Preservation and abundance of diatoms and silicoflagellates are estimated from acid-cleaned, strewn-slide preparations.

BASEMENT DESCRIPTION CONVENTIONS

Core Forms

Initial core description forms for igneous and metamorphic rocks are not the same as those used for sediments. The sediment barrel sheets are substantially those published in previous Initial Reports. Igneous rock representation on barrel sheets is too compressed to provide adequate information for potential sampling. Consequently, Visual Core Description forms, modified from those used onboard ship, were used for more complete graphic representation. All shipboard data per 1.5-meter section of core are listed on the modified forms as well as summary hand-specimen and thin section descriptions. The symbols and a number of format conventions for igneous rocks used on Leg 54 are presented on Figure 10.

All basalts on Leg 54 were split using a rock saw with a diamond blade into archive and working halves. The latter was described and sampled onboard ship. On a typical basalt description form (Figure 11), the left column is a visual representation of the working half using the symbols of Figure 10. Two closely spaced horizontal lines in this column indicate the location of styrofoam spacers taped between basalt pieces inside the liner. Each piece is numbered sequentially from the top of each section, beginning with the number 1. Pieces are labeled on the rounded, not the sawed surface. Pieces which were possible to fit together before splitting are given the same number, but are consecutively lettered, as 1A, 1B, 1C, etc. Spacers were placed between pieces with different numbers, but not between those with different letters and the same number. In general, addition of spacers represents a drilling gap (no recovery). However, in cores where recovery was high, it was impractical to use spacers. In these cases, drilling gaps are indicated only by a change in numbers. All pieces have orientation arrows pointing to the top of the section, both on archive and working halves, provided the original unsplit piece was cylindrical in the liner and of greater length than the diameter of the liner. Special procedures were adopted to ensure that orientation was preserved through every step of the sawing and labeling process. All pieces suitable for sampling requiring knowledge of top from bottom are indicated by upward-pointing arrows to the left of the piece numbers on the description forms. Since the pieces were rotated during drilling it is not possible to sample for declination studies.

Samples were taken for various measurements onboard ship. The type of measurement and approximate location are indicated in the column headed "Sample" using the following notation:

X = X-ray fluorescence analysis
M = magnetics measurements
S = sonic velocity measurements
T = thin section
D = density measurements
P = porosity measurements

Igneous Rock Classification

No igneous rocks other than basalts were recovered on Leg 54. Classification was based mainly on mineralogy of minerals visible in hand specimens, and secondarily on texture and thin section data (usually based on 1000 point counts per thin section).

Basalts are termed aphyric, sparsely phyric, or moderately phyric depending on the proportion of phenocrysts visible with the binocular microscope (~12x). Aphyric basalts were so called if phenocrysts were absent. In a practical vein, this meant that if one piece of basalt was found with a phenocryst or two in a section with all other pieces lacking phenocrysts, and no other criteria such as grain size or texture distinguished this basalt from the others, then it too was described as aphyric. A note of the rare phenocrysts, however, was included in the general description. This was done in order to restrict the number of lithologic units to those with clearly distinctive and persistent visual differences.

Sparsely phyric basalts are those with 1-2% phenocrysts present in almost every piece of a given core or section. Clearly contiguous pieces without phenocrysts were included in this category, again with the lack of phenocrysts noted in the general description.

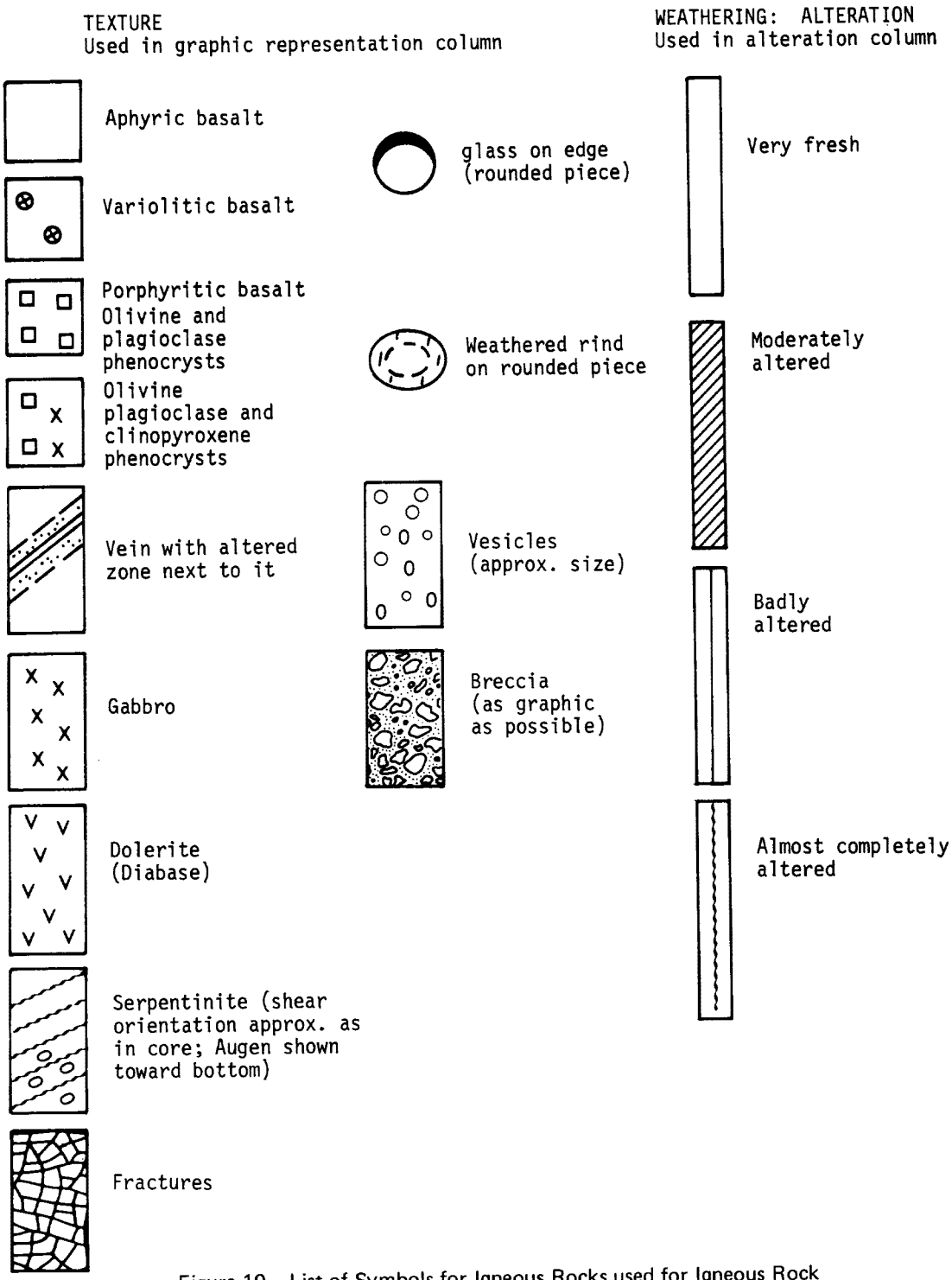
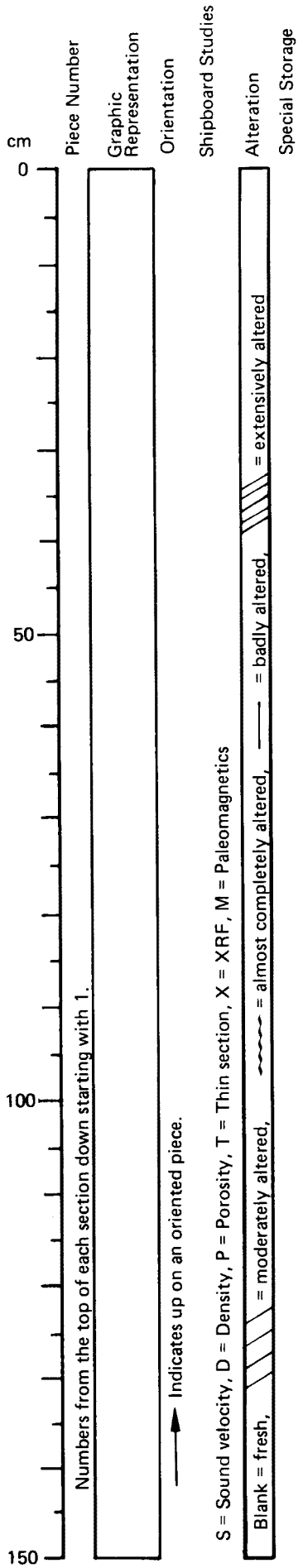


Figure 10. List of Symbols for Igneous Rocks used for Igneous Rock Description Forms (some not applicable to Leg 54).



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.	

Depth: ——— m to ——— m

ROCK TYPE AND STRUCTURE

TEXTURE

MINERALOGY

ALTERATION

THIN SECTION DATA (1000 counts)

Figure 11. Visual Core Description

Moderately phyric basalts contain 2-10% phenocrysts. Aphyric basalts within a group of moderately phyric basalts are separately termed aphyric basalts.

The basalts are further classified by phenocryst type, preceding the terms phyric, sparsely phyric, etc. A plagioclase-olivine moderately-phyric basalt contains 2-10% phenocrysts, most of them plagioclase, but with some olivine.

SAMPLE DISTRIBUTION POLICY

Deep Sea Drilling Project/International Phase of Ocean Drilling

Distribution of Deep Sea Drilling samples for investigation will be undertaken in order to (1) provide supplementary data to support GLOMAR CHALLENGER scientists in achieving the scientific objectives of their particular cruise, and in addition to serve as a mechanism for contributions to the INITIAL REPORTS; (2) provide individual investigators with materials to conduct detailed studies beyond the scope of the Initial Reports; and (3) provide the reference centers where paleontologic materials are stored with samples for reference and comparison purposes.

The National Science Foundation has established a Sample Distribution Panel to advise on the distribution of core materials. This panel is chosen in accordance with usual Foundation practices, in a manner that will assure advice in the various disiplines leading to a complete and adequate study of the cores and their contents. Funding for the proposed research must be secured separately by the investigator. It cannot be provided through the Deep Sea Drilling Project.

The Deep Sea Drilling Project's Curator is responsible for distributing the samples and controlling their quality, as well as preserving and conserving core material. He also is responsible for maintaining a record of all samples that have been distributed, shipboard and subsequent, indicating the recipient, and the natures of the proposed investigation. This information is made available to all investigators of DSDP materials as well as other interested researchers on request.

The distribution of samples is made directly from one of the two existing repositories, Lamont-Doherty Geological Observatory and Scripps Institution of Oceanography, by the Curator or his designated representative.

1. Distribution of Samples for Research Leading to Contributions to Initial Reports

Any investigator who wishes to contribute a paper to a given volume of the Initial Reports may write to the Chief Scientist, Deep Sea Drilling Project (A-031), Scripps Institution of Oceanography, University of California at San Diego, La Jolla, California 92093, U.S.A., requesting samples from a forthcoming cruise. Requests for a specific cruise should be received by the Chief Scientist TWO MONTHS in advance of the departure of the cruise in order to allow time for the review and consideration of all requests and to establish a suitable shipboard sampling program. The request should include a statement of the nature of the study proposed, size and approximate number of samples required to complete the study, and any particular sampling technique or equipment that might be required. The requests will be reviewed by the Chief Scientist of the Project and the cruise co-chief scientists; approval will be given in accordance with the scientific requirements of the cruise as determined by the appropriate JOIDES Advisory Panel(s). If approved, the requested samples will be taken, either by the shipboard party if the workload permits, or by the curatorial staff shortly following the return of the cores to the repository. Proposals must be of a scope to ensure that samples can be processed and a contribution completed in time for publication in the Initial Reports. Except for rare, specific instances involving ephemeral properties, sampling will not exceed one-quarter of the volume of core recovered, with no interval being depleted and one-half of all core being retained as an archive. Shipboard sampling shall not exceed approximately 100 igneous samples per investigator; in all cases co-chief scientists are requested to keep sampling to a minimum.

The co-chief scientists may elect to have special studies of selected core samples made by other investigators. In this event the names of these investigators and complete listings of all materials loaned or distributed must be forwarded, if possible, prior to the cruise or, as soon as possible following the cruise, to the Chief Scientist through the DSDP Staff Science Representative for that particular cruise. In such cases, all requirements of the Sample Distribution Policy shall also apply.

If a dispute arises or if a decision cannot be reached in the manner prescribed, the NSF Sample Distribution Panel will conduct the final arbitration.

Any publication of results other than in the Initial Reports within twelve (12) months of the completion of the cruise must be approved and authored by the whole shipboard party and, where appropriate, shore-based investigators. After twelve months, individual investigators may submit related papers for open publication provided they have submitted their contributions to the Initial Reports. Investigations not completed in time for inclusion in the Initial Reports for a specific cruise may not be published in other journals until final publication of that Initial Report for which it was intended. Notice of submission to other journals and a copy of the article should be sent to the DSDP Chief Science Editor.

2. Distribution of Samples for Research Leading to Publication other than in Initial Reports

A. Researchers intending to request samples for studies beyond the scope of the Initial Reports should first obtain sample request forms from the Curator, Deep Sea Drilling Project (A-031), Scripps Institution of Oceanography, University of California at San Diego, La Jolla, California 92093, U.S.A. On the forms the researcher is requested to specify the quantities and intervals of the core required, make a clear statement of the proposed research, state time required to complete and submit results for publication, specify the status of funding and the availability of equipment and space foreseen for the research.

In order to ensure that all requests for highly desirable but limited samples can be considered, approval of requests and distribution of samples will not be made prior to 2 months after publication of the Initial Core Descriptions (I.C.D.). ICD's required to be published within 10 months following each cruise. The only exceptions to this policy will be for specific instances involving ephemeral properties. Requests for samples can be based on the Initial Core Descriptions, copies of which are on file at various institutions throughout the world. Copies of original core logs and data are kept on file at DSDP and at the Repository at Lamont-Doherty Geological Observatory, Palisades, New York. Requests for samples from researchers in industrial laboratories will be handled in the same manner as these from academic organizations, with the same obligation to publish results promptly.

B. (1) The DSDP Curator is authorized to distribute samples up to 50 ml per meter of core. Requests for volumes of material in excess of this amount will be referred to the NSF Sample Distribution Panel for review and approval. Experience has shown that most investigations can be accomplished with 10ml sized samples or less. All investigators are encouraged to be as judicious as possible with regard to sample size and, especially, frequency within any given core interval. The Curator will not automatically distribute any parts of the cores which appear to be in particularly high demand; requests for such parts will be referred to the Sample Distribution Panel for review. Requests for samples from thin layers or important stratigraphic boundaries will also require Panel review.

(2) If investigators wish to study certain properties which may deteriorate prior to the normal availability of his samples, they may request that the normal waiting period not apply. All such requests must be reviewed by the curators and approved by the NSF Sample Distribution Panel.

C. Samples will not be provided prior to assurance that funding for sample studies either exists or is not needed. However, neither formal approval of sample requests nor distribution of samples will be made until the appropriate time (Item A). If a sample request is dependent, either wholly or in part, on proposed funding, the organization to whom the funding proposal has been submitted any information on the availability (or potential availability) of samples that it may request.

D. Investigators receiving samples are responsible for:

(1) publishing significant results; however contributions shall not be submitted for publication prior to 12 months following the termination of the appropriate leg;

(2) acknowledging, in publications, that samples were supplied through the assistance of the U.S. National Science Foundation and others as appropriate;

(3) submitting five (5) copies (for distribution to the Curator's file, the DSDP Repositories, the GLOMAR CHALLENGER's Library, and the National Science Foundation) of all reprints of published results to the Curator, Deep Sea Drilling Project (A-012), Scripps Institution of Oceanography, University of California at San Diego, La Jolla, California 92093, U.S.A.;

(4) returning, in good condition, the remainders of samples after termination of research, if requested by the Curator.

E. Cores are made available at repositories for investigators to examine and to specify exact samples in such instances as may be necessary for the scientific purposes of the sampling, subject to the limitations of B (1 and 2) and D, above, with specific permission of the Curator or his delegate.

F. Shipboard-produced smear slides of sediments and thin sections of indurated sediments, igneous and metamorphic rocks, will be returned to the appropriate repository at the end of each cruise or at the publication of the Initial Reports for that cruise. These smear slides and thin sections will form a reference collection of the cores stored at each repository and may be viewed at the respective repositories as an aid in the selection of core samples.

G. The Deep Sea Drilling Project routinely processes by computer most of the quantitative data presented in the Initial Reports. Space limitations in the Initial Reports preclude the detailed presentation of all such data. However, copies of the computer readout are available for those who wish the data for further analysis or as an aid in selecting samples. A charge will be made to recover expenses in excess of $50.00 incurred in filling requests.

3. Other Records

Magnetics, seismic reflection, downhole logging, and bathymetric data collected by the GLOMAR CHALLENGER will also be available for distribution at the same time samples become available.

Requests for data may be made to:

Associate Chief Scientist,
Science Services
Deep Sea Drilling Project (A-031)
Scripps Institution of
Oceanography
University of California
at San Diego
La Jolla, California 92093

A charge will be made to recover the expenses in excess of $50.00 in filling individual requests. If required, estimated charges can be furnished before the request is processed.

4. Reference Centers

As a separate and special category samples will be distributed for the purpose of establishing up to five reference centers where paleontologic materials will be available for reference and comparison purposes. The first of these reference centers has been approved at Basel, Switzerland.
Revised 9/28/76

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SITE SUMMARY SHEET

SITE 419 HOLE 419

Date occupied	8 May 1977 0742 hrs. LCT
Date departed	9 May 1977 0650 hrs. LCT
Time on hole	23 hours
Position: latitude	08°55.96'N
longitude	105°41.17'W
Water depth (sea level)	3274 corrected meters, echo sounding
Water depth (rig floor)	3290 corrected meters, echo sounding
Bottom felt at	3294 meters, drill pipe
Penetration	35.0 meters
Number of holes	1
Number of cores	5
Total length of cored section	35.0 meters
Total core recovered	21.6 meters
Percentage core recovery	62%

Oldest Sediment Cored

Depth sub-bottom	35.0 meters
Nature	foraminiferal-nannofossil ooze
Age	lower Pleistocene
Measured velocity	1.462-1.510 km/sec

Basement

Depth sub-bottom	
Nature	
Velocity range	

Principal Results:

Continuously cored 35 meters of foraminiferal-nannofossil ooze, radiolarian-nannofossil ooze, and small amount of brown calcareous clay at Hole 419. Recovered 21.6 meters of completely unconsolidated Pleistocene to Pliocene sediments, which are uniformly high in porosity (85-90%) and low in in situ compressional wave velocity (1.50-1.55 km/sec). Basement penetration was not attempted because sediment thickness was inadequate.

SITE 419 HOLE CORE 1 CORED INTERVAL: 3294.0-3294.5 m (0.0-0.5 m)

TIME–ROCK UNIT: UPPER PLEISTOCENE
BIOSTRAT ZONE: FORAMS FP; NANNOS AG; RADS M; DIATOMS RP; SILICOS B
FOSSIL CHARACTER: *C. cristatus* or *E. huxleyi*; *Collosphaera tuberosa*; *P. dolium*
SECTION: CC
METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID

DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE: *

2.5Y 4/4

LITHOLOGIC DESCRIPTION

MARLY FORAMINIFER-NANNOFOSSIL OOZE

Olive brown with minor dusky yellow green (5GY 5/2) finer-grained clots, intensely deformed foraminifer-nannofossil ooze.

Smear slide: CC

Nannofossils	50%	Sponge spicules	TR
Foraminifers	20%	Glass	TR
Clay	20%	Fe-oxide	TR(?)
Radiolaria	10%		

SITE 419 HOLE CORE 2 CORED INTERVAL: 3294.5-3304.0 m (0.5-10.0 m)

TIME–ROCK UNIT: UPPER PLEISTOCENE
BIOSTRAT ZONE: FORAMS FP; NANNOS AG; RADS *C. tuberosa* (R); DIATOMS RP; SILICOS
FOSSIL CHARACTER: *C. cristatus* or *E. huxleyi*; *Amphirhopalum ypsilon* (R); *P. dolium*
SECTION: 1, 2, 3, 4, 5, CC
METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID

DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE: *

7.5YR 3/2; 2.5Y 4/4; 5GY 5/2; 10Y 4/2; 5GY 3/2; 5Y 4/3; 2.5Y 4/4; 5Y 5/4; 5Y 5/6; 5GY 5/2; 5GY 3/2; 5Y 6/2; 5GY 3/2; 5Y 4/1

LITHOLOGIC DESCRIPTION

BROWN CALCAREOUS CLAY

Intensely deformed dark brown calcareous clay at the top of Core 2 (0 to 20 cm). Smear slides contain reddish iron and manganese(?) oxides.

Smear slide: 1-10

Clay	50%	Fe-oxide	5%
Foraminifers	20%	Sponge spicules	TR
Nannofossils	20%	Diatoms	TR
Radiolaria	5%	Glass	TR

MARLY FORAMINIFER-NANNOFOSSIL OOZE

Olive brown, grayish olive green to dark gray foraminifer-nannofossil ooze. Moderate deformation. Only in the deepest part of the core is the deformation intense. Possibility of bioturbation (Core 2, Section 2). Hard calcareous nodules about 1 cm diameter occur in Core 2, Section 3.

Smear slides: 1-30, 1-100, 2-30, 2-80, 2-120, 3-50, 3-110

Nannofossils	50-60%	Diatoms	TR-5%
Foraminifers	20-25%	Sponge spicules	TR
Clay	10-30%	Glass	TR
Radiolaria	5-10%		

Note: In all smear slides traces of brown glass are frequent.

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	5.8	0.5	44
2-116	2.8	0.4	20
3-120	5.2	0.2	42

Grain Size:

	Sand	Silt	Clay
1-140	1.8	71.2	27.0
2-138	2.0	49.5	48.5
3-139	1.2	39.7	59.1

SITE 419 HOLE CORE 3 CORED INTERVAL: 3304.0-3313.5 m (10.0-19.5 m)

TIME–ROCK UNIT: UPPER PLEISTOCENE
BIOSTRAT ZONE: FORAMS FP; NANNOS AG; RADS *C. cristatus*; DIATOMS RP; SILICOS
FOSSIL CHARACTER: *C. cristatus*; *Amphirhopalum ypsilon* (R); *P. dolium*
SECTION: 1, 2, 3, 4, CC
METERS: 0.5, 1.0

GRAPHIC LITHOLOGY: VOID

DRILLING DISTURBANCE; SEDIMENTARY STRUCTURES; LITHOLOGIC SAMPLE: *

5Y 4/3; 10YR 4/4; 5Y 3/2; 10YR 4/4; 5Y 4/4; 5Y 5/6; 10Y 5/4; 5Y 4/4; 5GY 5/2; 5Y 5/4

LITHOLOGIC DESCRIPTION

MARLY FORAMINIFER-NANNOFOSSIL OOZE GRADING DOWNWARD TO MARLY NANNOFOSSIL OOZE

Olive, dusky yellow green to dark yellowish brown sediment. Section 1 contains harder dark (10YR 3/3) fragments near top. The upper part of the core is soupy, in the other part the deformation is moderate. Burrows are present in different parts of the core.

Smear slides: 1-50, 1-110 (foraminifer-nannofossil ooze)

Nannofossils	50-70%	Diatoms	TR
Foraminifers	10-15%	Sponge spicules	TR
Clay	10-25%	Glass (brown)	TR
Radiolaria	5%	Fe-oxide	TR

Smear slides: 2-50, 2-110, 3-40

Nannofossils	60-70%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	20-25%	Glass (brown)	TR
Radiolaria	5%	Fe-oxide	TR

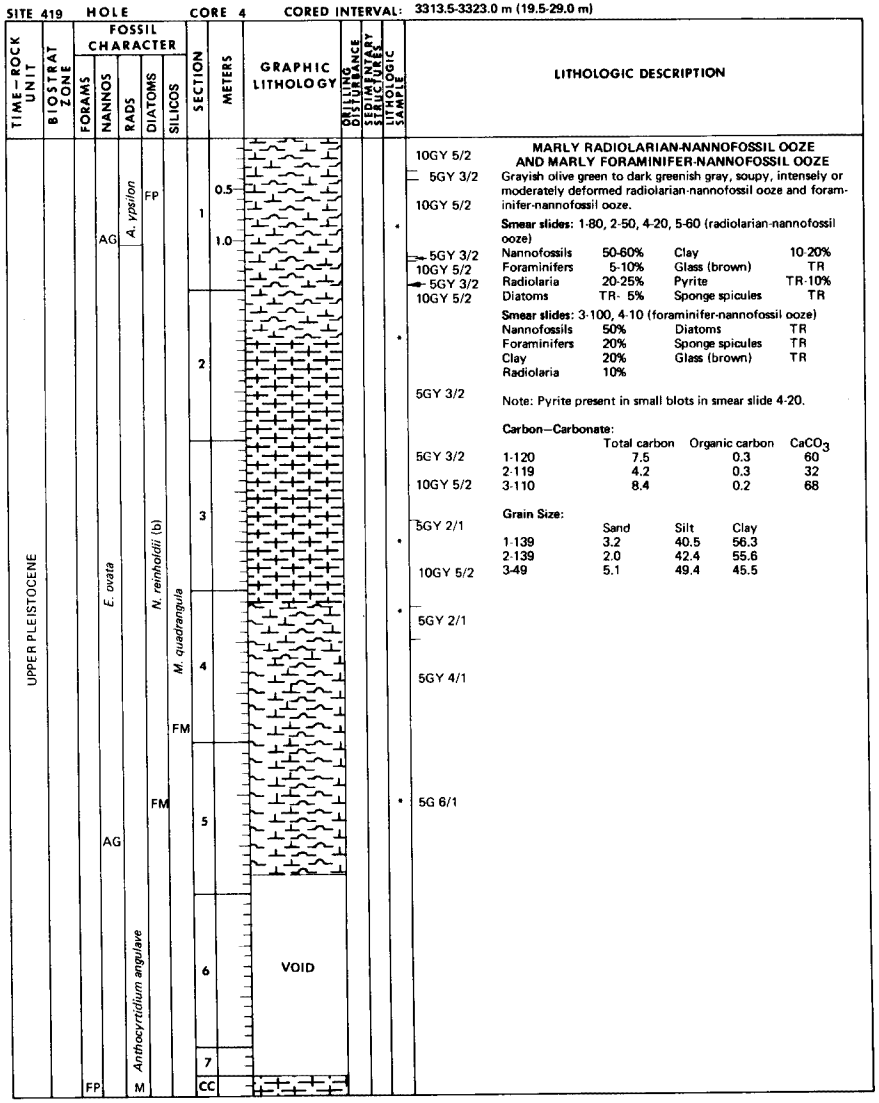
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	5.9	0.3	47
2-120	5.9	0.2	48
3-30	4.4	0.3	34

Grain Size:

	Sand	Silt	Clay
1-129	2.8	53.2	44.0
2-139	2.2	49.4	48.4

SITE 419 HOLE CORE 4 CORED INTERVAL: 3313.5-3323.0 m (19.5-29.0 m)



MARLY RADIOLARIAN-NANNOFOSSIL OOZE AND MARLY FORAMINIFER-NANNOFOSSIL OOZE

Grayish olive green to dark greenish gray, soupy, intensely or moderately deformed radiolarian-nannofossil ooze and foraminifer-nannofossil ooze.

Smear slides: 1-80, 2-50, 4-20, 5-60 (radiolarian-nannofossil ooze)

Nannofossils	50-60%	Clay	10-20%
Foraminifers	5-10%	Glass (brown)	TR
Radiolaria	20-25%	Pyrite	TR-10%
Diatoms	TR- 5%	Sponge spicules	TR

Smear slides: 3-100, 4-10 (foraminifer-nannofossil ooze)

Nannofossils	50%	Diatoms	TR
Foraminifers	20%	Sponge spicules	TR
Clay	20%	Glass (brown)	TR
Radiolaria	10%		

Note: Pyrite present in small blots in smear slide 4-20.

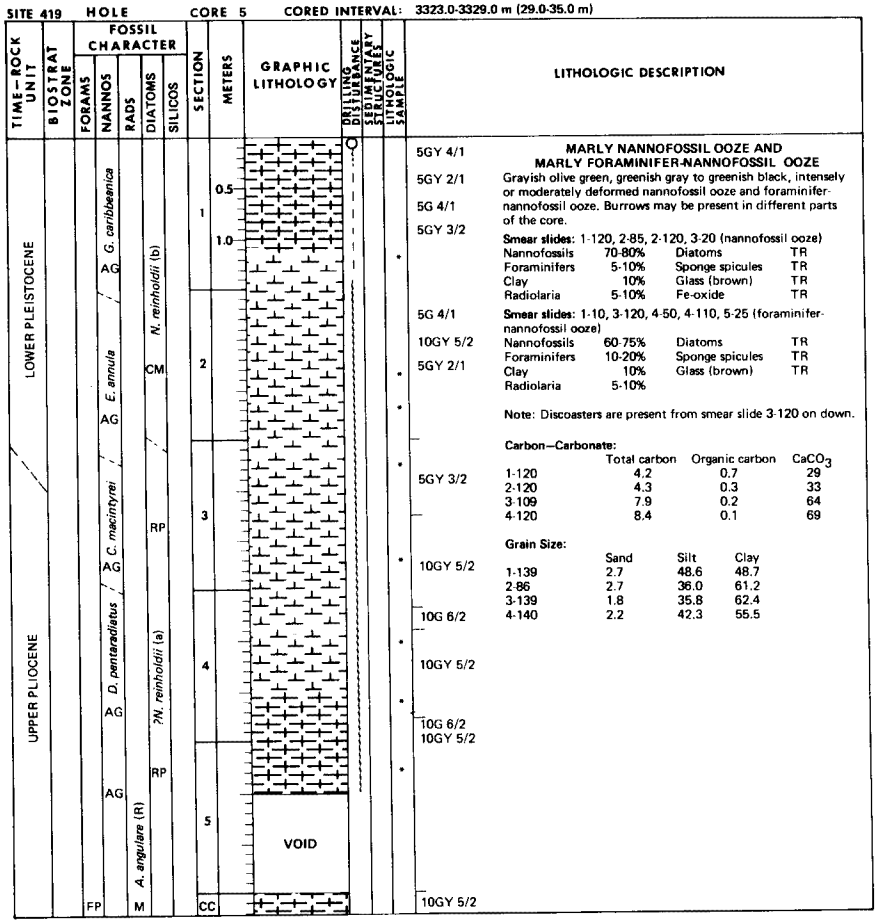
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	7.5	0.3	60
2-119	4.2	0.3	32
3-110	8.4	0.2	68

Grain Size:

	Sand	Silt	Clay
1-139	3.2	40.5	56.3
2-139	2.0	42.4	55.6
3-49	5.1	49.4	45.5

SITE 419 HOLE CORE 5 CORED INTERVAL: 3323.0-3329.0 m (29.0-35.0 m)



MARLY NANNOFOSSIL OOZE AND MARLY FORAMINIFER-NANNOFOSSIL OOZE

Grayish olive green, greenish gray to greenish black, intensely or moderately deformed nannofossil ooze and foraminifer-nannofossil ooze. Burrows may be present in different parts of the core.

Smear slides: 1-120, 2-85, 2-120, 3-20 (nannofossil ooze)

Nannofossils	70-80%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5-10%	Fe-oxide	TR

Smear slides: 1-10, 3-120, 4-50, 4-110, 5-25 (foraminifer-nannofossil ooze)

Nannofossils	60-75%	Diatoms	TR
Foraminifers	10-20%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5-10%		

Note: Discoasters are present from smear slide 3-120 on down.

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	4.2	0.7	29
2-120	4.3	0.3	33
3-109	7.9	0.2	64
4-120	8.4	0.1	69

Grain Size:

	Sand	Silt	Clay
1-139	2.7	48.6	48.7
2-86	2.7	36.0	61.2
3-139	1.8	35.8	62.4
4-140	2.2	42.3	55.5

SITE SUMMARY SHEET

SITE 419 HOLE 419A

Date occupied	9 May 1977 0730 hrs. LCT
Date departed	9 May 1977 1442 hrs. LCT
Time on hole	8.9 hours
Position: latitude	08° 55.47'N
longitude	105° 41.22'W
Water depth (sea level)	3274 corrected meters, echo sounding
Water depth (rig floor)	3267 corrected meters, echo sounding
Bottom felt at	3277 meters, drill pipe
Penetration	46.0 meters
Number of holes	1
Number of cores	1
Total length of cored section	8.0 meters
Total core recovered	4.74 meters
Percentage core recovery	59%

Oldest Sediment Cored

Depth sub-bottom	8.0 meters
Nature	foraminiferal-nannofossil ooze
Age	Pleistocene
Measured velocity	1.5 km/sec

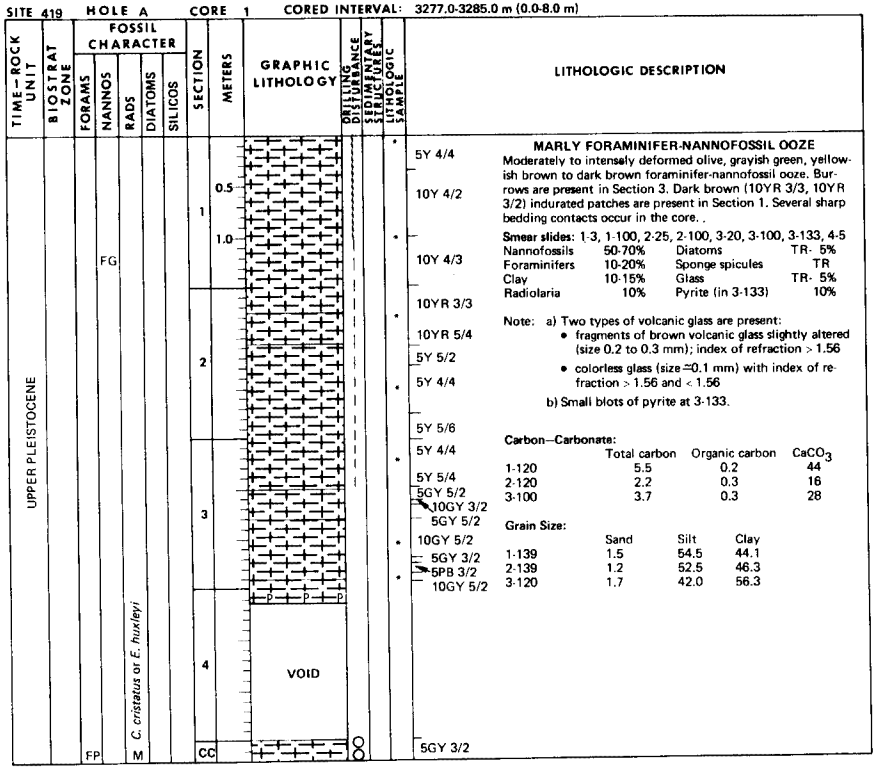
Basement

Depth sub-bottom	
Nature	
Velocity range	

Principal Results:

Hole was washed down to basement after taking mud-line core of marly foraminiferal-nannofossil ooze containing thin layer of brown calcareous clay. No basement penetration attempted because of inadequate sediment cover.

SITE 419 HOLE A CORE 1 CORED INTERVAL: 3277.0-3285.0 m (0.0-8.0 m)



MARLY FORAMINIFER-NANNOFOSSIL OOZE

Moderately to intensely deformed olive, grayish green, yellowish brown to dark brown foraminifer-nannofossil ooze. Burrows are present in Section 3. Dark brown (10YR 3/3, 10YR 3/2) indurated patches are present in Section 1. Several sharp bedding contacts occur in the core. .

Smear slides: 1-3, 1-100, 2-25, 2-100, 3-20, 3-100, 3-133, 4-5

Nannofossils	50-70%	Diatoms	TR- 5%
Foraminifers	10-20%	Sponge spicules	TR
Clay	10-15%	Glass	TR- 5%
Radiolaria	10%	Pyrite (in 3-133)	10%

Note: a) Two types of volcanic glass are present:
- fragments of brown volcanic glass slightly altered (size 0.2 to 0.3 mm); index of refraction > 1.56
- colorless glass (size ≈0.1 mm) with index of refraction > 1.56 and < 1.56

b) Small blots of pyrite at 3-133.

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	5.5	0.2	44
2-120	2.2	0.3	16
3-100	3.7	0.3	28

Grain Size:

	Sand	Silt	Clay
1-139	1.5	54.5	44.1
2-139	1.2	52.5	46.3
3-120	1.7	42.0	56.3

SITE SUMMARY SHEET

SITE 420 HOLE 420

Date occupied	10 May 1977 0800 hrs. LCT
Date departed	11 May 1977 1822 hrs. LCT
Time on hole	42.5 hours
Position: latitude	09° 00.10'N
longitude	106° 06.77'W
Water depth (sea level)	3381 corrected meters, echo sounding
Water depth (rig floor)	3397 corrected meters, echo sounding
Bottom felt at	3404 meters, drill pipe
Penetration	147.0 meters
Number of holes	1
Number of cores	17
Total length of cored section	147.0 meters
Total core recovered	95.07 meters
Percentage core recovery	65%

Oldest Sediment Cored

Depth sub-bottom	118.5 meters
Nature	foraminiferal-nannofossil ooze
Age	Pliocene
Measured velocity	1.5 km/sec

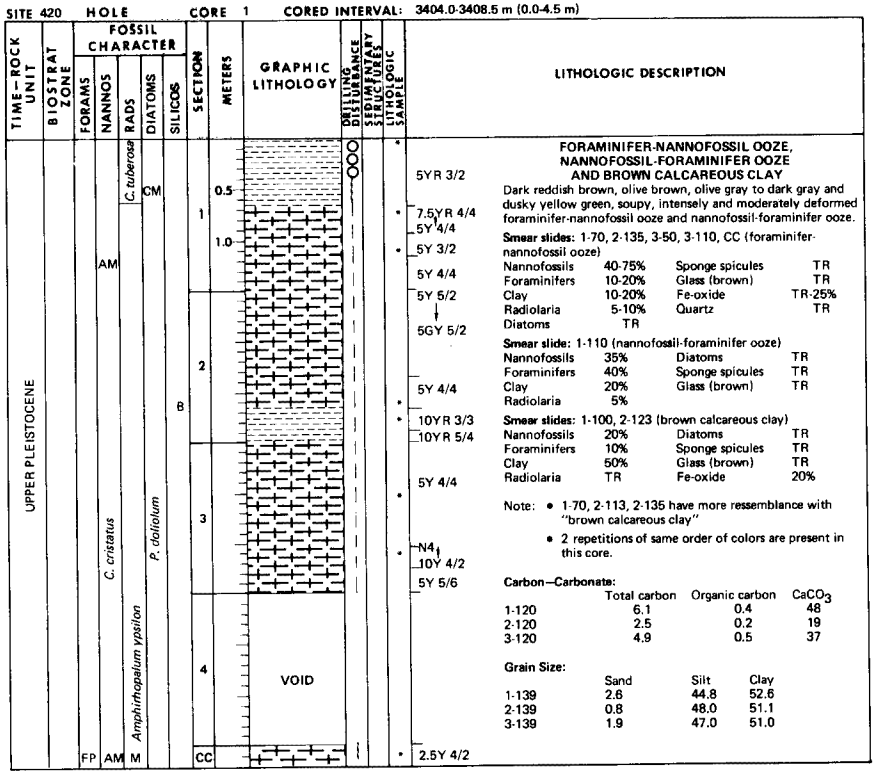
Basement

Depth sub-bottom	19.0 meters
Nature	basalt
Velocity range	5.2 km/sec

Principal Results:

Continuously cored 115 meters of foraminiferal-nannofossil ooze, nannofossil ooze, siliceous nannofossil ooze, and brown calcareous clay, and 32 meters of fractured rock. Recovered rocks are sparsely plagioclase phyric and moderately plagioclase phyric fractionated tholeiitic basalts. Recovery was high in sedimentation section, very low in basalts. Site lies in the Gilbert reversed magnetic epoch and an age of slightly more than 3.37 m.y. was assigned to basement.

SITE 420 HOLE CORE 1 CORED INTERVAL: 3404.0-3408.5 m (0.0-4.5 m)



FORAMINIFER-NANNOFOSSIL OOZE, NANNOFOSSIL-FORAMINIFER OOZE AND BROWN CALCAREOUS CLAY

Dark reddish brown, olive brown, olive gray to dark gray and dusky yellow green, soupy, intensely and moderately deformed foraminifer-nannofossil ooze and nannofossil-foraminifer ooze.

Smear slides: 1-70, 2-135, 3-50, 3-110, CC (foraminifer-nannofossil ooze)

Nannofossils	40-75%	Sponge spicules	TR
Foraminifers	10-20%	Glass (brown)	TR
Clay	10-20%	Fe-oxide	TR-25%
Radiolaria	5-10%	Quartz	TR
Diatoms	TR		

Smear slide: 1-110 (nannofossil-foraminifer ooze)

Nannofossils	35%	Diatoms	TR
Foraminifers	40%	Sponge spicules	TR
Clay	20%	Glass (brown)	TR
Radiolaria	5%		

Smear slides: 1-100, 2-123 (brown calcareous clay)

Nannofossils	20%	Diatoms	TR
Foraminifers	10%	Sponge spicules	TR
Clay	50%	Glass (brown)	TR
Radiolaria	TR	Fe-oxide	20%

Note:
- 1-70, 2-113, 2-135 have more ressemblance with "brown calcareous clay"
- 2 repetitions of same order of colors are present in this core.

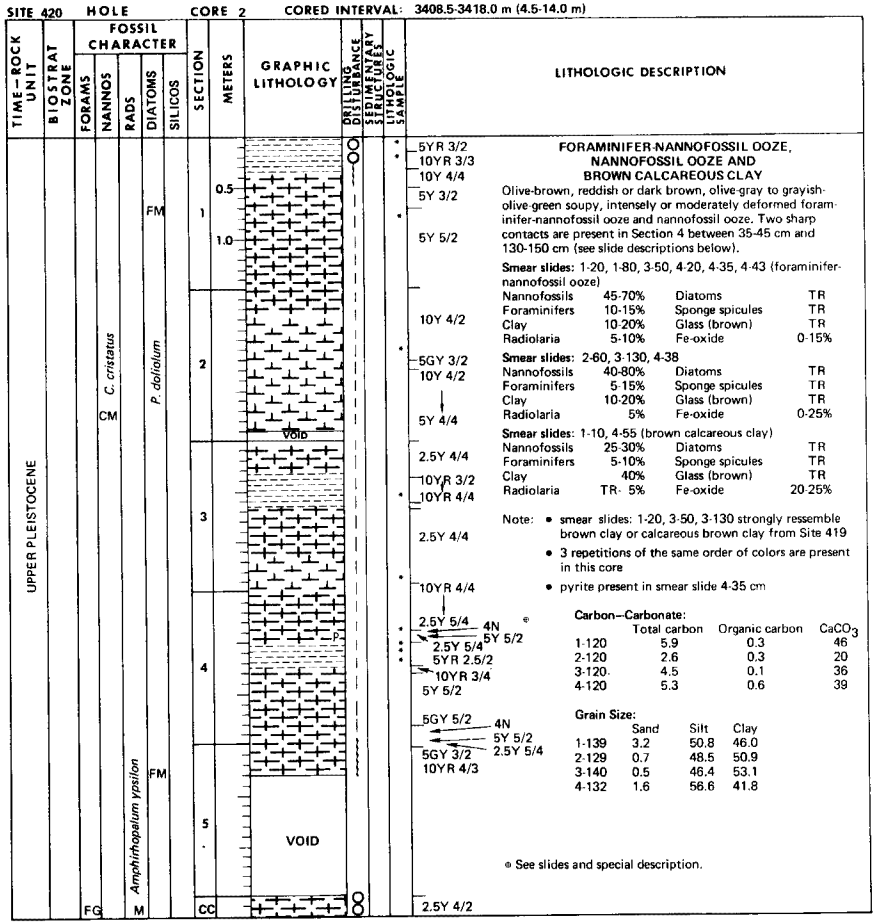
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	6.1	0.4	48
2-120	2.5	0.2	19
3-120	4.9	0.5	37

Grain Size:

	Sand	Silt	Clay
1-139	2.6	44.8	52.6
2-139	0.8	48.0	51.1
3-139	1.9	47.0	51.0

SITE 420 HOLE CORE 2 CORED INTERVAL: 3408.5-3418.0 m (4.5-14.0 m)



FORAMINIFER-NANNOFOSSIL OOZE, NANNOFOSSIL OOZE AND BROWN CALCAREOUS CLAY

Olive-brown, reddish or dark brown, olive-gray to grayish-olive-green soupy, intensely or moderately deformed foraminifer-nannofossil ooze and nannofossil ooze. Two sharp contacts are present in Section 4 between 35-45 cm and 130-150 cm (see slide descriptions below).

Smear slides: 1-20, 1-80, 3-50, 4-20, 4-35, 4-43 (foraminifer-nannofossil ooze)

Nannofossils	45-70%	Diatoms	TR
Foraminifers	10-15%	Sponge spicules	TR
Clay	10-20%	Glass (brown)	TR
Radiolaria	5-10%	Fe-oxide	0-15%

Smear slides: 2-60, 3-130, 4-38

Nannofossils	40-80%	Diatoms	TR
Foraminifers	5-15%	Sponge spicules	TR
Clay	10-20%	Glass (brown)	TR
Radiolaria	5%	Fe-oxide	0-25%

Smear slides: 1-10, 4-55 (brown calcareous clay)

Nannofossils	25-30%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	40%	Glass (brown)	TR
Radiolaria	TR- 5%	Fe-oxide	20-25%

Note:
- smear slides: 1-20, 3-50, 3-130 strongly ressemble brown clay or calcareous brown clay from Site 419
- 3 repetitions of the same order of colors are present in this core
- pyrite present in smear slide 4-35 cm

Carbon–Carbonate:

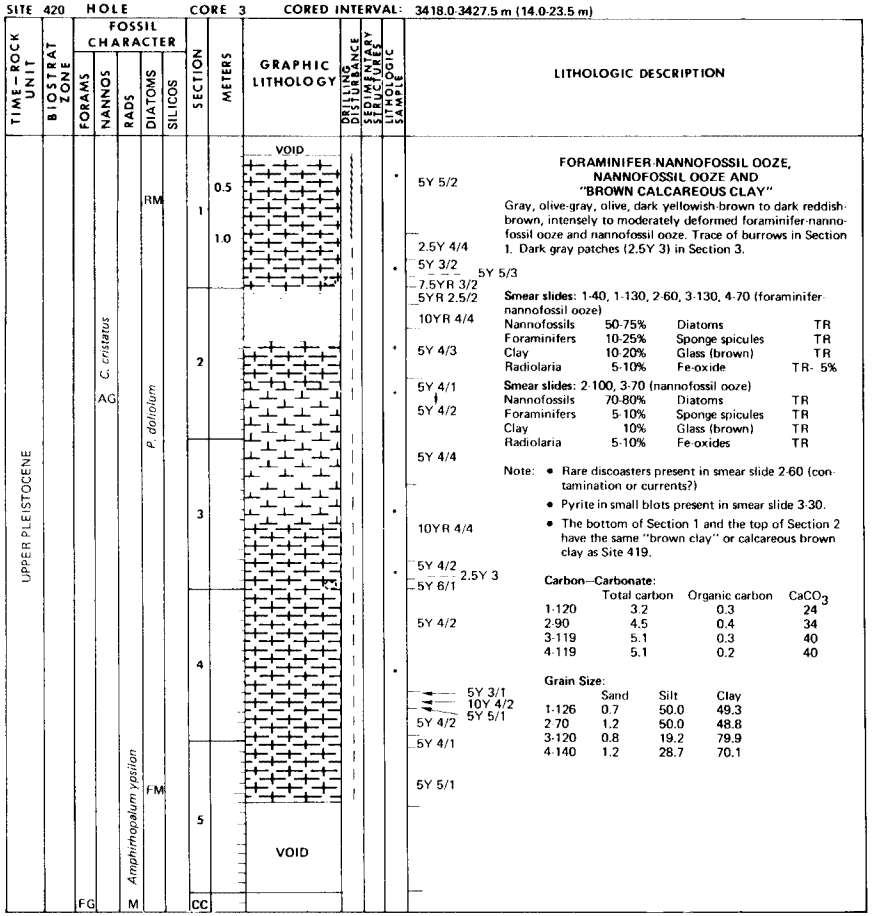
	Total carbon	Organic carbon	$CaCO_3$
1-120	5.9	0.3	46
2-120	2.6	0.3	20
3-120	4.5	0.1	36
4-120	5.3	0.6	39

Grain Size:

	Sand	Silt	Clay
1-139	3.2	50.8	46.0
2-129	0.7	48.5	50.9
3-140	0.5	46.4	53.1
4-132	1.6	56.6	41.8

⊕ See slides and special description.

SITE 420 HOLE CORE 3 CORED INTERVAL: 3418.0-3427.5 m (14.0-23.5 m)



FORAMINIFER-NANNOFOSSIL OOZE, NANNOFOSSIL OOZE AND "BROWN CALCAREOUS CLAY"

Gray, olive-gray, olive, dark yellowish-brown to dark reddish-brown, intensely to moderately deformed foraminifer-nannofossil ooze and nannofossil ooze. Trace of burrows in Section 1. Dark gray patches (2.5Y 3) in Section 3.

Smear slides: 1-40, 1-130, 2-60, 3-130, 4-70 (foraminifer-nannofossil ooze)

Nannofossils	50-75%	Diatoms	TR
Foraminifers	10-25%	Sponge spicules	TR
Clay	10-20%	Glass (brown)	TR
Radiolaria	5-10%	Fe-oxide	TR-5%

Smear slides: 2-100, 3-70 (nannofossil ooze)

Nannofossils	70-80%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5-10%	Fe-oxides	TR

Note:
- Rare discoasters present in smear slide 2-60 (contamination or currents?)
- Pyrite in small blots present in smear slide 3-30.
- The bottom of Section 1 and the top of Section 2 have the same "brown clay" or calcareous brown clay as Site 419.

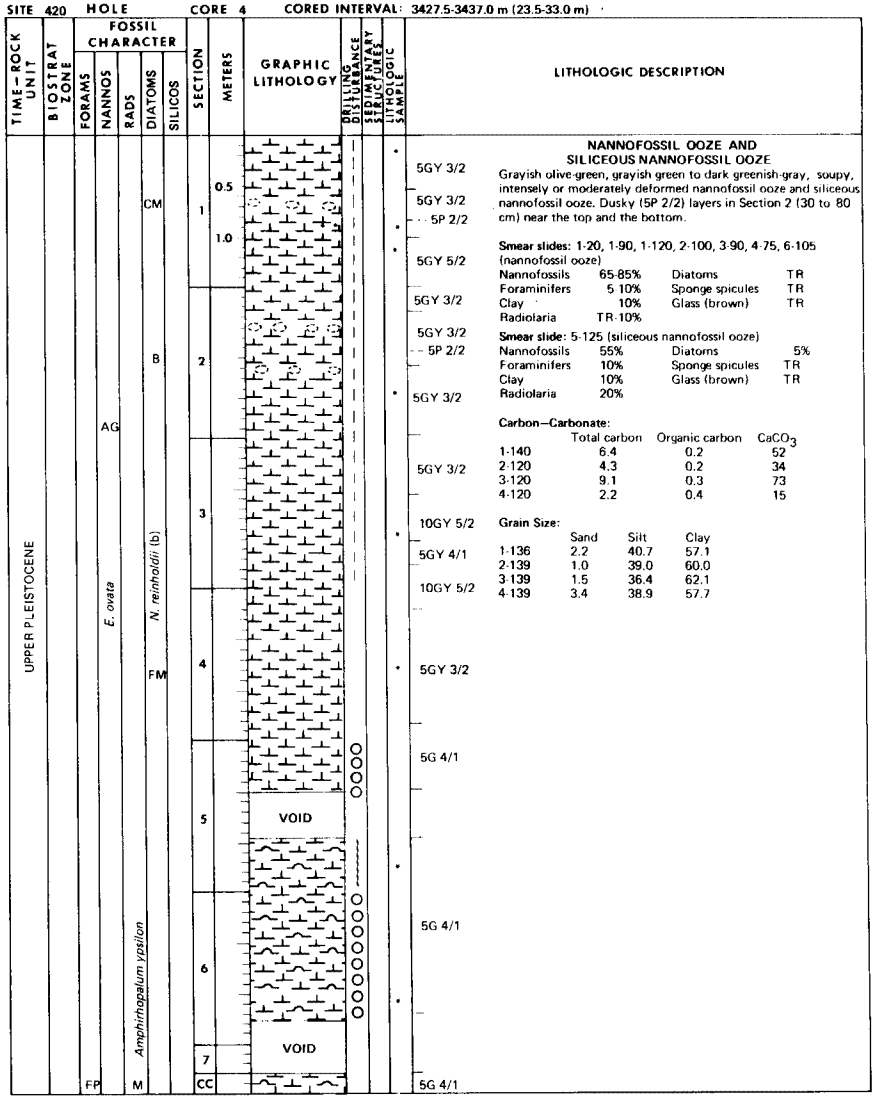
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	3.2	0.3	24
2-90	4.5	0.4	34
3-119	5.1	0.3	40
4-119	5.1	0.2	40

Grain Size:

	Sand	Silt	Clay
1-126	0.7	50.0	49.3
2-70	1.2	50.0	48.8
3-120	0.8	19.2	79.9
4-140	1.2	28.7	70.1

SITE 420 HOLE CORE 4 CORED INTERVAL: 3427.5-3437.0 m (23.5-33.0 m)



NANNOFOSSIL OOZE AND SILICEOUS NANNOFOSSIL OOZE

Grayish olive-green, grayish green to dark greenish-gray, soupy, intensely or moderately deformed nannofossil ooze and siliceous nannofossil ooze. Dusky (5P 2/2) layers in Section 2 (30 to 80 cm) near the top and the bottom.

Smear slides: 1-20, 1-90, 1-120, 2-100, 3-90, 4-75, 6-105 (nannofossil ooze)

Nannofossils	65-85%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR-10%		

Smear slide: 5-125 (siliceous nannofossil ooze)

Nannofossils	55%	Diatoms	5%
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	20%		

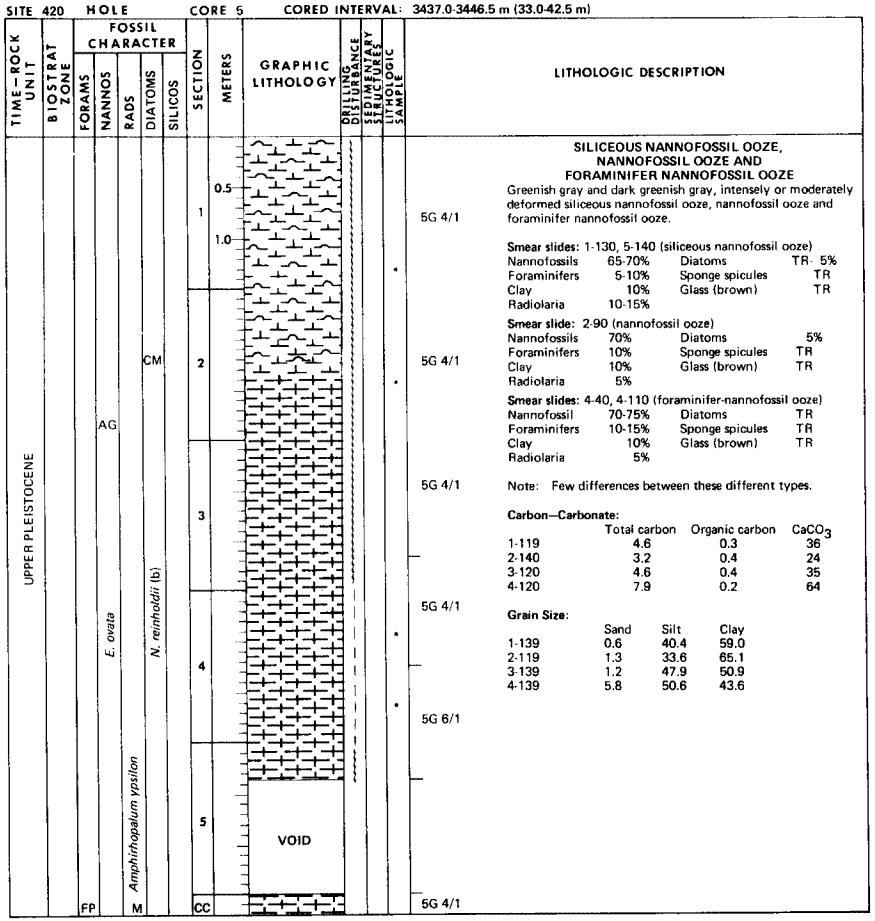
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-140	6.4	0.2	52
2-120	4.3	0.2	34
3-120	9.1	0.3	73
4-120	2.2	0.4	15

Grain Size:

	Sand	Silt	Clay
1-136	2.2	40.7	57.1
2-139	1.0	39.0	60.0
3-139	1.5	36.4	62.1
4-139	3.4	38.9	57.7

SITE 420 HOLE CORE 5 CORED INTERVAL: 3437.0-3446.5 m (33.0-42.5 m)



SILICEOUS NANNOFOSSIL OOZE, NANNOFOSSIL OOZE AND FORAMINIFER NANNOFOSSIL OOZE

Greenish gray and dark greenish gray, intensely or moderately deformed siliceous nannofossil ooze, nannofossil ooze and foraminifer nannofossil ooze.

Smear slides: 1-130, 5-140 (siliceous nannofossil ooze)

Nannofossils	65-70%	Diatoms	TR- 5%
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	10-15%		

Smear slide: 2-90 (nannofossil ooze)

Nannofossils	70%	Diatoms	5%
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%		

Smear slides: 4-40, 4-110 (foraminifer-nannofossil ooze)

Nannofossil	70-75%	Diatoms	TR
Foraminifers	10-15%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%		

Note: Few differences between these different types.

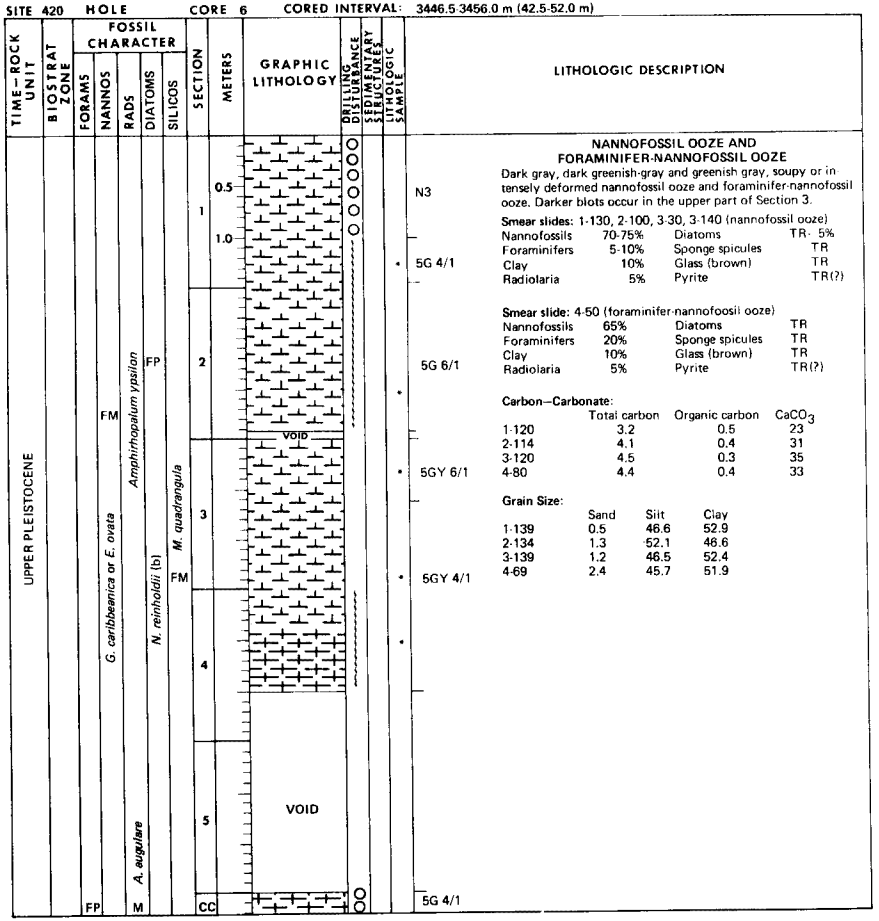
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-119	4.6	0.3	36
2-140	3.2	0.4	24
3-120	4.6	0.4	35
4-120	7.9	0.2	64

Grain Size:

	Sand	Silt	Clay
1-139	0.6	40.4	59.0
2-119	1.3	33.6	65.1
3-139	1.2	47.9	50.9
4-139	5.8	50.6	43.6

SITE 420 HOLE CORE 6 CORED INTERVAL: 3446.5-3456.0 m (42.5-52.0 m)



NANNOFOSSIL OOZE AND FORAMINIFER-NANNOFOSSIL OOZE

Dark gray, dark greenish-gray and greenish gray, soupy or in tensely deformed nannofossil ooze and foraminifer-nannofossil ooze. Darker blots occur in the upper part of Section 3.

Smear slides: 1-130, 2-100, 3-30, 3-140 (nannofossil ooze)

Nannofossils	70-75%	Diatoms	TR- 5%
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR(?)

Smear slide: 4-50 (foraminifer-nannofoosil ooze)

Nannofossils	65%	Diatoms	TR
Foraminifers	20%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR(?)

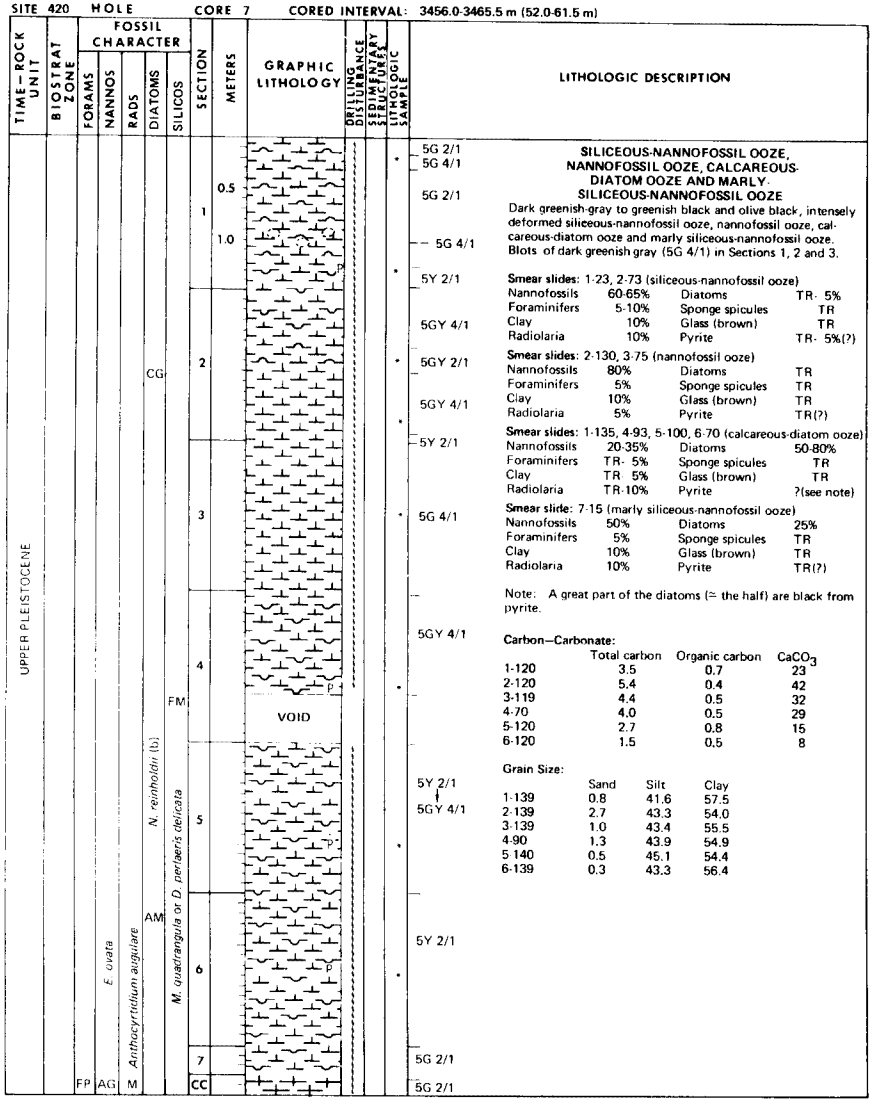
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	3.2	0.5	23
2-114	4.1	0.4	31
3-120	4.5	0.3	35
4-80	4.4	0.4	33

Grain Size:

	Sand	Silt	Clay
1-139	0.5	46.6	52.9
2-134	1.3	52.1	46.6
3-139	1.2	46.5	52.4
4-69	2.4	45.7	51.9

SITE 420 HOLE CORE 7 CORED INTERVAL: 3456.0-3465.5 m (52.0-61.5 m)



SILICEOUS-NANNOFOSSIL OOZE, NANNOFOSSIL OOZE, CALCAREOUS-DIATOM OOZE AND MARLY-SILICEOUS-NANNOFOSSIL OOZE

Dark greenish-gray to greenish black and olive black, intensely deformed siliceous-nannofossil ooze, nannofossil ooze, calcareous-diatom ooze and marly siliceous-nannofossil ooze. Blots of dark greenish gray (5G 4/1) in Sections 1, 2 and 3.

Smear slides: 1-23, 2-73 (siliceous-nannofossil ooze)

Nannofossils	60-65%	Diatoms	TR- 5%
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	10%	Pyrite	TR- 5%(?)

Smear slides: 2-130, 3-75 (nannofossil ooze)

Nannofossils	80%	Diatoms	TR
Foraminifers	5%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR(?)

Smear slides: 1-135, 4-93, 5-100, 6-70 (calcareous-diatom ooze)

Nannofossils	20-35%	Diatoms	50-80%
Foraminifers	TR- 5%	Sponge spicules	TR
Clay	TR- 5%	Glass (brown)	TR
Radiolaria	TR-10%	Pyrite	?(see note)

Smear slide: 7-15 (marly siliceous-nannofossil ooze)

Nannofossils	50%	Diatoms	25%
Foraminifers	5%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	10%	Pyrite	TR(?)

Note: A great part of the diatoms (≃ the half) are black from pyrite.

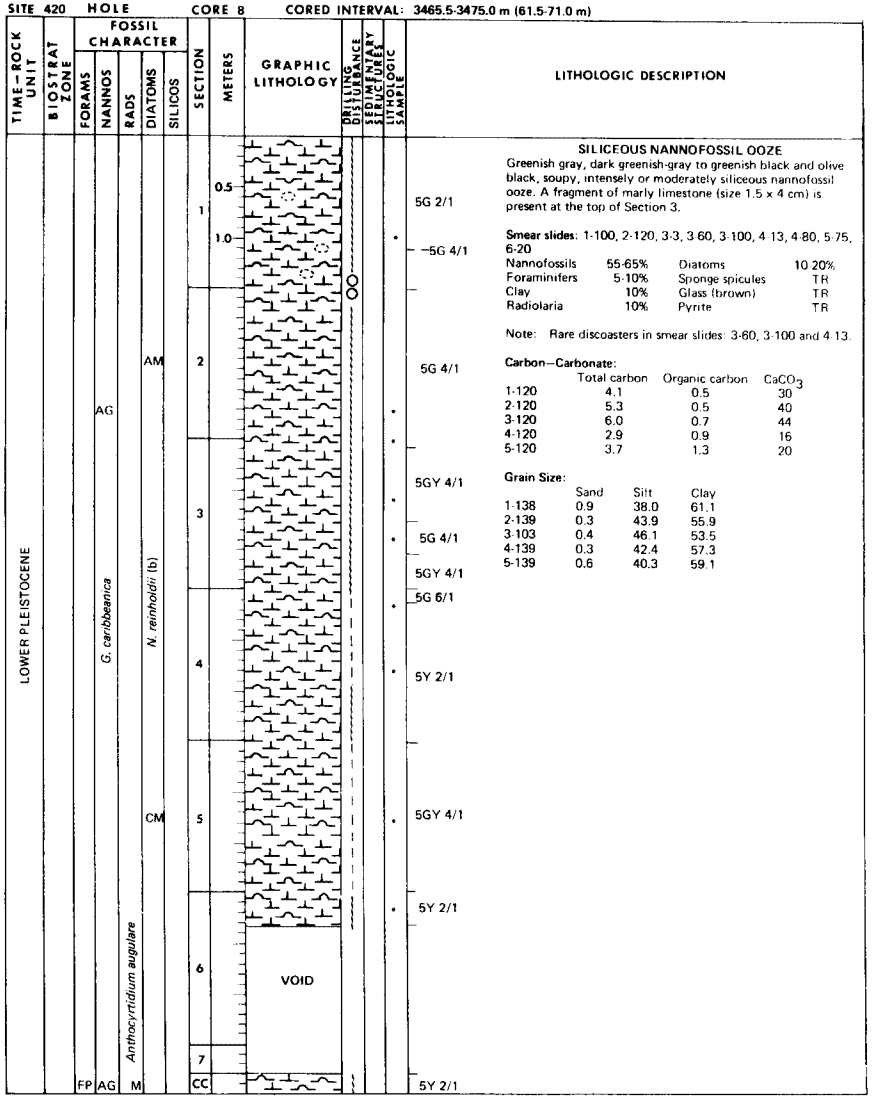
Carbon-Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	3.5	0.7	23
2-120	5.4	0.4	42
3-119	4.4	0.5	32
4-70	4.0	0.5	29
5-120	2.7	0.8	15
6-120	1.5	0.5	8

Grain Size:

	Sand	Silt	Clay
1-139	0.8	41.6	57.5
2-139	2.7	43.3	54.0
3-139	1.0	43.4	55.5
4-90	1.3	43.9	54.9
5-140	0.5	45.1	54.4
6-139	0.3	43.3	56.4

SITE 420 HOLE CORE 8 CORED INTERVAL: 3465.5-3475.0 m (61.5-71.0 m)



SILICEOUS NANNOFOSSIL OOZE

Greenish gray, dark greenish-gray to greenish black and olive black, soupy, intensely or moderately siliceous nannofossil ooze. A fragment of marly limestone (size 1.5 x 4 cm) is present at the top of Section 3.

Smear slides: 1-100, 2-120, 3-3, 3-60, 3-100, 4-13, 4-80, 5-75, 6-20

Nannofossils	55-65%	Diatoms	10-20%
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	10%	Pyrite	TR

Note: Rare discoasters in smear slides: 3-60, 3-100 and 4-13.

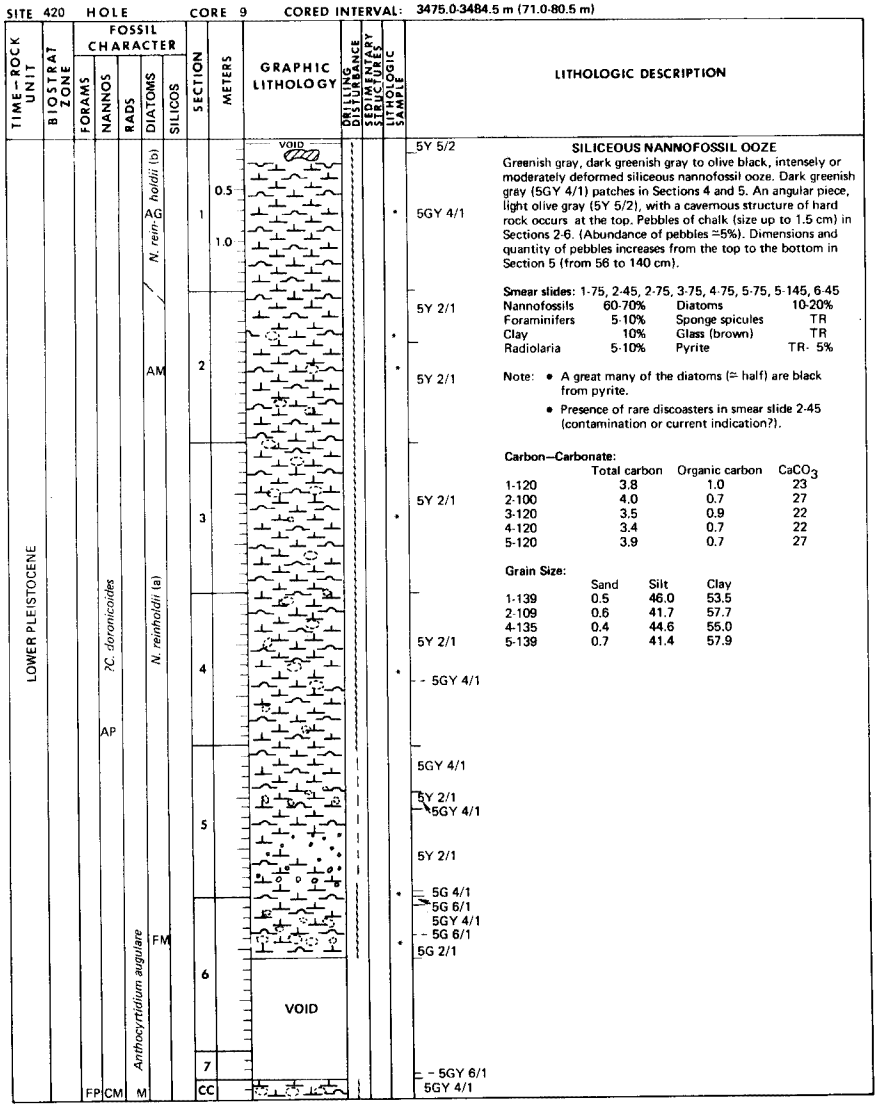
Carbon-Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	4.1	0.5	30
2-120	5.3	0.5	40
3-120	6.0	0.7	44
4-120	2.9	0.9	16
5-120	3.7	1.3	20

Grain Size:

	Sand	Silt	Clay
1-138	0.9	38.0	61.1
2-139	0.3	43.9	55.9
3-103	0.4	46.1	53.5
4-139	0.3	42.4	57.3
5-139	0.6	40.3	59.1

SITE 420 HOLE CORE 9 CORED INTERVAL: 3475.0-3484.5 m (71.0-80.5 m)



SILICEOUS NANNOFOSSIL OOZE

Greenish gray, dark greenish gray to olive black, intensely or moderately deformed siliceous nannofossil ooze. Dark greenish gray (5GY 4/1) patches in Sections 4 and 5. An angular piece, light olive gray (5Y 5/2), with a cavernous structure of hard rock occurs at the top. Pebbles of chalk (size up to 1.5 cm) in Sections 2-6. (Abundance of pebbles ≈5%). Dimensions and quantity of pebbles increases from the top to the bottom in Section 5 (from 56 to 140 cm).

Smear slides: 1-75, 2-45, 2-75, 3-75, 4-75, 5-75, 5-145, 6-45

Nannofossils	60-70%	Diatoms	10-20%
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5-10%	Pyrite	TR- 5%

Note:
- A great many of the diatoms (≈ half) are black from pyrite.
- Presence of rare discoasters in smear slide 2-45 (contamination or current indication?).

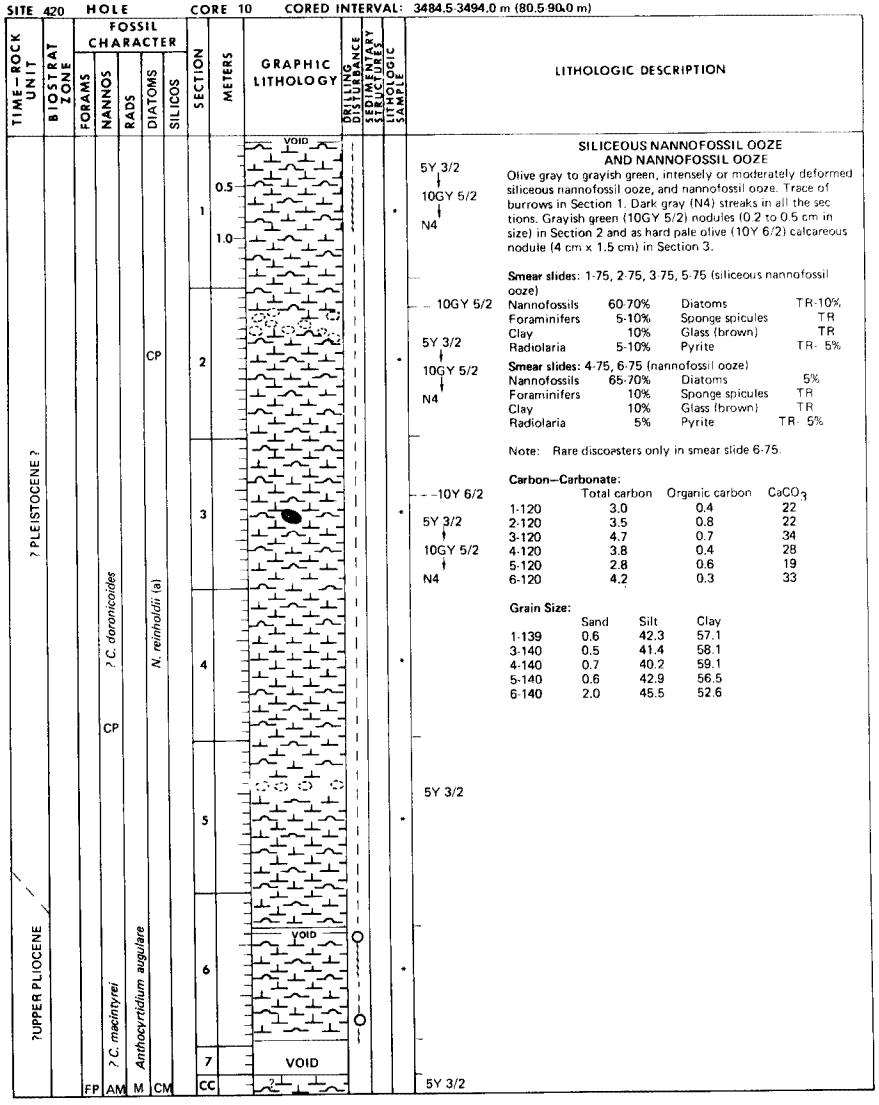
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	3.8	1.0	23
2-100	4.0	0.7	27
3-120	3.5	0.9	22
4-120	3.4	0.7	22
5-120	3.9	0.7	27

Grain Size:

	Sand	Silt	Clay
1-139	0.5	46.0	53.5
2-109	0.6	41.7	57.7
4-135	0.4	44.6	55.0
5-139	0.7	41.4	57.9

SITE 420 HOLE CORE 10 CORED INTERVAL: 3484.5-3494.0 m (80.5-90.0 m)



SILICEOUS NANNOFOSSIL OOZE AND NANNOFOSSIL OOZE

Olive gray to grayish green, intensely or moderately deformed siliceous nannofossil ooze, and nannofossil ooze. Trace of burrows in Section 1. Dark gray (N4) streaks in all the sections. Grayish green (10GY 5/2) nodules (0.2 to 0.5 cm in size) in Section 2 and as hard pale olive (10Y 6/2) calcareous nodule (4 cm x 1.5 cm) in Section 3.

Smear slides: 1-75, 2-75, 3-75, 5-75 (siliceous nannofossil ooze)

Nannofossils	60-70%	Diatoms	TR-10%
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5-10%	Pyrite	TR- 5%

Smear slides: 4-75, 6-75 (nannofossil ooze)

Nannofossils	65-70%	Diatoms	5%
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR- 5%

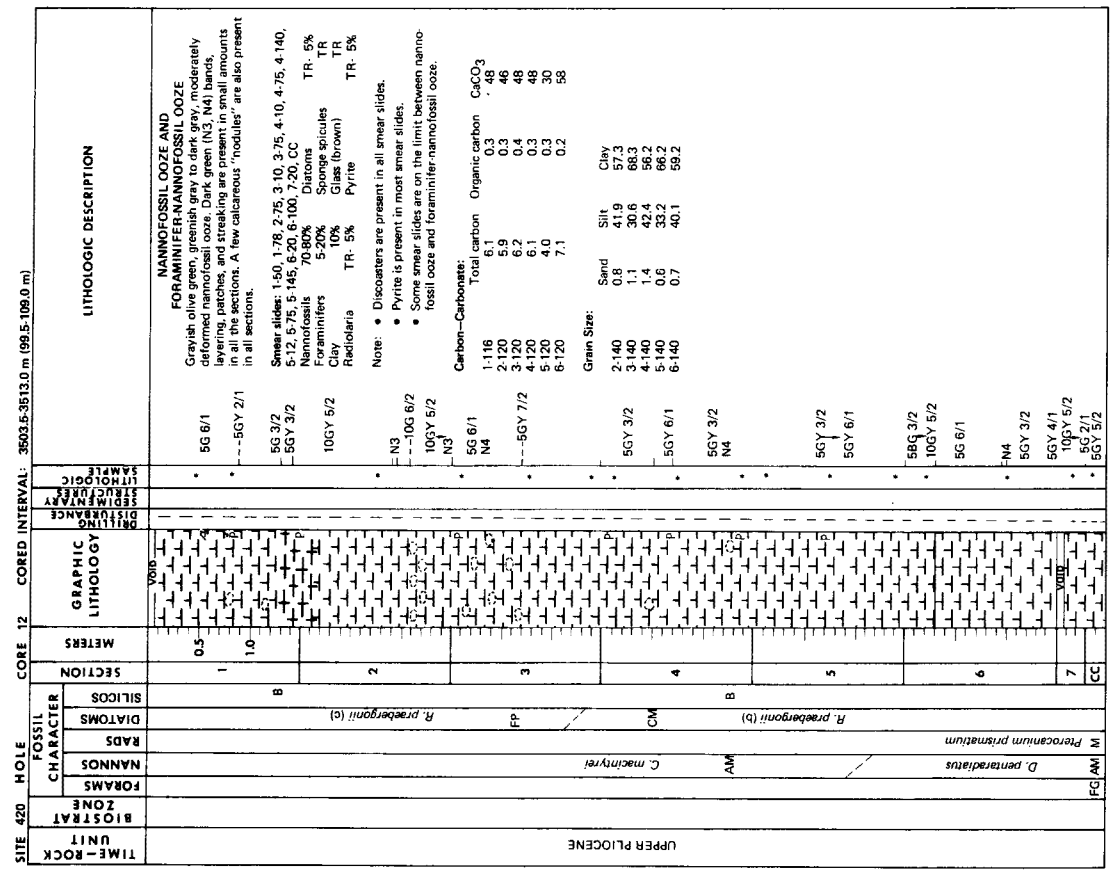
Note: Rare discoasters only in smear slide 6-75.

Carbon–Carbonate:

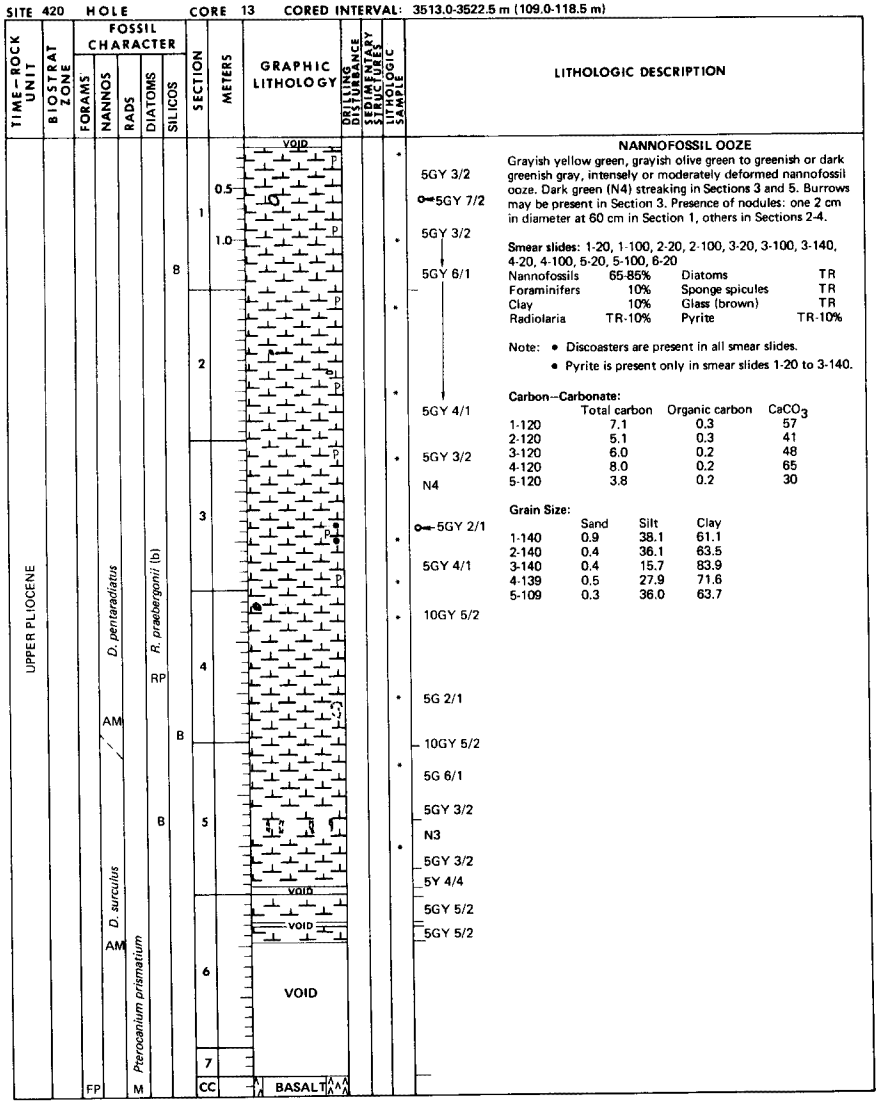
	Total carbon	Organic carbon	$CaCO_3$
1-120	3.0	0.4	22
2-120	3.5	0.8	22
3-120	4.7	0.7	34
4-120	3.8	0.4	28
5-120	2.8	0.6	19
6-120	4.2	0.3	33

Grain Size:

	Sand	Silt	Clay
1-139	0.6	42.3	57.1
3-140	0.5	41.4	58.1
4-140	0.7	40.2	59.1
5-140	0.6	42.9	56.5
6-140	2.0	45.5	52.6


SITE 420 HOLE CORE 12 CORED INTERVAL: 3503.5-3513.0 m (99.5-109.0 m)
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
DIATOMS
SILICOS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
UPPER PLIOCENE
C. macintyrei
Pterocanium prismatium
R. praebergonii (c)
R. praebergonii (b)
D. penteradiatus
NANNOFOSSIL OOZE AND FORAMINIFER-NANNOFOSSIL OOZE
Grayish olive green, greenish gray to dark gray, moderately deformed nannofossil ooze. Dark green (N3, N4) bands, layering, patches, and streaking are present in small amounts in all the sections. A few calcareous "nodules" are also present in all sections.
Smear slides: 1-50, 1-78, 2-75, 3-10, 3-75, 4-10, 4-75, 4-140, 5-12, 5-75, 5-145, 6-20, 6-100, 7-20, CC
Nannofossils 70-80% Diatoms TR- 5%
Foraminifers 5-20% Sponge spicules TR
Clay 10% Glass (brown) TR
Radiolaria TR- 5% Pyrite TR- 5%
Note: • Discoasters are present in all smear slides.
• Pyrite is present in most smear slides.
• Some smear slides are on the limit between nannofossil ooze and foraminifer-nannofossil ooze.
Carbon–Carbonate:
1-116 Total carbon 6.1 Organic carbon 0.3 CaCO3 48
2-120 5.9 0.3 46
3-120 6.2 0.4 48
4-120 6.1 0.3 48
5-120 4.0 0.3 30
6-120 7.1 0.2 58
Grain Size:
2-140 Sand 0.8 Silt 41.9 Clay 57.3
3-140 1.1 30.6 68.3
4-140 1.4 42.4 56.2
5-140 0.6 33.2 66.2
6-140 0.7 40.1 59.2
5G 6/1
5G 3/2
5GY 3/2
10GY 5/2
N3
5G 6/1
N4
5GY 3/2
5GY 6/1
5GY 4/1
10GY 5/2
5G 2/1
5GY 5/2
VOID
SITE 420 HOLE CORE 11 CORED INTERVAL: 3494.0-3503.5 m (90.0-99.5 m)
TIME–ROCK UNIT
BIOSTRAT ZONE
FOSSIL CHARACTER
FORAMS
NANNOS
RADS
DIATOMS
SILICOS
SECTION
METERS
GRAPHIC LITHOLOGY
DRILLING DISTURBANCE
SEDIMENTARY STRUCTURES
LITHOLOGIC SAMPLE
LITHOLOGIC DESCRIPTION
UPPER PLIOCENE
C. macintyrei
Pterocanium prismatium
R. praebergonii (c)
N. reinholdii (a)
SILICEOUS NANNOFOSSIL OOZE GRADING DOWNWARD TO NANNOFOSSIL OOZE
Greenish gray to grayish green, soupy, intensely or moderately deformed siliceous-nannofossil ooze and nannofossil ooze. Presence of bluish gray (5B 5/1) streaking in Section 1. Trace of burrows in Section 3.
Smear slides: 1-50, 2-75, 3-75 (siliceous nannofossil ooze)
Nannofossils 55-65% Diatoms 10-15%
Foraminifers 5-10% Sponge spicules TR
Clay 10% Glass (brown) TR
Radiolaria 10% Pyrite TR- 5%
Smear slide: 4-25 (nannofossil ooze)
Nannofossils 70% Diatoms 5%
Foraminifers 10% Sponge spicules TR
Clay 10% Glass TR
Radiolaria 5% Pyrite TR
Note: • Discoasters are very rare at the top of the core and abundant at the bottom.
• Pyrite present in small amounts in all the sections.
Carbon–Carbonate:
Total carbon Organic carbon CaCO3
2-120 7.4 0.4 59
3-120 7.6 0.3 61
Grain Size:
Sand Silt Clay
1-140 0.5 38.9 60.6
5G 6/1
5B 5/1
5Y 4/1
5G 6/1
N4
10GY 5/2
5G 5/2
5GY 3/2
5G 5/2
VOID

SITE 420 HOLE CORE 13 CORED INTERVAL: 3513.0-3522.5 m (109.0-118.5 m)



NANNOFOSSIL OOZE

Grayish yellow green, grayish olive green to greenish or dark greenish gray, intensely or moderately deformed nannofossil ooze. Dark green (N4) streaking in Sections 3 and 5. Burrows may be present in Section 3. Presence of nodules: one 2 cm in diameter at 60 cm in Section 1, others in Sections 2-4.

Smear slides: 1-20, 1-100, 2-20, 2-100, 3-20, 3-100, 3-140, 4-20, 4-100, 5-20, 5-100, 6-20

Nannofossils	65-85%	Diatoms	TR
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR-10%	Pyrite	TR-10%

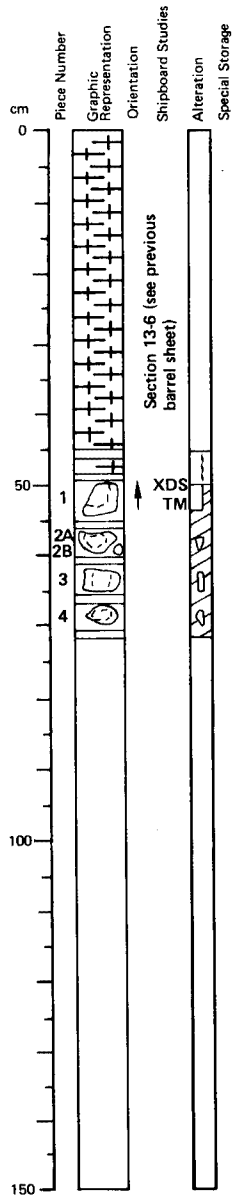
Note: • Discoasters are present in all smear slides.
• Pyrite is present only in smear slides 1-20 to 3-140.

Carbon--Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	7.1	0.3	57
2-120	5.1	0.3	41
3-120	6.0	0.2	48
4-120	8.0	0.2	65
5-120	3.8	0.2	30

Grain Size:

	Sand	Silt	Clay
1-140	0.9	38.1	61.1
2-140	0.4	36.1	63.5
3-140	0.4	15.7	83.9
4-139	0.5	27.9	71.6
5-109	0.3	36.0	63.7



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 0		1 3	CC

Depth: 3519.5 m to 3522.5 m

0-45 cm contains section 420-13-6, described on previous barrel sheet. The Core Catcher (CC) sample was placed in the same liner, and extends from 45-72 cm.

ROCK TYPE AND STRUCTURE
Very sparsely plagioclase phyric fine-grained fresh to moderately altered basalt.

TEXTURE
Aphanitic, 2-3% vesicles up to 2 mm.

MINERALOGY
Rare plagioclase phenocrysts up to 2 mm long. Groundmass unresolvable in hand specimens.

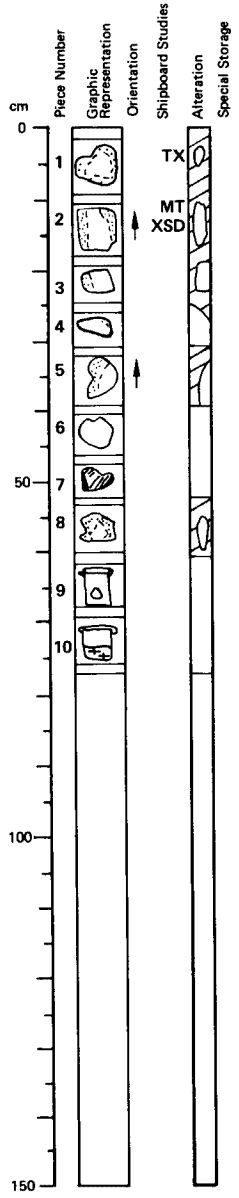
ALTERATION
Prominent 1-3 cm alteration rinds on all pieces. Vesicles filled with green clays in altered rims. Piece 1 has thin alteration veins traversing outer altered rim. External surfaces have thin patches of iron oxide "rust"-colored material.

SEDIMENTS
Upper 2 cm of CC sample are same as in 13-6, only they had been wedged around basalt piece 1 by drilling. They may not represent the basalt-sediment contact, but are as close to it as we have.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Vesicles	Alteration
50-57 cm (Piece 1):	18.4	4.7	–	70.8	6.3	2.1

Glass = spherulitic groundmass of unresolvable minerals.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 0		1 4	1

Depth: 3522.5 m to 3532.0 m

ROCK TYPE AND STRUCTURE
Fine-grained, fresh to moderately altered, very sparsely plagioclase phyric or aphyric basalt. Exterior surfaces are fracture or joint surfaces, in some pieces parallel to alteration rinds.

TEXTURE
Aphanitic to glassy, with scattered tiny (less than 1 mm) round or tubular vesicles (less than 2%).

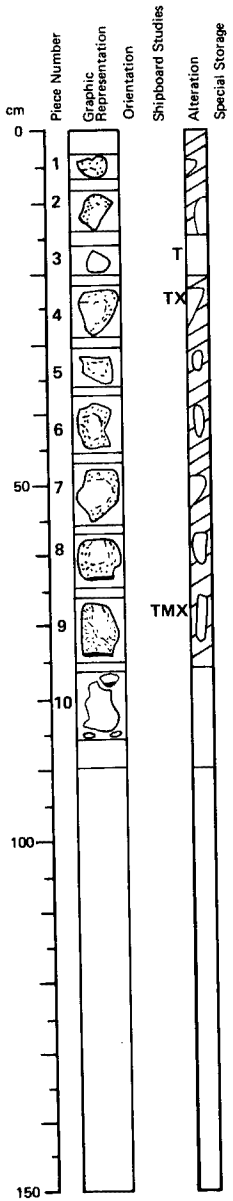
MINERALOGY
Rare 1-2 mm plagioclase phenocrysts. Perhaps a few very rare weathered olivines.

ALTERATION
Prominent 1-2 cm dark gray weathering rinds on many pieces generally parallel to jointing and perpendicular to glassy edges (which are flat). Secondary minerals (green clays and Fe-oxides) fill vesicles in altered rims. Joint surfaces partly coated with a thin Fe-oxide crust.

Note: Last two slots (9 and 10) are 10cc bottles containing (9) a small basalt piece and some basalt chips, and (10) a drilling slurry of sediments and basalt chips. Neither 9 or 10 are in place.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Vesicles	Alteration
1-8 cm (Piece 1):	46.5	27.7	–	24.1	1.5	0.2



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 0		1 5	1

Depth: 3532.0 m to 3541.5 m

ROCK TYPE AND STRUCTURE

Fine-grained, fresh to moderately altered, very sparsely plagioclase phyric or aphyric basalt. Exterior surfaces are fracture or joint surfaces, in some pieces parallel to alteration rinds. Pieces 8-10 have glassy edges, 8 and 9 in particular having flat glassy edges perpendicular to joint/fracture surfaces. Pieces 8 and 9 may be inverted as shown (the glassy edges may represent upper surfaces of cooling units), but their width does not exceed the liner diameter, hence they must be considered unoriented pieces.

TEXTURE

Aphanitic to glassy, with scattered tiny (less than 1 mm) round or tubular vesicles, abundant (up to 20%) in Pieces 1, 2, 6, and 7.

MINERALOGY

Rare 1-2 mm plagioclase phenocrysts. Tiny elongate skeletal plagioclase can form up to 15% of sawed surfaces in hand samples. Rest of groundmass is unresolvable.

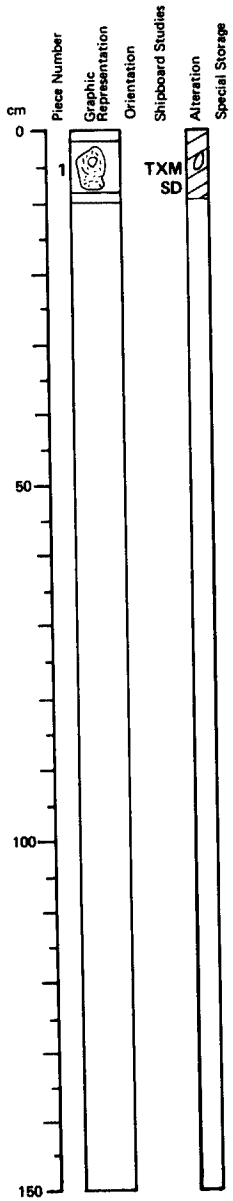
ALTERATION

Prominent 1-3 cm dark gray alteration rinds on most pieces. Vesicles in rinds filled with green clays or rust colored Fe-oxide minerals. Pieces 6 and 9 have thin veins with brown clays and/or calcite. Vesicles in 9 may have a zeolite in them.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Vesicles	Alt. Min.
15-19 cm (Piece 3):	5.0	1.8	1.4	90.5	1.3	–
22-27 cm (Piece 4):	25.2	6.4	0.7	66.8	0.9	–
69-72 cm (Piece 9):	11.1	1.7	<0.1	86.6	0.3	0.3

Glass = spherulitic groundmass of unresolvable minerals. Opaques present but too tiny to count and are included in glass.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 0		1 6	1

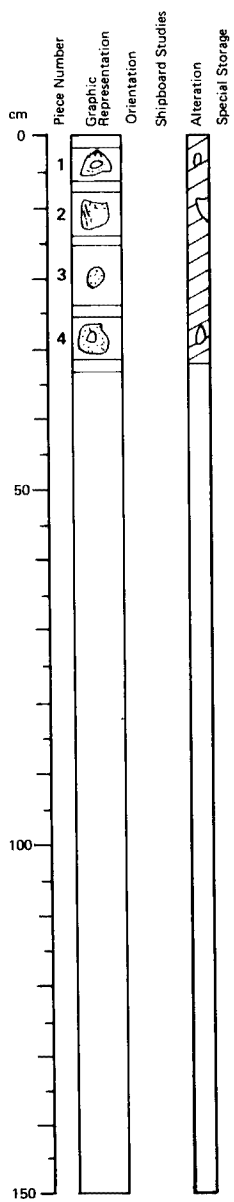
Depth: 3541.5 m to 3545.5 m

Piece 1:
Very sparsely plagioclase phyric fine-grained basalt. Vesicles in weathering rind filled by white crusts and green clay. Possibly some sulfides in vesicles. Irridescent Fe-oxide and Fe-stained translucent vesicle fillings.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Vesicles	Alteration
2-10 cm (Piece 1):	8.8	4.4	1.3	83.3	2.8	–

Glass = spherulitic groundmass of unresolvable minerals. Includes opaques, which were too tiny to count.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
54	420		17	1

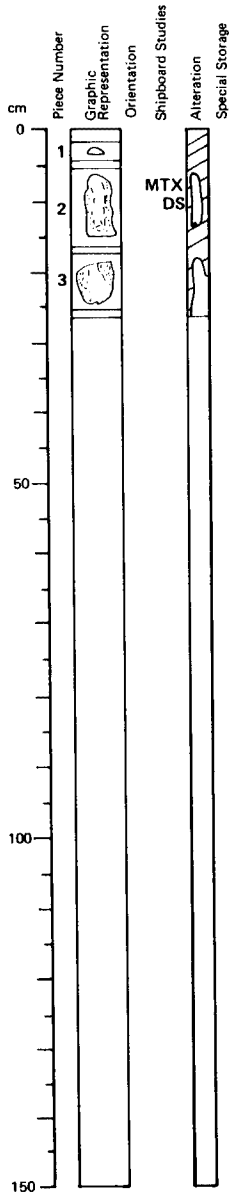
Depth: 3545.5 m to 3551.0 m

ROCK TYPE AND STRUCTURE
Fine-grained very sparsely plagioclase phyric basalt. Piece 1 has thin glassy rim. Fresh cores, moderately altered rims.

TEXTURE
Aphanitic to glassy. Plagioclase crystals are more prominent against the darker groundmass near the glassy rim of Piece 1. All pieces have 1-2% 0.5 mm vesicles, empty in fresh "cores", filled with clays in altered rims.

MINERALOGY
Plagioclase phenocrysts 1-2 mm very rare. Elongate or radiating clumps of tiny (1 mm or less) plagioclase crystals especially prominent in Piece 1.

ALTERATION
Prominent dark gray alteration rinds on all pieces. Vesicles filled with green or white clays in these rinds. Piece 1 has fragments of a pale yellow white non-carbonate crack filling on one of its exterior surfaces, probably originally a joint surface.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
54	420			Bit

Depth: Not known

Samples came up in bit. After retrieving Core 420-17, it was not possible to get back down to the depth reached at the end of Core 17. Therefore, the pieces recovered here probably fell down the hole and were cored above the deepest penetration achieved in the hole.

ROCK TYPE AND STRUCTURE
Very sparsely plagioclase phyric fine-grained basalt. Piece 2 has a lower flat glassy edge. Exterior surfaces of pieces are joint or fracture surfaces.

TEXTURE
Aphanitic to glassy, with rare plagioclase phenocrysts (1-2 mm). Vesicles less than 1% and no more than 1-2 mm diameter.

MINERALOGY
Plagioclase phenocrysts (rare). Unresolvable in groundmass.

ALTERATION
Alteration rinds prominent on Pieces 2 and 3. Exterior surfaces have thin dusky brown oxidation or Fe-Mn coatings.

SITE SUMMARY SHEET

SITE 420 HOLE 420A

Date occupied	11 May 1977 1936 hrs. LCT
Date departed	12 May 1977 0600 hrs. LCT
Time on hole	12.7 hours
Position: latitude	09°00.50'N
longitude	106°06.32'W
Water depth (sea level)	3382 corrected meters, echo sounding
Water depth (rig floor)	3398 corrected meters, echo sounding
Bottom felt at	3412 meters, drill pipe
Penetration	63.0 meters
Number of holes	1
Number of cores	1
Total length of cored section	6.0 meters
Total core recovered	6.05 meters
Percentage core recovery	100%

Oldest Sediment Cored

Depth sub-bottom	6.0 meters
Nature	foraminiferal-nannofossil ooze
Age	Pleistocene
Measured velocity	1.5 km/sec

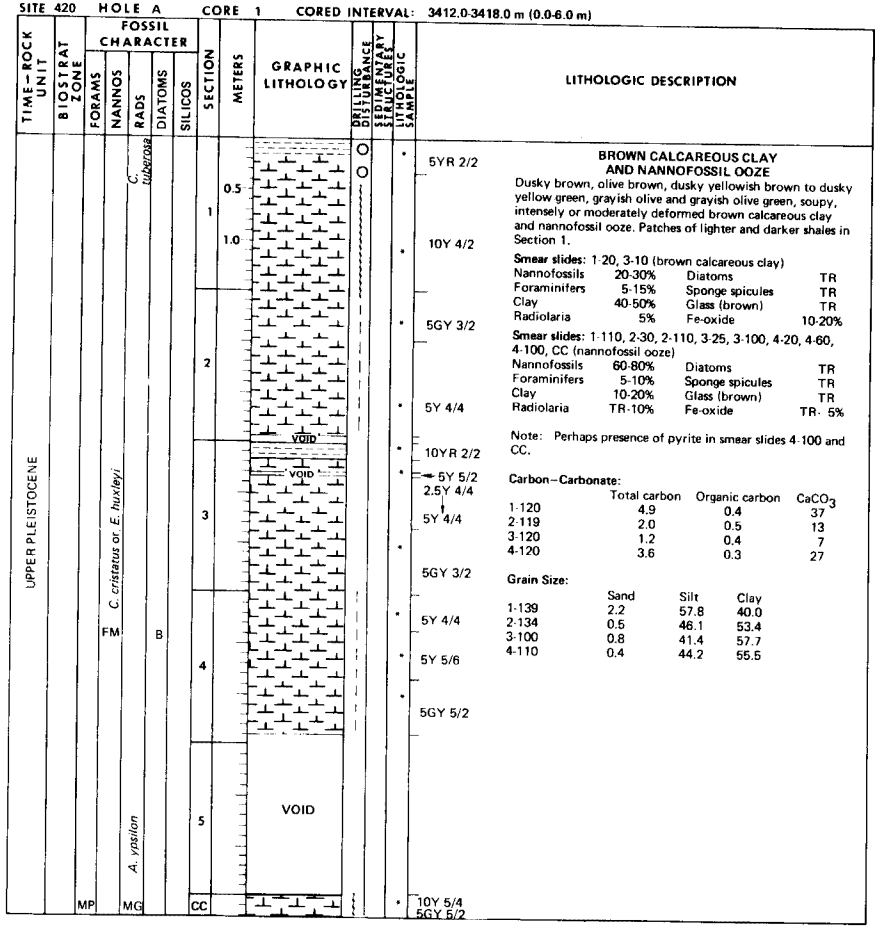
Basement

Depth sub-bottom	
Nature	
Velocity range	

Principal Results:

Hole was washed down to basement after taking mud-line core of marly nannofossil ooze interbedded with brown calcareous clay. No basement penetration attempted because of inadequate sediment cover.

SITE 420 HOLE A CORE 1 CORED INTERVAL: 3412.0-3418.0 m (0.0-6.0 m)



BROWN CALCAREOUS CLAY AND NANNOFOSSIL OOZE

Dusky brown, olive brown, dusky yellowish brown to dusky yellow green, grayish olive and grayish olive green, soupy, intensely or moderately deformed brown calcareous clay and nannofossil ooze. Patches of lighter and darker shales in Section 1.

Smear slides: 1-20, 3-10 (brown calcareous clay)

Nannofossils	20-30%	Diatoms	TR
Foraminifers	5-15%	Sponge spicules	TR
Clay	40-50%	Glass (brown)	TR
Radiolaria	5%	Fe-oxide	10-20%

Smear slides: 1-110, 2-30, 2-110, 3-25, 3-100, 4-20, 4-60, 4-100, CC (nannofossil ooze)

Nannofossils	60-80%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	10-20%	Glass (brown)	TR
Radiolaria	TR-10%	Fe-oxide	TR- 5%

Note: Perhaps presence of pyrite in smear slides 4-100 and CC.

Carbon-Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	4.9	0.4	37
2-119	2.0	0.5	13
3-120	1.2	0.4	7
4-120	3.6	0.3	27

Grain Size:

	Sand	Silt	Clay
1-139	2.2	57.8	40.0
2-134	0.5	46.1	53.4
3-100	0.8	41.4	57.7
4-110	0.4	44.2	55.5

SITE SUMMARY SHEET

SITE 421 HOLE 421

Date occupied	12 May 1977 1200 hrs. LCT
Date departed	13 May 1977 1625 hrs. LCT
Time on hole	32.1 hours
Position: latitude	09°01.41'N
longitude	106°03.68'W
Water depth (sea level)	3339 corrected meters, echo sounding
Water depth (rig floor)	3355 corrected meters, echo sounding
Bottom felt at	3342 meters, drill pipe
Penetration	114.0 meters
Number of holes	1
Number of cores	4
Total length of cored section	38.0 meters
Total core recovered	11.22 meters
Percentage core recovery	30%

Oldest Sediment Cored

Depth sub-bottom	95.0 meters
Nature	foraminiferal-nannofossil ooze
Age	Pleistocene
Measured velocity	1.5 km/sec

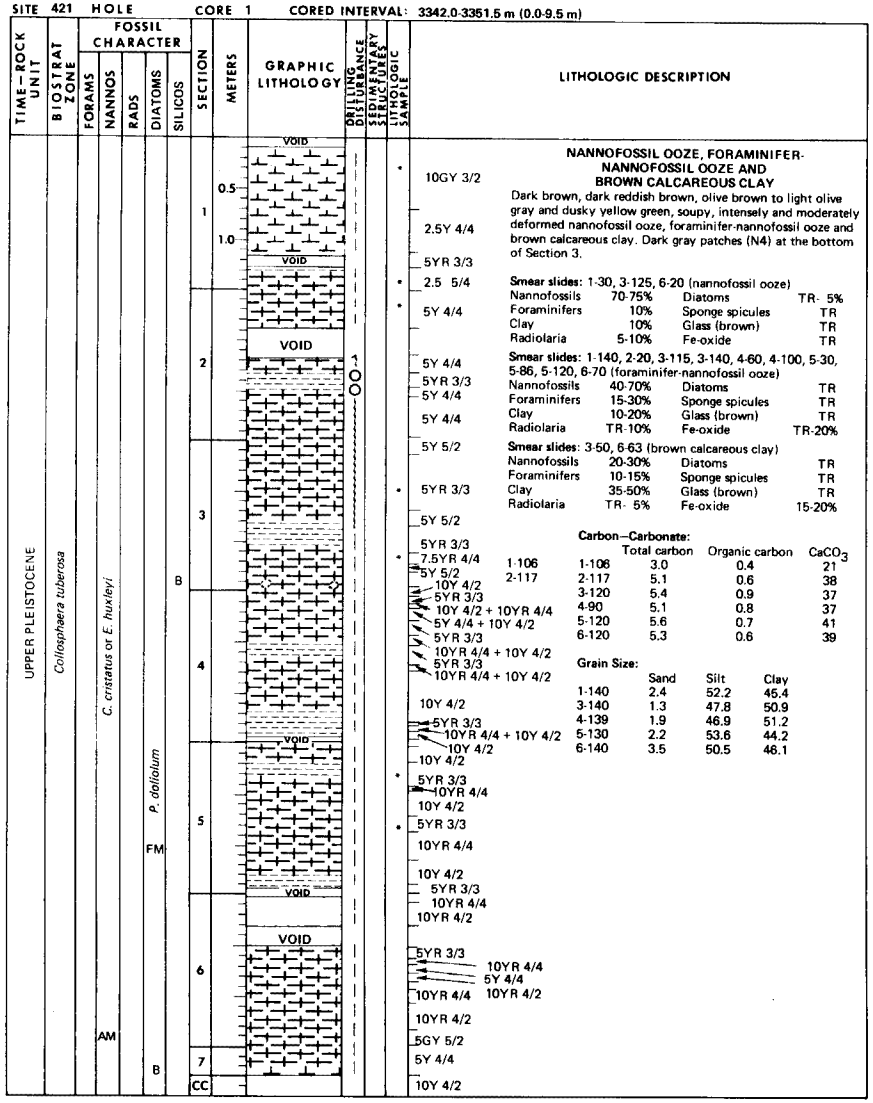
Basement

Depth sub-bottom	28.5 meters
Nature	basalt
Velocity range	5.18 - 5.97 km/sec

Principal Results:

Site located on western flank of EPR about 201 km from rise crest. Hole washed down to basement after taking mudline core and continuously cored through 30 meters of fragmented basalt. Recovered 1.63 meters of aphyric to sparsely phyric plagioclase-pyroxene basalt of moderately fractionated tholeiite chemistry. Basalts show negative magnetic inclinations in accordance with placement of site in Gilbert reversed magnetic epoch based upon sea-level magnetic anomaly identification.

SITE 421 HOLE CORE 1 CORED INTERVAL: 3342.0-3351.5 m (0.0-9.5 m)



LITHOLOGIC DESCRIPTION

NANNOFOSSIL OOZE, FORAMINIFER-NANNOFOSSIL OOZE AND BROWN CALCAREOUS CLAY

Dark brown, dark reddish brown, olive brown to light olive gray and dusky yellow green, soupy, intensely and moderately deformed nannofossil ooze, foraminifer-nannofossil ooze and brown calcareous clay. Dark gray patches (N4) at the bottom of Section 3.

Smear slides: 1-30, 3-125, 6-20 (nannofossil ooze)

Nannofossils	70-75%	Diatoms	TR- 5%
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5-10%	Fe-oxide	TR

Smear slides: 1-140, 2-20, 3-115, 3-140, 4-60, 4-100, 5-30, 5-86, 5-120, 6-70 (foraminifer-nannofossil ooze)

Nannofossils	40-70%	Diatoms	TR
Foraminifers	15-30%	Sponge spicules	TR
Clay	10-20%	Glass (brown)	TR
Radiolaria	TR-10%	Fe-oxide	TR-20%

Smear slides: 3-50, 6-63 (brown calcareous clay)

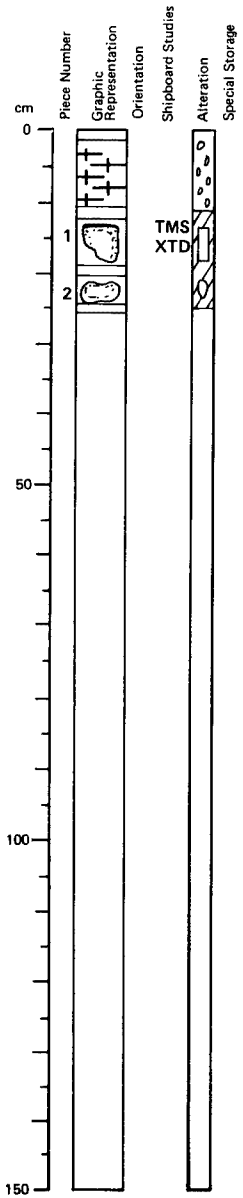
Nannofossils	20-30%	Diatoms	TR
Foraminifers	10-15%	Sponge spicules	TR
Clay	35-50%	Glass (brown)	TR
Radiolaria	TR- 5%	Fe-oxide	15-20%

Carbon–Carbonate:

		Total carbon	Organic carbon	$CaCO_3$
1-106	1-106	3.0	0.4	21
2-117	2-117	5.1	0.6	38
	3-120	5.4	0.9	37
	4-90	5.1	0.8	37
	5-120	5.6	0.7	41
	6-120	5.3	0.6	39

Grain Size:

	Sand	Silt	Clay
1-140	2.4	52.2	45.4
3-140	1.3	47.8	50.9
4-139	1.9	46.9	51.2
5-130	2.2	53.6	44.2
6-140	3.5	50.5	46.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	1		2	1

Depth: 3427.5 m to 3437.0 m

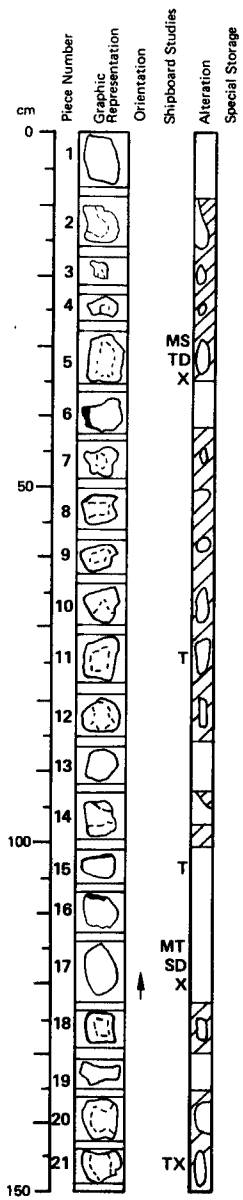
SEDIMENTS
0-10 cm brecciated by drilling; siliceous nannofossil ooze.

ROCK TYPE AND STRUCTURE
Fine-grained very sparsely plagioclase phyric basalt with darker gray alteration rims and lighter gray fresh cores. Piece 1 has a flat glassy edge, probably an upper edge. External surfaces are joint and fracture surfaces.

TEXTURE
Glassy to fine-grained. 1-2% pin-hole vesicles.

MINERALOGY
Rare plagioclase phenocrysts up to 2 mm. Unresolvable in groundmass.

ALTERATION
Dark alteration rims up to 2 cm thick. Vesicles in rims filled with platy and clay minerals, sometimes green in color. Traces of iron-oxide coating on external surfaces.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	1		3	1

Depth: 3437.0 m to 3438.5 m

ROCK TYPE AND STRUCTURE
Aphyric to very sparsely plagioclase phyric fine-grained basalt, some pieces with glassy edges. External surfaces of most pieces are joint and fracture surfaces. These are nearly perpendicular to glassy edges where glass is present.

TEXTURE
Aphanitic to glassy, with less than 1% vesicles.

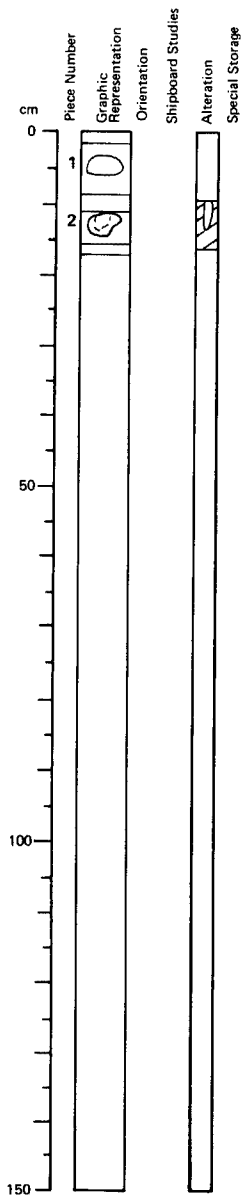
MINERALOGY
One or two plagioclase phenocrysts 1-2 mm in Pieces 5 and 14. Groundmass too fine-grained to resolve in hand specimens.

ALTERATION
Alteration rims 1-2 cm thick surround fresher cores in many pieces. In altered rims, vesicles filled with platy and clay minerals. Some samples sparsely veined with secondary minerals. Scattered altered olivine? phenocrysts. Some pieces have iron oxide coatings on exterior surfaces. Altered rims have darker color than cores.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Alteration
28-35 cm (Piece 5):	43.8	34.5	–	20.2	1.5
71-75 cm (Piece 11):	47.0	30.4	–	20.1	2.5
145-148 cm (Piece 21):	50.3	32.5	–	17.0	1.7

Glass = spherulitic or sub-microcrystalline mesostasis and includes opaques.

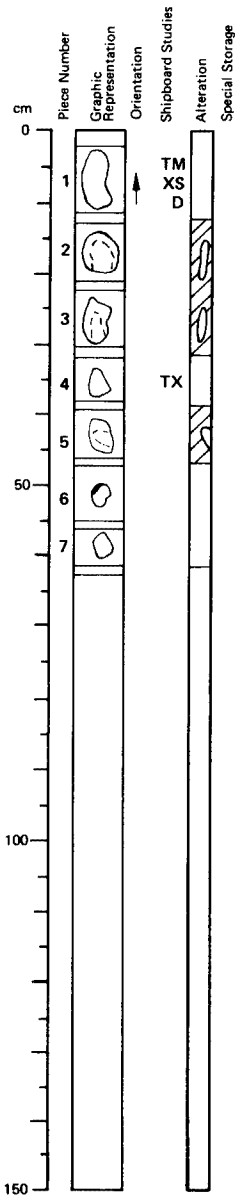


VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 1		3	2

Depth: 3438.5 m to 3446.5 m

General description given under 421-3-1. In this section, Piece 1 has a thin, indistinct weathering rind and a small patch of rusty weathered crust. Vesicles, less than 5%, are empty, and locally concentrated. Piece 2 has a prominent dark gray weathered rind, and no vesicles.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 1		4	1

Depth: 3446.5 m to 3456.5 m

ROCK TYPE AND STRUCTURE
Very fine-grained to glassy sparsely plagioclase phyric or aphyric basalt, with distinct alteration rims, and exterior joint/fracture surfaces.

TEXTURE
Aphanitic to glassy, vesicles less than 2 mm and 5% except Piece 1 where long tubular vesicles are present. Piece 4 is slightly coarser grained than others. Piece 6 has glass.

MINERALOGY
Plagioclase phenocrysts less than 3 mm and less than 1% in Pieces 4 and 6.

WEATHERING
Prominent dark gray weathered rinds on Pieces 2, 3, and 5 wherein vesicles are filled with platy or green clay minerals. Joint surfaces have rust-colored coating.

SD

SITE SUMMARY SHEET

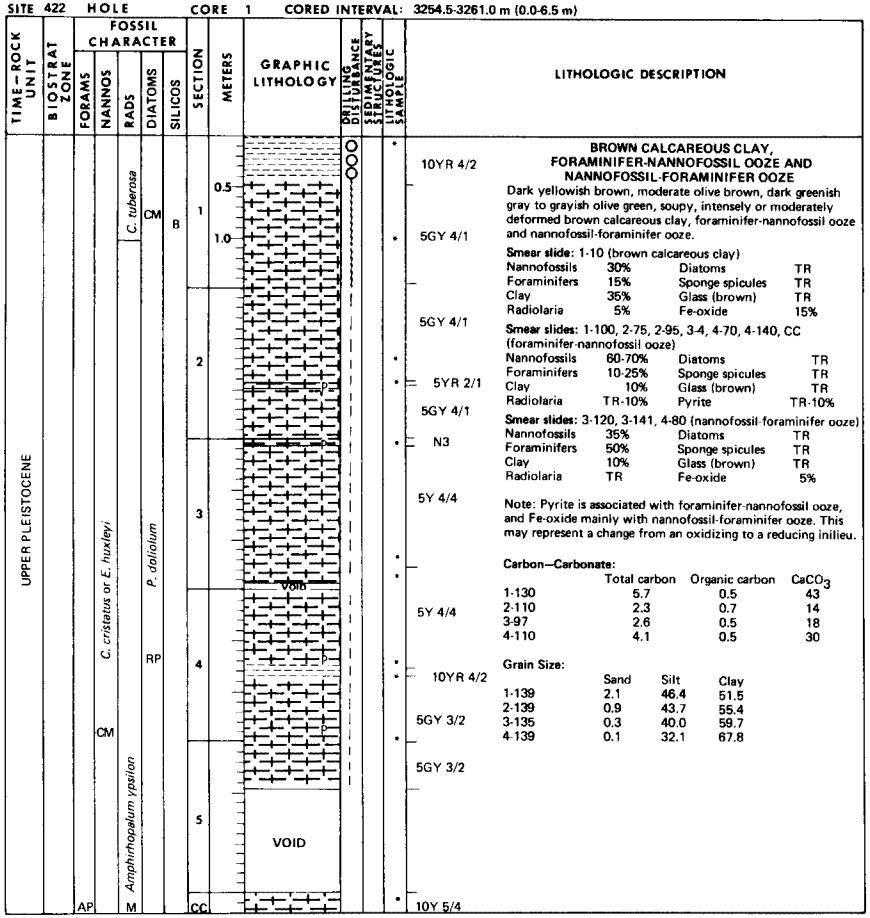
SITE 422 HOLE 422

Date occupied	14 May 1977 1130 hrs. LCT
Date departed	15 May 1977 1324 hrs. LCT
Time on hole	26 hours
Position: latitude	9° 10.59'N
longitude	105° 16.27'W
Water depth (sea level)	3247 corrected meters, echo sounding
Water depth (rig floor)	3250 corrected meters, echo sounding
Bottom felt at	3300.5 meters, drill pipe
Penetration	73.0 meters
Number of holes	1
Number of cores	10
Total length of cored section	73.0 meters
Total core recovered	46.97 meters
Percentage core recovery	64%
Oldest Sediment Cored	
Depth sub-bottom	44.5 meters
Nature	foraminiferal-nannofossil ooze
Age	lower Pleistocene
Measured velocity	1.5 km/sec
Basement	
Depth sub-bottom	24.0 meters
Nature	basaltic rock
Velocity range	5.8 - 6.2 km/sec

Principal Results:

Site located in northern moat of OCP Ridge on flat-lying pond of acoustically stratified sediments underlain by horizontal and very strong basement reflector. Continuously cored 46 meters of marly foraminiferal-nannofossil ooze, marly nannofossil ooze, siliceous ooze and brown calcareous clay above 3 meters of plagioclase-pyroxene doleritic rock representing single cooling unit. Penetrated another 4 meters of foraminiferal-nannofossil ooze below doleritic rock and then an additional 10.5 meters of dolerite containing two cooling units. Hole floored by fragmented basalt of typical fabric petrology and chemistry. Total basement recovery was 9.56 meters. Dolerite contrasts with fabric basalt by having lower K_2O and TiO_2 (i. e., less fractionated), lower stabilities of magnetization, and higher mean densities and velocities.

SITE 422 HOLE CORE 1 CORED INTERVAL: 3254.5-3261.0 m (0.0-6.5 m)



BROWN CALCAREOUS CLAY, FORAMINIFER-NANNOFOSSIL OOZE AND NANNOFOSSIL-FORAMINIFER OOZE

Dark yellowish brown, moderate olive brown, dark greenish gray to grayish olive green, soupy, intensely or moderately deformed brown calcareous clay, foraminifer-nannofossil ooze and nannofossil-foraminifer ooze.

Smear slide: 1-10 (brown calcareous clay)

Nannofossils	30%	Diatoms	TR
Foraminifers	15%	Sponge spicules	TR
Clay	35%	Glass (brown)	TR
Radiolaria	5%	Fe-oxide	15%

Smear slides: 1-100, 2-75, 2-95, 3-4, 4-70, 4-140, CC (foraminifer-nannofossil ooze)

Nannofossils	60-70%	Diatoms	TR
Foraminifers	10-25%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR-10%	Pyrite	TR-10%

Smear slides: 3-120, 3-141, 4-80 (nannofossil-foraminifer ooze)

Nannofossils	35%	Diatoms	TR
Foraminifers	50%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR	Fe-oxide	5%

Note: Pyrite is associated with foraminifer-nannofossil ooze, and Fe-oxide mainly with nannofossil-foraminifer ooze. This may represent a change from an oxidizing to a reducing inilieu.

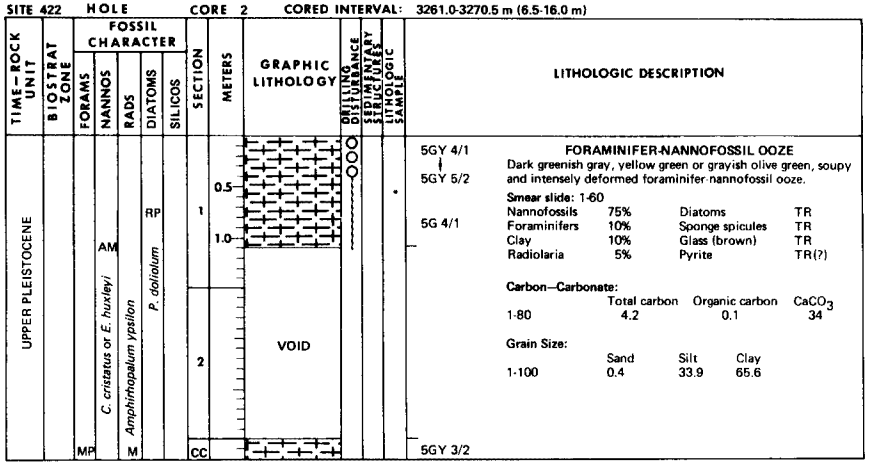
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-130	5.7	0.5	43
2-110	2.3	0.7	14
3-97	2.6	0.5	18
4-110	4.1	0.5	30

Grain Size:

	Sand	Silt	Clay
1-139	2.1	46.4	51.5
2-139	0.9	43.7	55.4
3-135	0.3	40.0	59.7
4-139	0.1	32.1	67.8

SITE 422 HOLE CORE 2 CORED INTERVAL: 3261.0-3270.5 m (6.5-16.0 m)



FORAMINIFER-NANNOFOSSIL OOZE

Dark greenish gray, yellow green or grayish olive green, soupy and intensely deformed foraminifer-nannofossil ooze.

Smear slide: 1-60

Nannofossils	75%	Diatoms	TR
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR(?)

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-80	4.2	0.1	34

Grain Size:

	Sand	Silt	Clay
1-100	0.4	33.9	65.6

SITE 422 HOLE CORE 3 CORED INTERVAL: 3270.5-3280.0 m (16.0-25.5 m)

TIME-ROCK UNIT: UPPER PLEISTOCENE

BIOSTRAT ZONE: FOSSIL CHARACTER — FORAMS: FP; NANNOS: *C. cristatus* or *E. huxleyi*; RADS: *Amphirhopalum ypsilon*; DIATOMS: *?P. doliolum*, RP, FM; SILICOS: *N. reinholdii* (b)

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

VOID (Section 5)

VOID (Section 7)

FORAMINIFER-NANNOFOSSIL OOZE AND NANNOFOSSIL OOZE

Grayish olive, grayish green to dark greenish-gray and olive gray, intensely or moderately deformed foraminifer-nannofossil ooze, nannofossil ooze and marly siliceous-nannofossil ooze.

Smear slides: 1-80, 1-140, 2-75, 3-80, 3-105, 3-127, 4-60, 6-60, 6-120 (foraminifer-nannofossil ooze)

Nannofossils	55-75%	Diatoms	TR- 5%
Foraminifers	15-30%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR-10%	Pyrite	TR-10%

Smear slides: 5-30, 5-100 (nannofossil ooze)

Nannofossils	80%	Diatoms	TR
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR	Pyrite	TR

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	6.1	0.3	48
2-120	1.5	0.0	13
3-120	4.7	0.3	37
4-70	5.3	0.3	41
5-18	5.8	0.2	47
6-120	4.4	0.3	34

Grain Size:

	Sand	Silt	Clay
1-139	1.8	37.0	61.2
2-139	0.6	17.9	81.5
3-139	1.1	41.7	57.2
4-100	1.0	26.7	72.3
5-69	1.1	26.2	72.7
6-135	0.8	29.7	69.6

SITE 422 HOLE CORE 4 CORED INTERVAL: 3280.0-3289.5 m (25.5-35.0 m)

TIME-ROCK UNIT: UPPER PLEISTOCENE

BIOSTRAT ZONE: FOSSIL CHARACTER — FORAMS: MP; NANNOS: AG; RADS: *E. ovata*; DIATOMS: CM; SILICOS: M; *Amphirhopalum ypsilon*; *N. reinholdii* (b)

SECTION | METERS | GRAPHIC LITHOLOGY | DRILLING DISTURBANCE | SEDIMENTARY STRUCTURES | LITHOLOGIC SAMPLE

FORAMINIFER-NANNOFOSSIL OOZE AND SILICEOUS-NANNOFOSSIL OOZE

Grayish olive green, greenish gray, dark greenish gray to greenish black, intensely to moderately deformed foraminifer-nannofossil ooze and siliceous-nannofossil ooze. Presence of greenish gray (5G 6/1) patches (size up to 3-4 cm) in Section 3. Patches of lighter material and fragments of denser sedimentary material of the same color that sediments have in other parts of the core.

Smear slides: 1-30, 1-70, 1-93, 5-80, 6-35, 6-120, 7-12 (foraminifer-nannofossil ooze)

Nannofossils	60-70%	Diatoms	TR- 5%
Foraminifers	15-25%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5-10%	Pyrite	TR- 5%

Smear slides: 1-130, 2-120, 3-94, 3-110, 4-75 (siliceous-nannofossil ooze)

Nannofossils	55-60%	Diatoms	TR- 5%
Foraminifers	5-10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	20-25%		

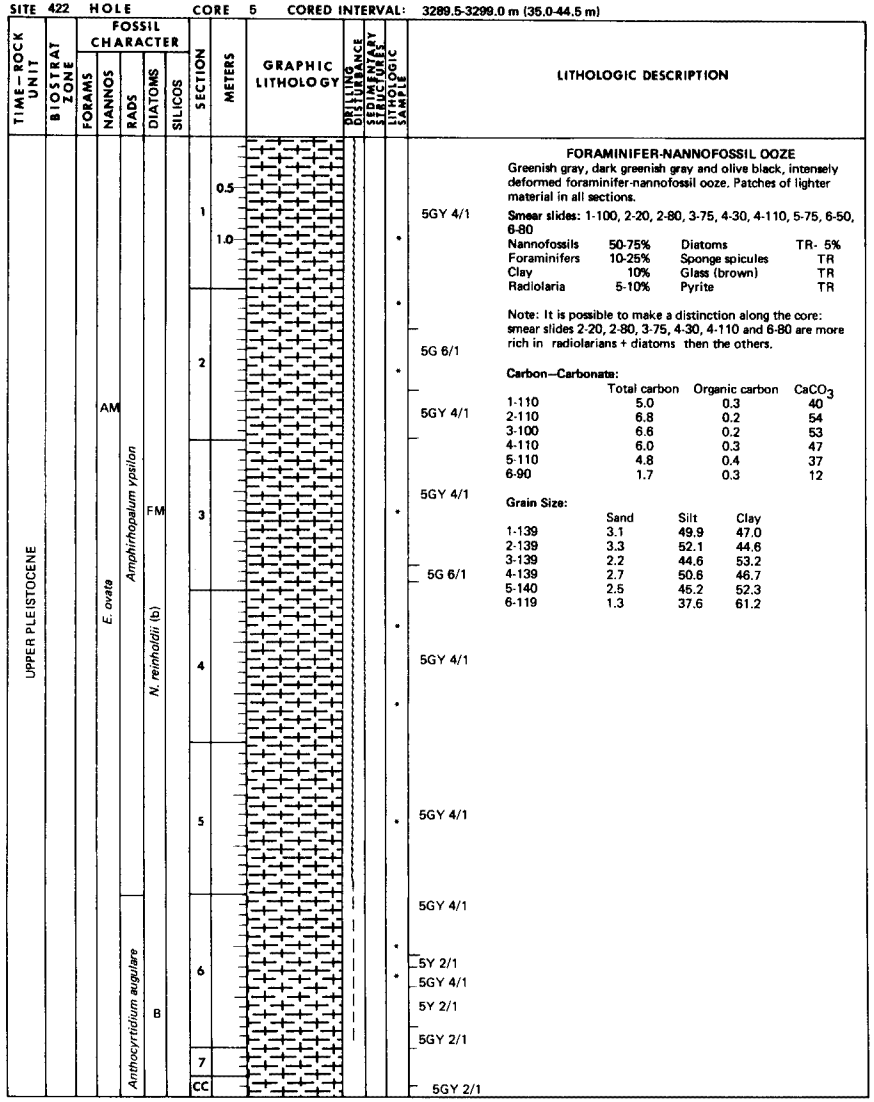
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-110	4.0	0.3	31
2-110	4.0	0.5	30
3-110	2.1	0.4	14
4-100	3.9	0.3	29
5-110	3.7	0.4	27
6-120	5.8	0.3	45

Grain Size:

	Sand	Silt	Clay
1-139	1.4	47.2	51.4
2-139	0.6	45.7	53.7
4-139	1.5	44.3	54.1
5-139	2.5	50.7	46.8
6-139	3.6	45.3	51.1

SITE 422 HOLE CORE 5 CORED INTERVAL: 3289.5-3299.0 m (35.0-44.5 m)



FORAMINIFER-NANNOFOSSIL OOZE

Greenish gray, dark greenish gray and olive black, intensely deformed foraminifer-nannofossil ooze. Patches of lighter material in all sections.

Smear slides: 1-100, 2-20, 2-80, 3-75, 4-30, 4-110, 5-75, 6-50, 6-80

Nannofossils	50-75%	Diatoms	TR- 5%
Foraminifers	10-25%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5-10%	Pyrite	TR

Note: It is possible to make a distinction along the core: smear slides 2-20, 2-80, 3-75, 4-30, 4-110 and 6-80 are more rich in radiolarians + diatoms then the others.

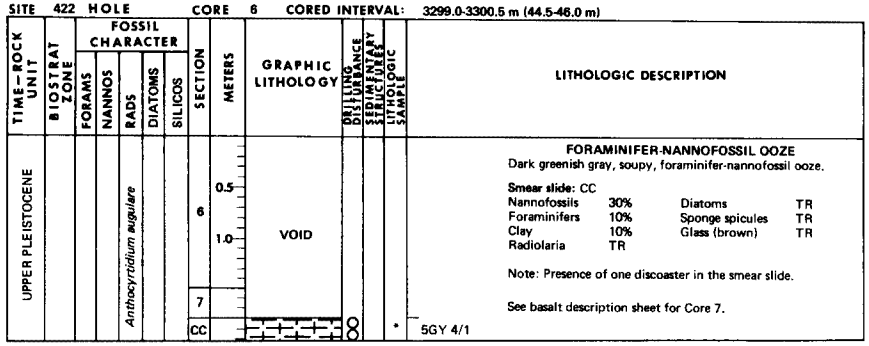
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-110	5.0	0.3	40
2-110	6.8	0.2	54
3-100	6.6	0.2	53
4-110	6.0	0.3	47
5-110	4.8	0.4	37
6-90	1.7	0.3	12

Grain Size:

	Sand	Silt	Clay
1-139	3.1	49.9	47.0
2-139	3.3	52.1	44.6
3-139	2.2	44.6	53.2
4-139	2.7	50.6	46.7
5-140	2.5	45.2	52.3
6-119	1.3	37.6	61.2

SITE 422 HOLE CORE 6 CORED INTERVAL: 3299.0-3300.5 m (44.5-46.0 m)



FORAMINIFER-NANNOFOSSIL OOZE

Dark greenish gray, soupy, foraminifer-nannofossil ooze.

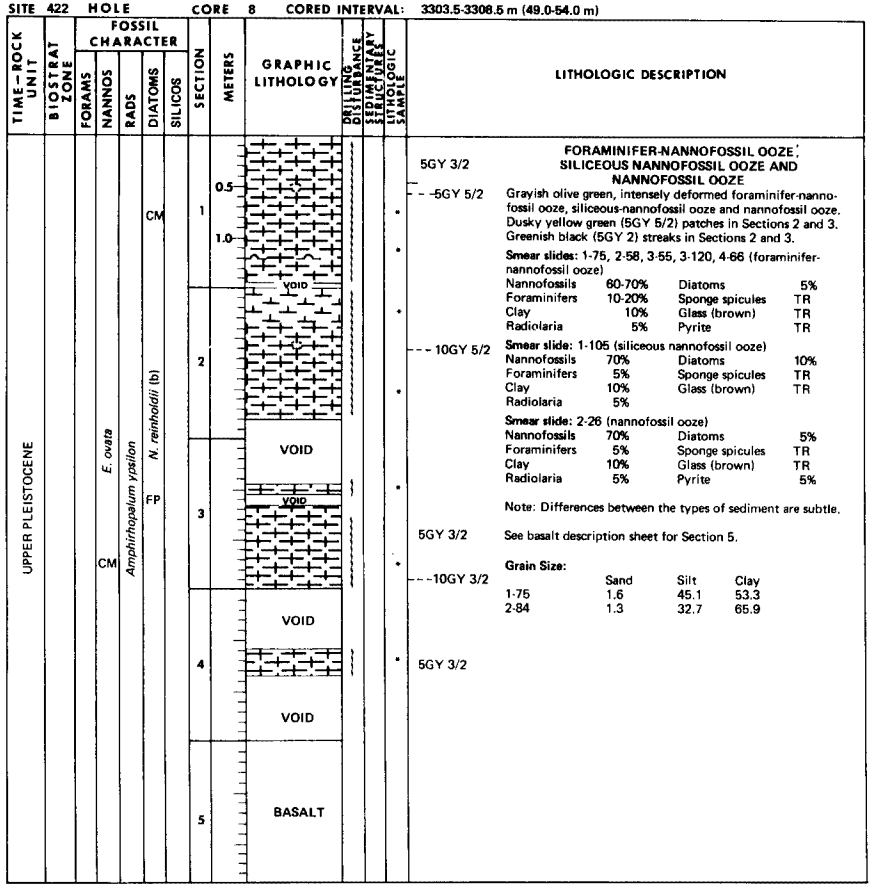
Smear slide: CC

Nannofossils	30%	Diatoms	TR
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR		

Note: Presence of one discoaster in the smear slide.

See basalt description sheet for Core 7.

SITE 422 HOLE CORE 8 CORED INTERVAL: 3303.5-3308.5 m (49.0-54.0 m)



FORAMINIFER-NANNOFOSSIL OOZE, SILICEOUS NANNOFOSSIL OOZE AND NANNOFOSSIL OOZE

Grayish olive green, intensely deformed foraminifer-nannofossil ooze, siliceous-nannofossil ooze and nannofossil ooze. Dusky yellow green (5GY 5/2) patches in Sections 2 and 3. Greenish black (5GY 2) streaks in Sections 2 and 3.

Smear slides: 1-75, 2-58, 3-55, 3-120, 4-66 (foraminifer-nannofossil ooze)

Nannofossils	60-70%	Diatoms	5%
Foraminifers	10-20%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR

Smear slide: 1-105 (siliceous nannofossil ooze)

Nannofossils	70%	Diatoms	10%
Foraminifers	5%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%		

Smear slide: 2-26 (nannofossil ooze)

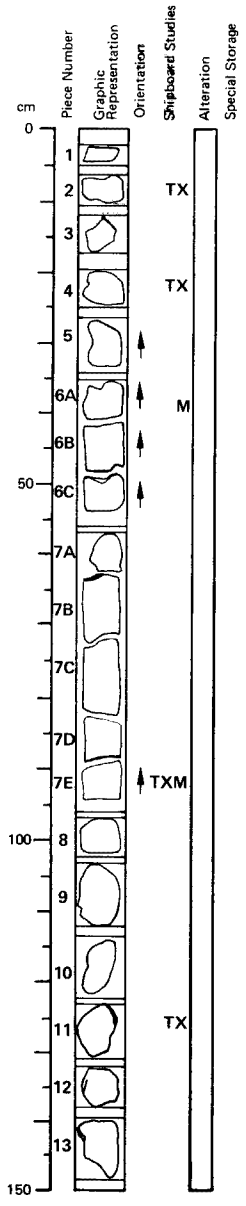
Nannofossils	70%	Diatoms	5%
Foraminifers	5%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	5%	Pyrite	5%

Note: Differences between the types of sediment are subtle.

See basalt description sheet for Section 5.

Grain Size:

	Sand	Silt	Clay
1-75	1.6	45.1	53.3
2-84	1.3	32.7	65.9



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 2		7	1

Depth: 3300.5 m to 3303.0 m

ROCK TYPE AND STRUCTURE
Fine- to medium-grained aphyric basalt, minor alteration on joint and fracture surfaces, no glass. Texture coarsens through Piece 9, is finer in Piece 10.

TEXTURE
Aphanitic 2-3% vesicles in most pieces, more abundant in Pieces 10 and 12. Tube vesicles in 13.

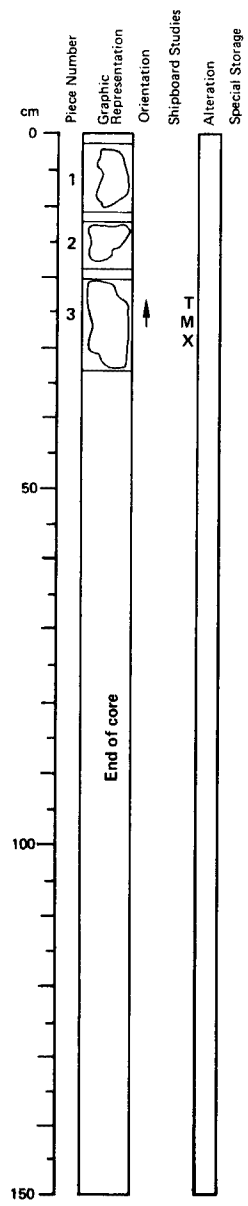
MINERALOGY
No phenocrysts.

ALTERATION
Blue clays in vesicles, zeolite(?) in 6B.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Fe-oxide	Vesicles
20-25 cm (Piece 4):	42.5	43.2	TR	6.9	6.3	1.0
90-95 cm (Piece 7E):	48.8	41.8	TR	3.3	5.5	–
122-131 cm (Piece 11):	34.0	54.1	TR		11.9	–

Also 1-2% plagioclase phenocrysts.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 2		7	2

Depth: 3303.0 m to 3303.5 m

ROCK TYPE AND STRUCTURE
Fine-grained aphyric basalt.

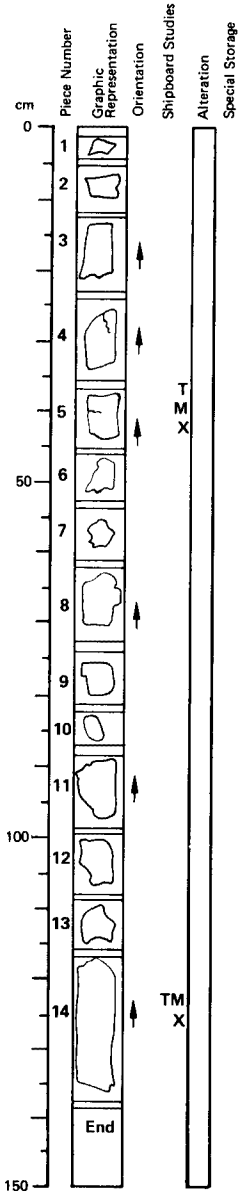
TEXTURE
Aphanitic with minor vesicles.

MINERAOLOGY
No phenocrysts.

ALTERATION
Vesicles with clays and a zeolite(?) in Piece 1.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Vesicles	Fe oxide
19-23 cm (Piece 3):	30.3	48.9	0.1	17.0	1.0	3.5



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 2		8	5

Depth: 3307.0 m to 3308.5 m

ROCK TYPE AND STRUCTURE
Fresh aphyric to sparsely plagioclase phyric fine-grained basalts, some alteration on fracture surfaces. Pieces 12-14 finer grained than those above.

TEXTURE
Aphanitic, minor pin-hole vesicles (0-2%).

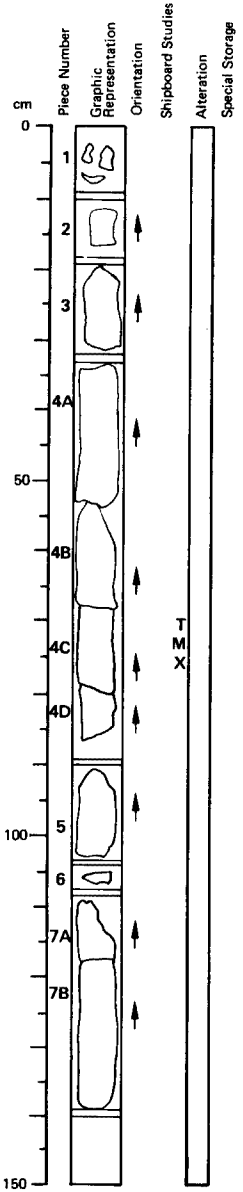
MINERALOGY
1-2% plagioclase phenocrysts in Pieces 2 and 3.

ALTERATION
Blue clays in vesicles.

Note: Sediments in Sections 1-4 described on sediment barrel sheet.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Vesicles	Fe-oxide
132-135 cm (Piece 14):	53.4	33.4	TR	7.4	0.4	5.3



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 2		9	1

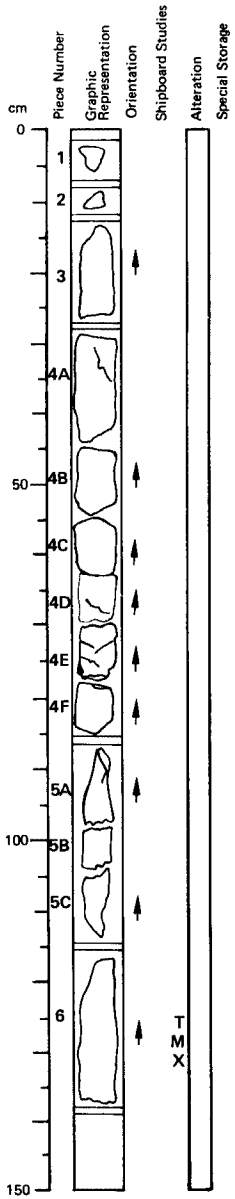
Depth: 3308.5 m to 3310.0 m

ROCK TYPE AND STRUCTURE
Fine-grained, aphyric basalt, quite fresh. Piece 1 is broken rubble. Textures become coarser downward until 7B, where they become finer again.

TEXTURE
Aphanitic, rare vesicles; more in Pieces 2 and 5 than others.

MINERALOGY
No phenocrysts.

ALTERATION
Vesicles have blue gray clay in 2 and 5.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 2		9	2

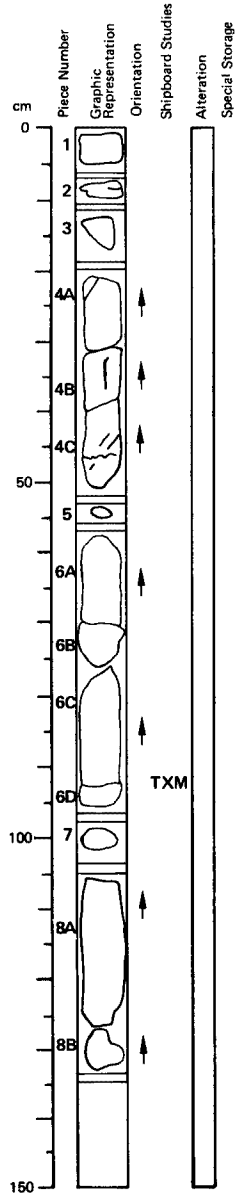
Depth: 3310.0-3311.5 m

ROCK TYPE AND STRUCTURE
Fine-grained aphyric basalt. Homogeneous grain size throughout.

TEXTURE
Aphanitic to microlitic. Minor small vesicles, more abundant in 4C downward.

MINERALS
Plagioclase microlites visible in hand sample.

ALTERATION
Blue clays in vesicles, thin cracks with clays in 4A, D, and E. 1-2 mm alteration rind, Pieces 5A-C, and 6.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 2		9	3

Depth: 3313.0-3314.5 m

ROCK TYPE AND STRUCTURE
Fine-grained aphyric to very sparsely plagioclase-phyric fresh basalt. Glassy segregations in Pieces 6A and 6D. Deep tube vesicles in 8B.

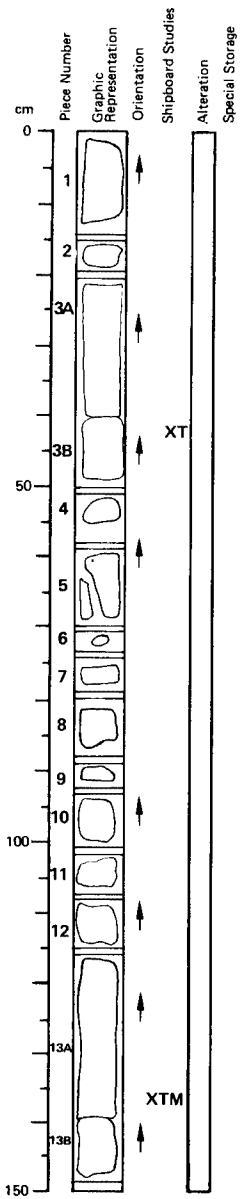
TEXTURE
Microlitic, with rare plagioclase phenocrysts.

MINERALOGY
Plagioclase phenocrysts in Pieces 1, 3 and 4A-C.

ALTERATION
Blue gray clays on fracture surfaces, Piece 6A; and in pin-hole vesicles, Pieces 1 & 4. Alteration minerals in cracks in Pieces 2, 4B and 4C.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Fe-oxide	Vesicles
90-93 cm (Piece 6C):	52.6	34.2	9.4		3.5	1.3



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 2		9	4

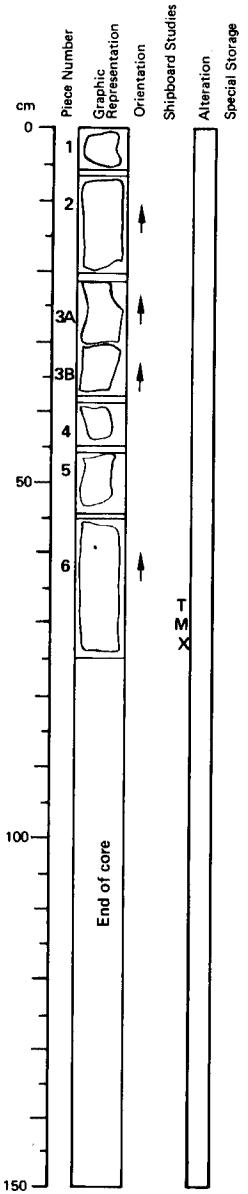
Depth: 3314.5 m to 3316.0 m

ROCK TYPE AND STRUCTURE
Fine-grained aphyric to very sparsely plagioclase phyric basalt. Glassy segregations in Pieces 4 and 13B. Trace of flow banding perpendicular to core in Piece 5. Vesicles tubular up to 2 mm in Pieces 1 and 3A. Smaller in 8 and 10.

TEXTURE
Microlitic.

MINERALOGY
Rare plagioclase phenocrysts in Piece 3A.

ALTERATION
Blue clays in vesicles in Pieces 8 and 10. Small alteration veinlets in 10.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 2		9	5

Depth: 3316.0 m to 3318.0 m

ROCK TYPE AND STRUCTURE
Fine-grained aphyric basalt similar to Sections 1-4. A few tubular vesilces on Pieces 1, 2 and 5. Vesicles more rare and smaller elsewhere.

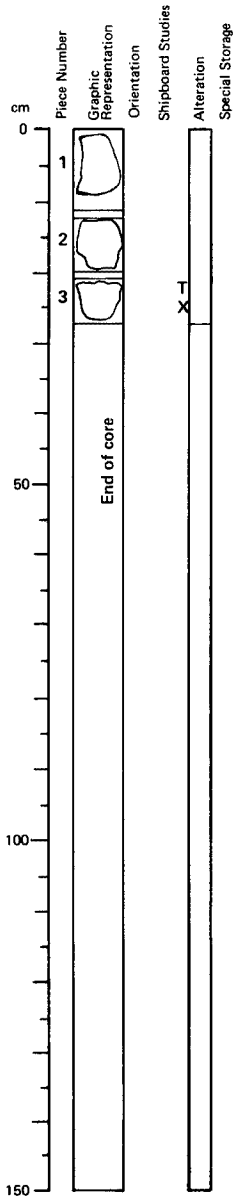
TEXTURE
Microlitic.

MINERALOGY
No phenocrysts.

ALTERATION
Minor; blue clay in vesicles in Pieces 1 and 6. Greenish clay on top outer surface of 6.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Vesicles	Fe-oxide
72-75 cm (Piece 6):	54.0	32.0	TR(?)	8.8	–	5.0



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE		CORE		SECT.	
5	4	4	2	2		1	0		1

Depth: 3318.0 m to 3327.5 m

Pieces 1 and 2:
Fine-grained aphyric basalt similar to Core 9.

Piece 3:
Extremely fine-grained (spherulitic) aphyric basalt with rare plagioclase phenocrysts, rare hollow vesicles and a glassy margin on one edge. This piece is higher in Fe and Ti than basalts of Cores 7, 8, and 9.

THIN SECTION DATA (1000 counts)
20-24 cm (Piece 3):
0.6 clinopyroxene phenocrysts
1.8 plagioclase phenocrysts
97.6 spherulitic to glassy groundmass

SITE SUMMARY SHEET

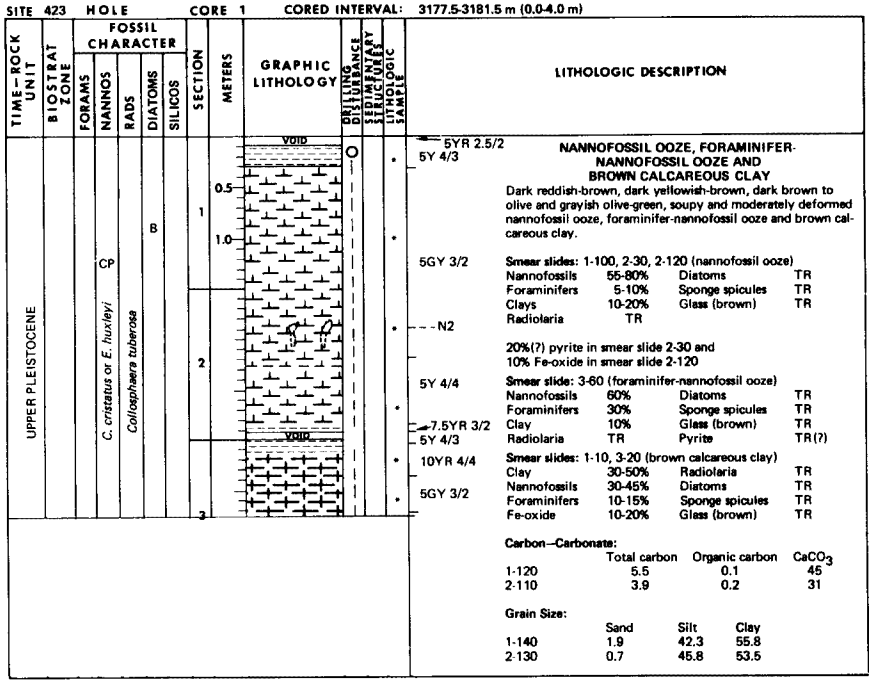
SITE 423 HOLE 423

Date occupied	15 May 1977 1930 hrs. LCT
Date departed	16 May 1977 2024 hrs. LCT
Time on hole	17 hours
Position: latitude	9°08.81'N
longitude	105°06.57'W
Water depth (sea level)	3161 corrected meters, echo sounding
Water depth (rig floor)	3167 corrected meters, echo sounding
Bottom felt at	3177.5 meters, drill pipe
Penetration	53.5 meters
Number of holes	1
Number of cores	8
Total length of cored section	53.5 meters
Total core recovered	27.98 meters
Percentage core recovery	52%
Oldest Sediment Cored	
Depth sub-bottom	42.0 meters
Nature	nannofossil ooze
Age	Pleistocene
Measured velocity	1.5 km/sec
Basement	
Depth sub-bottom	11.5 meters
Nature	basalt
Velocity range	5.7 km/sec

Principal Results:

Site located on original prime site of Leg 54 – the PT-4A sediment pond – 99 km west of EPR within the Matuyama reversed magnetic epoch. Continuously cored 38 meters of marly foraminiferal-nannofossil and nannofossil ooze, siliceous nannofossil ooze, and brown calcareous clay, and 15.5 meters of highly fractured basalt. Recovered 27 meters of sediment and 0.87 meters of aphyric plagioclase-pyroxene basalt of moderately fractionated tholeiite chemistry. Magnetic inclinations are negative, in agreement with the predicted sea-level anomaly.

SITE 423 HOLE CORE 1 CORED INTERVAL: 3177.5-3181.5 m (0.0-4.0 m)



LITHOLOGIC DESCRIPTION

NANNOFOSSIL OOZE, FORAMINIFER-NANNOFOSSIL OOZE AND BROWN CALCAREOUS CLAY

Dark reddish-brown, dark yellowish-brown, dark brown to olive and grayish olive-green, soupy and moderately deformed nannofossil ooze, foraminifer-nannofossil ooze and brown calcareous clay.

Smear slides: 1-100, 2-30, 2-120 (nannofossil ooze)

Nannofossils	55-80%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clays	10-20%	Glass (brown)	TR
Radiolaria	TR		

20%(?) pyrite in smear slide 2-30 and 10% Fe-oxide in smear slide 2-120

Smear slide: 3-60 (foraminifer-nannofossil ooze)

Nannofossils	60%	Diatoms	TR
Foraminifers	30%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR	Pyrite	TR(?)

Smear slides: 1-10, 3-20 (brown calcareous clay)

Clay	30-50%	Radiolaria	TR
Nannofossils	30-45%	Diatoms	TR
Foraminifers	10-15%	Sponge spicules	TR
Fe-oxide	10-20%	Glass (brown)	TR

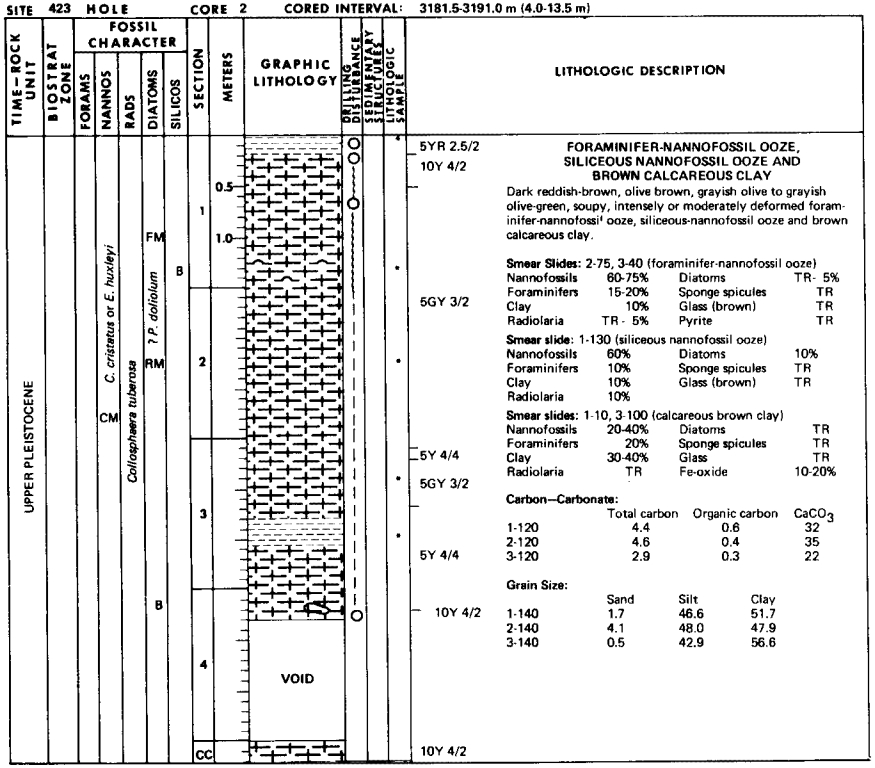
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	5.5	0.1	45
2-110	3.9	0.2	31

Grain Size:

	Sand	Silt	Clay
1-140	1.9	42.3	55.8
2-130	0.7	45.8	53.5

SITE 423 HOLE CORE 2 CORED INTERVAL: 3181.5-3191.0 m (4.0-13.5 m)



LITHOLOGIC DESCRIPTION

FORAMINIFER-NANNOFOSSIL OOZE, SILICEOUS NANNOFOSSIL OOZE AND BROWN CALCAREOUS CLAY

Dark reddish-brown, olive brown, grayish olive to grayish olive-green, soupy, intensely or moderately deformed foraminifer-nannofossil ooze, siliceous-nannofossil ooze and brown calcareous clay.

Smear Slides: 2-75, 3-40 (foraminifer-nannofossil ooze)

Nannofossils	60-75%	Diatoms	TR- 5%
Foraminifers	15-20%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	TR - 5%	Pyrite	TR

Smear slide: 1-130 (siliceous nannofossil ooze)

Nannofossils	60%	Diatoms	10%
Foraminifers	10%	Sponge spicules	TR
Clay	10%	Glass (brown)	TR
Radiolaria	10%		

Smear slides: 1-10, 3-100 (calcareous brown clay)

Nannofossils	20-40%	Diatoms	TR
Foraminifers	20%	Sponge spicules	TR
Clay	30-40%	Glass	TR
Radiolaria	TR	Fe-oxide	10-20%

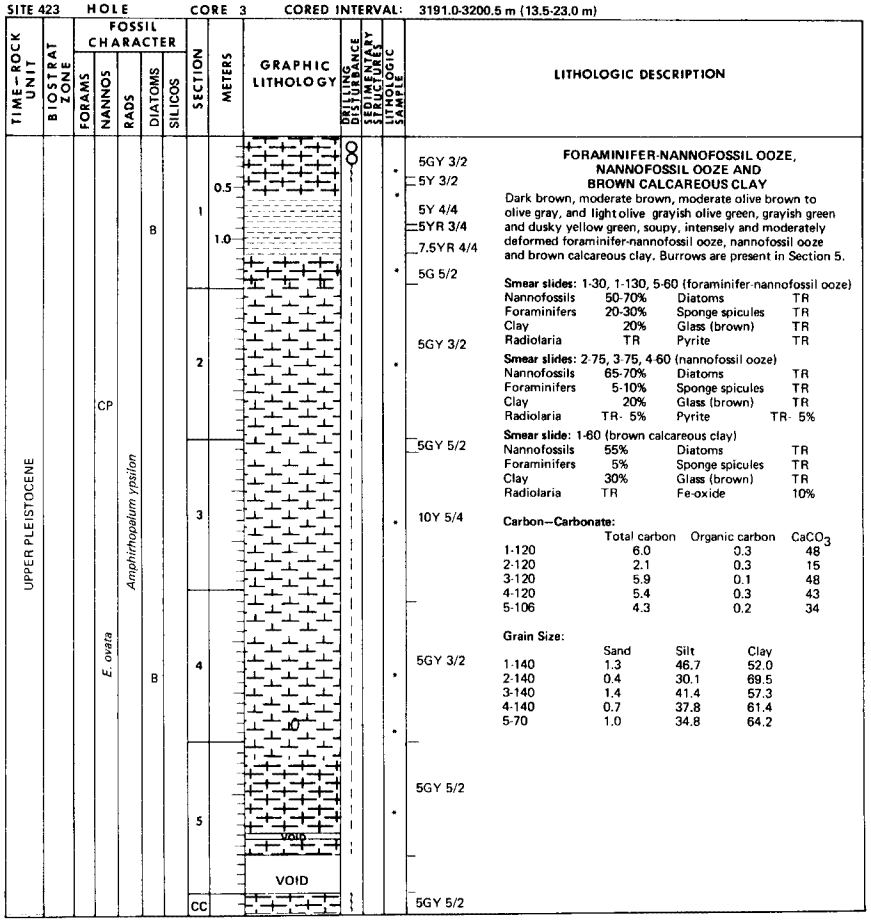
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	4.4	0.6	32
2-120	4.6	0.4	35
3-120	2.9	0.3	22

Grain Size:

	Sand	Silt	Clay
1-140	1.7	46.6	51.7
2-140	4.1	48.0	47.9
3-140	0.5	42.9	56.6

SITE 423 HOLE CORE 3 CORED INTERVAL: 3191.0-3200.5 m (13.5-23.0 m)



FORAMINIFER-NANNOFOSSIL OOZE, NANNOFOSSIL OOZE AND BROWN CALCAREOUS CLAY

Dark brown, moderate brown, moderate olive brown to olive gray, and light olive grayish olive green, grayish green and dusky yellow green, soupy, intensely and moderately deformed foraminifer-nannofossil ooze, nannofossil ooze and brown calcareous clay. Burrows are present in Section 5.

Smear slides: 1-30, 1-130, 5-60 (foraminifer-nannofossil ooze)

Nannofossils	50-70%	Diatoms	TR
Foraminifers	20-30%	Sponge spicules	TR
Clay	20%	Glass (brown)	TR
Radiolaria	TR	Pyrite	TR

Smear slides: 2-75, 3-75, 4-60 (nannofossil ooze)

Nannofossils	65-70%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	20%	Glass (brown)	TR
Radiolaria	TR- 5%	Pyrite	TR- 5%

Smear slide: 1-60 (brown calcareous clay)

Nannofossils	55%	Diatoms	TR
Foraminifers	5%	Sponge spicules	TR
Clay	30%	Glass (brown)	TR
Radiolaria	TR	Fe-oxide	10%

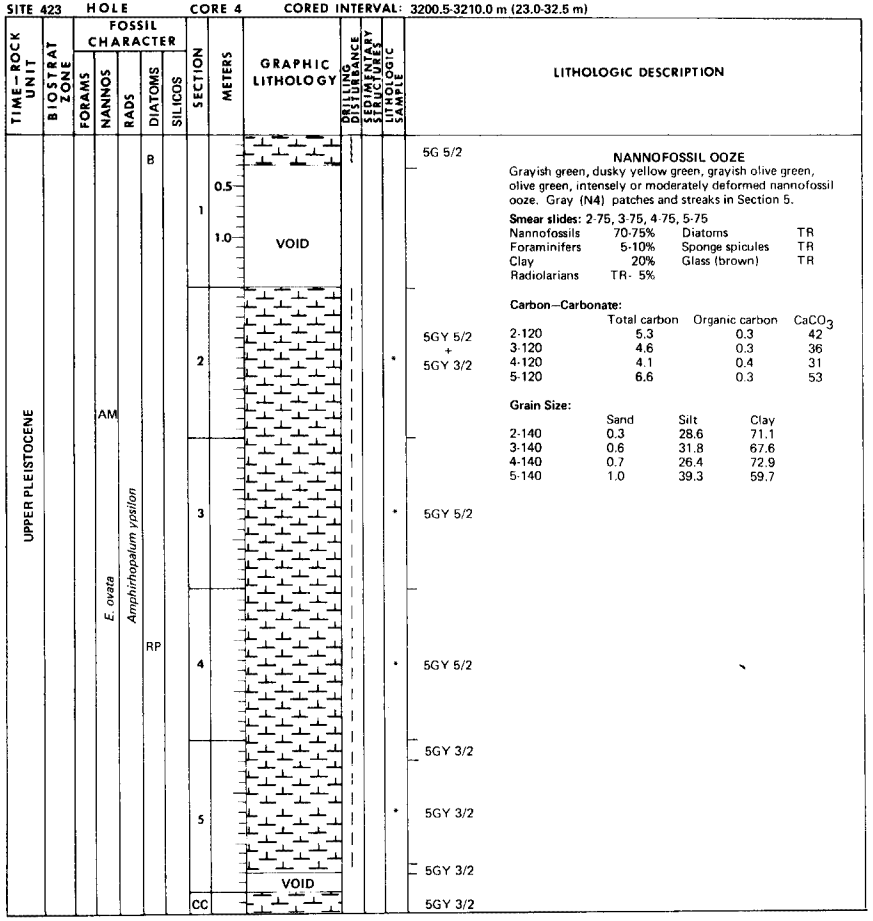
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	6.0	0.3	48
2-120	2.1	0.3	15
3-120	5.9	0.1	48
4-120	5.4	0.3	43
5-106	4.3	0.2	34

Grain Size:

	Sand	Silt	Clay
1-140	1.3	46.7	52.0
2-140	0.4	30.1	69.5
3-140	1.4	41.4	57.3
4-140	0.7	37.8	61.4
5-70	1.0	34.8	64.2

SITE 423 HOLE CORE 4 CORED INTERVAL: 3200.5-3210.0 m (23.0-32.5 m)



NANNOFOSSIL OOZE

Grayish green, dusky yellow green, grayish olive green, olive green, intensely or moderately deformed nannofossil ooze. Gray (N4) patches and streaks in Section 5.

Smear slides: 2-75, 3-75, 4-75, 5-75

Nannofossils	70-75%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	20%	Glass (brown)	TR
Radiolarians	TR- 5%		

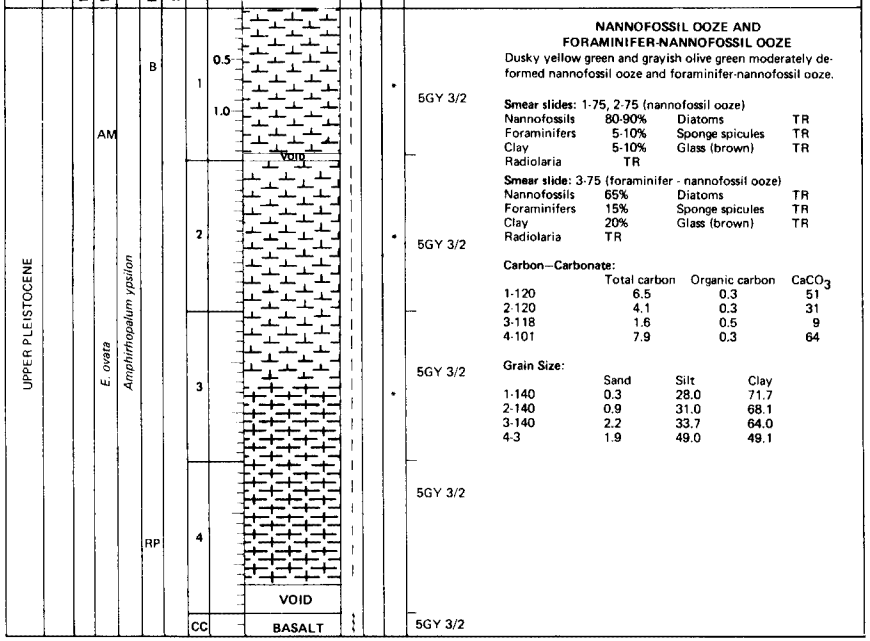
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-120	5.3	0.3	42
3-120	4.6	0.3	36
4-120	4.1	0.4	31
5-120	6.6	0.3	53

Grain Size:

	Sand	Silt	Clay
2-140	0.3	28.6	71.1
3-140	0.6	31.8	67.6
4-140	0.7	26.4	72.9
5-140	1.0	39.3	59.7

SITE 423 HOLE CORE 5 CORED INTERVAL: 3210.0-3219.5 m (32.5-42.0 m)



NANNOFOSSIL OOZE AND FORAMINIFER-NANNOFOSSIL OOZE

Dusky yellow green and grayish olive green moderately deformed nannofossil ooze and foraminifer-nannofossil ooze.

Smear slides: 1-75, 2-75 (nannofossil ooze)

Nannofossils	80-90%	Diatoms	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	5-10%	Glass (brown)	TR
Radiolaria	TR		

Smear slide: 3-75 (foraminifer - nannofossil ooze)

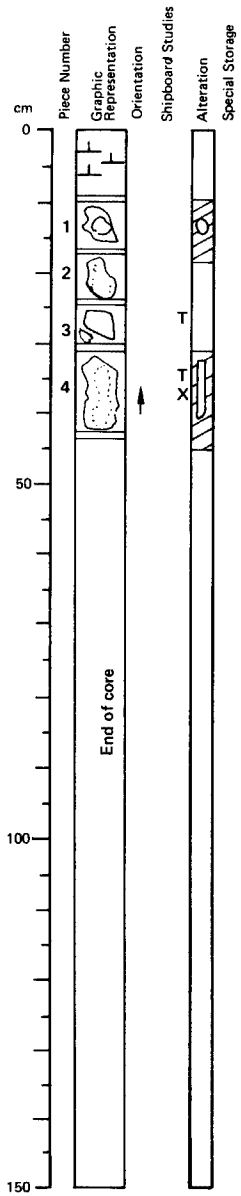
Nannofossils	65%	Diatoms	TR
Foraminifers	15%	Sponge spicules	TR
Clay	20%	Glass (brown)	TR
Radiolaria	TR		

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	6.5	0.3	51
2-120	4.1	0.3	31
3-118	1.6	0.5	9
4-101	7.9	0.3	64

Grain Size:

	Sand	Silt	Clay
1-140	0.3	28.0	71.7
2-140	0.9	31.0	68.1
3-140	2.2	33.7	64.0
4-3	1.9	49.0	49.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	4	4	2	3			5	CC

Depth: 3219.0 m to 3219.5 m

0-8 cm nannofossil ooze

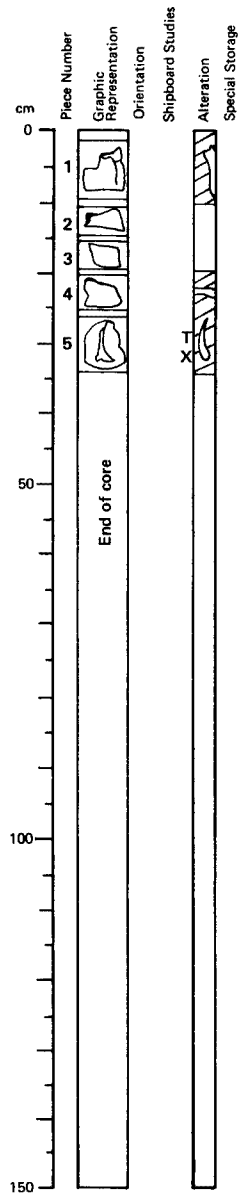
ROCK TYPE AND STRUCTURE (10-42 cm)
Fine-grained aphyric (Pieces 3 and 4) or sparsely plagioclase-phyric (Pieces 1 and 2) basalt. Glass on Piece 2. 1-2 cm darker alteration rinds on Pieces 1 and 4. Flow banding(?) on 2, which also has aligned vesicles. Glassy segregation in Piece 3. Rare pin-hole vesicles in all pieces.

TEXTURE
Glassy Piece 3, spherulitic Pieces 1-3, and microlitic Piece 4.

ALTERATION
Minor; rinds on 1 and 4. Fe-oxides fill pin-hole vesicles in these. Elsewhere vesicles are empty. Green gray clay on fracture surfaces, Pieces 1 and 4.

THIN SECTION DATA (1000 counts)
27-29 cm (Piece 3):
3.9 plagioclase microlites
2.7 intergrown clinopyroxene
rest spherulitic groundmass

40-42 cm (Piece 4):
A few per cent plagioclase and clinopyroxene microlites in spherulitic matrix.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	4	4	2	3			6	1

Depth: 3219.5 m to 3224.0 m

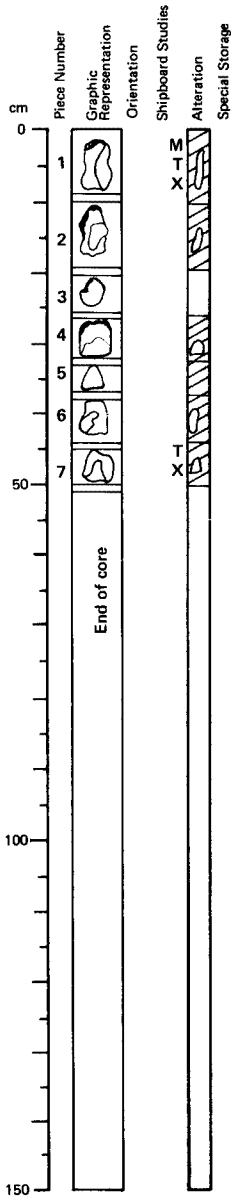
ROCK TYPE AND STRUCTURE
Fine-grained, very sparsely plagioclase-phyric fresh to moderately altered basalt. Piece 5 has marked flow banding. Glass on Pieces 2-4.

TEXTURE
Glassy to spherulithic. Rare pin-hole vesicles.

MINERALOGY
Rare plagioclase phenocrysts all pieces. A single olivine phenocrysts in Piece 5.

ALTERATION
One cm rinds on Pieces 1, 4 and 5. Vesicles have green-blue clay mineral Pieces 1 & 3, white mineral, Piece 2.

THIN SECTION DATA (1000 counts)
28-34 cm (Piece 5): A few per cent plagioclase and clinopyroxene microlites in a spherulitic to glassy matrix rock shows flow banding with alteranting less and more crystalline bands.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 3		7	1

Depth: 3224.0 m to 3229.0 m

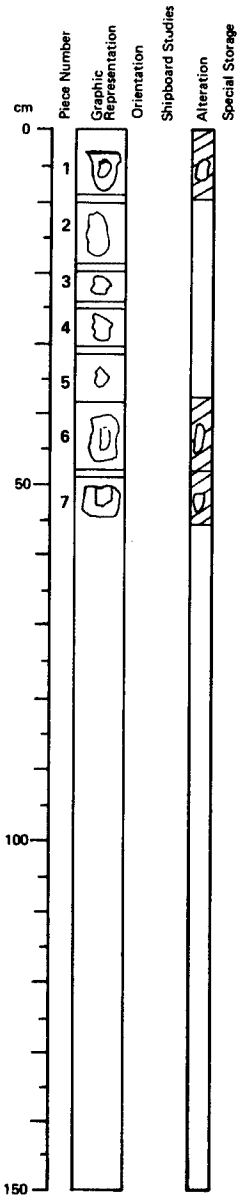
ROCK TYPE AND STRUCTURE
Very sparsely plagioclase phyric basalt. Glass on Pieces 1-4. Fresh to moderately altered.

TEXTURE
Glassy to spherulitic. Rare pin-hole vesicles.

MINERALOGY
Rare plagioclase phenocrysts.

ALTERATION
One cm rinds most pieces. Fe-oxyhydroxides and clays fill vesicles in these rinds. Fe-oxide coloration on fracture surface, Piece 6.

THIN SECTION DATA (1000 counts)
47-48 cm (Piece 7): A few per cent plagioclase and clinopyroxene microlites in a spherulitic to glassy matrix. Rock shows banding of alternating more and less crystalline material.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 3		8	1

Depth: 3229.0 m to 3231.0 m

ROCK TYPE AND STRUCTURE
Fine-grained aphyric basalt, fresh to moderately altered. Glass on Pieces 1 and 2.

TEXTURE
Glassy to spherulitic pin-hole vesicles in most pieces.

MINERALOGY
No phenocrysts.

ALTERATION
One cm rinds on Pieces 1, 6 and 7. Some Fe-oxide staining in rinds.

THIN SECTION DATA (1000 counts)
4-8 cm (Piece 1): Spherulitic banded basalt. Plagioclase spherulites in glassy bands, plagioclase microlites in more crystalline bands.

42-44 cm (Piece 6):
<1% plagioclase phenocrysts
<0.2 mm diameter
Groundmass has 27.8% plagioclase microlites 32.8% clinopyroxene sheaf spherulites or dendritic patches 39.1% combined opaques and dark sub-microcrystalline glass. Smectites in vesicles.

SITE SUMMARY SHEET

SITE 424 HOLE 424

Date occupied	23 May 1977 0500 hrs. LCT
Date departed	24 May 1977 0700 hrs. LCT
Time on hole	26 hours
Position: latitude	00° 35.63'N
longitude	86° 07.82'W
Water depth (sea level)	2685 corrected meters, echo sounding
Water depth (rig floor)	2701 corrected meters, echo sounding
Bottom felt at	2703.5 meters, drill pipe
Penetration	76 meters
Number of holes	1
Number of cores	8
Total length of cored section	76 meters
Total core recovered	36.45 meters
Percentage core recovery	48%

Oldest Sediment Cored

Depth sub-bottom	37.5 meters
Nature	Mn-Fe sediment interlayered with nanno-foram ooze
Age	
Measured velocity	

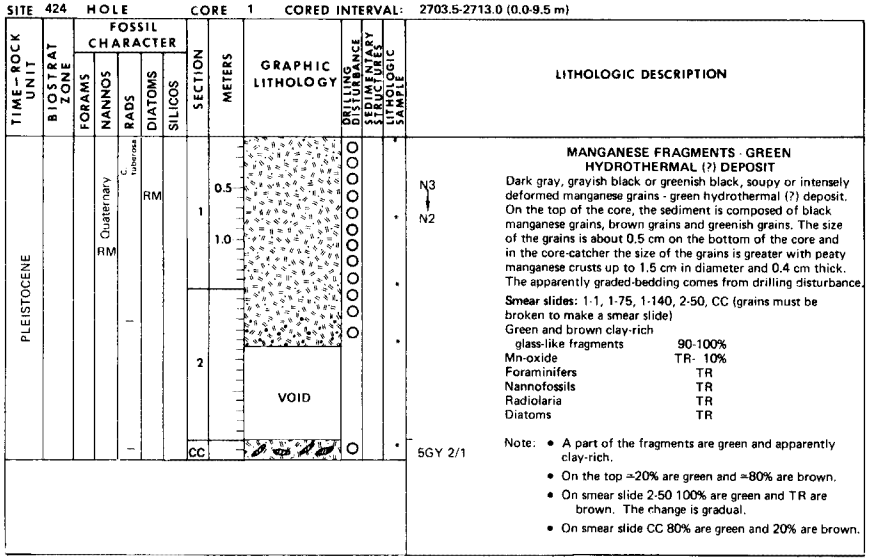
Basement

Depth sub-bottom	38.5 meters
Nature	basaltic rock
Velocity range	5.7 km/sec

Principal Results:

Site comprises N-S transect of four basement holes across a supposed geothermal mounds field about 22 km south of the Galapagos Spreading Center. Magnetic crustal age varies from about 0.60 m.y. at Hole 424C to 0.62 m.y. at Hole 424A. Two holes (424, 424A) located on mound-like features, which were found to consist of, at most, a very thin cap (<30 cm) of foraminiferal-nannofossil ooze overlying up to 15 meters of Fe-Mn material intermixed with green hydrothermal muds, which in turn overlie up to 16 meters of foraminiferal-nannofossil ooze. Other two holes (424B, 424C) located off mounds. Hole 424B shows up to 20 meters of green hydrothermal muds sandwiched between foraminiferal-nannofossil ooze units. Basement at all holes consists of fine- to coarse-grained plagioclase-pyroxene basalts showing hyalopilitic, variolitic, intersertal, and subophitic textures. Hole 424B rocks properly termed ferrobasalts. No obvious hydrothermal alteration, but incipient stages possible.

SITE 424 HOLE CORE 1 CORED INTERVAL: 2703.5-2713.0 (0.0-9.5 m)



MANGANESE FRAGMENTS - GREEN HYDROTHERMAL (?) DEPOSIT

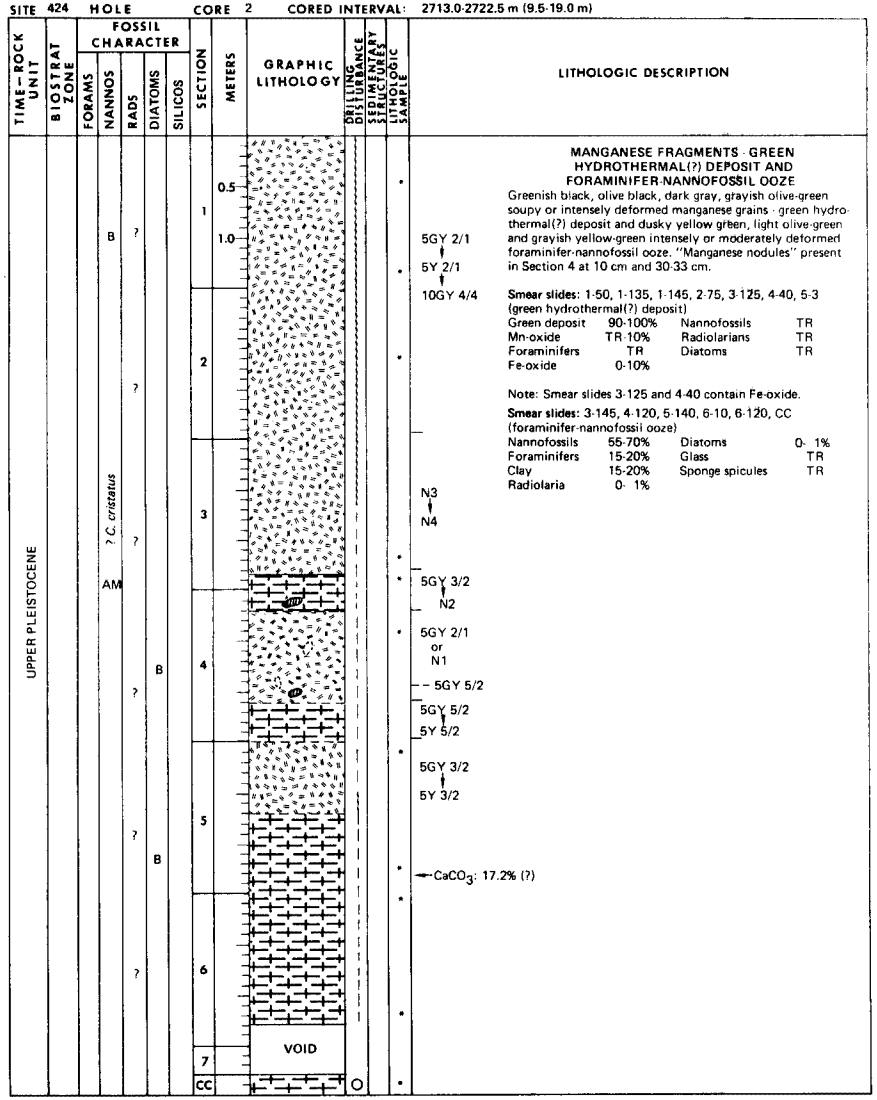
Dark gray, grayish black or greenish black, soupy or intensely deformed manganese grains - green hydrothermal (?) deposit. On the top of the core, the sediment is composed of black manganese grains, brown grains and greenish grains. The size of the grains is about 0.5 cm on the bottom of the core and in the core-catcher the size of the grains is greater with peaty manganese crusts up to 1.5 cm in diameter and 0.4 cm thick. The apparently graded-bedding comes from drilling disturbance.

Smear slides: 1-1, 1-75, 1-140, 2-50, CC (grains must be broken to make a smear slide)

Green and brown clay-rich glass-like fragments	90-100%
Mn-oxide	TR- 10%
Foraminifers	TR
Nannofossils	TR
Radiolaria	TR
Diatoms	TR

Note:
- A part of the fragments are green and apparently clay-rich.
- On the top ≈20% are green and ≈80% are brown.
- On smear slide 2-50 100% are green and TR are brown. The change is gradual.
- On smear slide CC 80% are green and 20% are brown.

SITE 424 HOLE CORE 2 CORED INTERVAL: 2713.0-2722.5 m (9.5-19.0 m)



MANGANESE FRAGMENTS - GREEN HYDROTHERMAL(?) DEPOSIT AND FORAMINIFER-NANNOFOSSIL OOZE

Greenish black, olive black, dark gray, grayish olive-green soupy or intensely deformed manganese grains - green hydrothermal(?) deposit and dusky yellow green, light olive-green and grayish yellow-green intensely or moderately deformed foraminifer-nannofossil ooze. "Manganese nodules" present in Section 4 at 10 cm and 30-33 cm.

Smear slides: 1-50, 1-135, 1-145, 2-75, 3-125, 4-40, 5-3 (green hydrothermal(?) deposit)

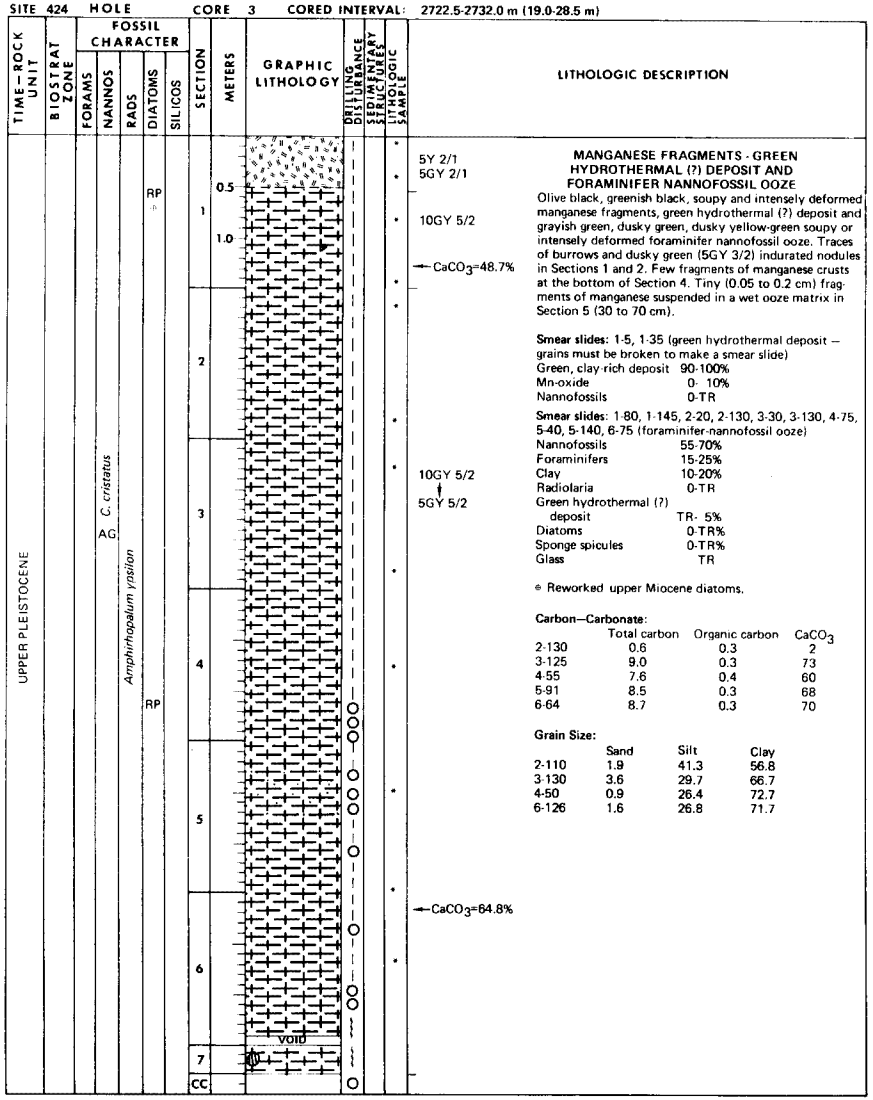
Green deposit	90-100%	Nannofossils	TR
Mn-oxide	TR-10%	Radiolarians	TR
Foraminifers	TR	Diatoms	TR
Fe-oxide	0-10%		

Note: Smear slides 3-125 and 4-40 contain Fe-oxide.

Smear slides: 3-145, 4-120, 5-140, 6-10, 6-120, CC (foraminifer-nannofossil ooze)

Nannofossils	55-70%	Diatoms	0- 1%
Foraminifers	15-20%	Glass	TR
Clay	15-20%	Sponge spicules	TR
Radiolaria	0- 1%		

SITE 424 HOLE CORE 3 CORED INTERVAL: 2722.5-2732.0 m (19.0-28.5 m)



MANGANESE FRAGMENTS - GREEN HYDROTHERMAL (?) DEPOSIT AND FORAMINIFER NANNOFOSSIL OOZE

Olive black, greenish black, soupy and intensely deformed manganese fragments, green hydrothermal (?) deposit and grayish green, dusky green, dusky yellow-green soupy or intensely deformed foraminifer nannofossil ooze. Traces of burrows and dusky green (5GY 3/2) indurated nodules in Sections 1 and 2. Few fragments of manganese crusts at the bottom of Section 4. Tiny (0.05 to 0.2 cm) fragments of manganese suspended in a wet ooze matrix in Section 5 (30 to 70 cm).

Smear slides: 1-5, 1-35 (green hydrothermal deposit — grains must be broken to make a smear slide)

Green, clay-rich deposit	90-100%
Mn-oxide	0- 10%
Nannofossils	0-TR

Smear slides: 1-80, 1-145, 2-20, 2-130, 3-30, 3-130, 4-75, 5-40, 5-140, 6-75 (foraminifer-nannofossil ooze)

Nannofossils	55-70%
Foraminifers	15-25%
Clay	10-20%
Radiolaria	0-TR
Green hydrothermal (?) deposit	TR- 5%
Diatoms	0-TR%
Sponge spicules	0-TR%
Glass	TR

⊕ Reworked upper Miocene diatoms.

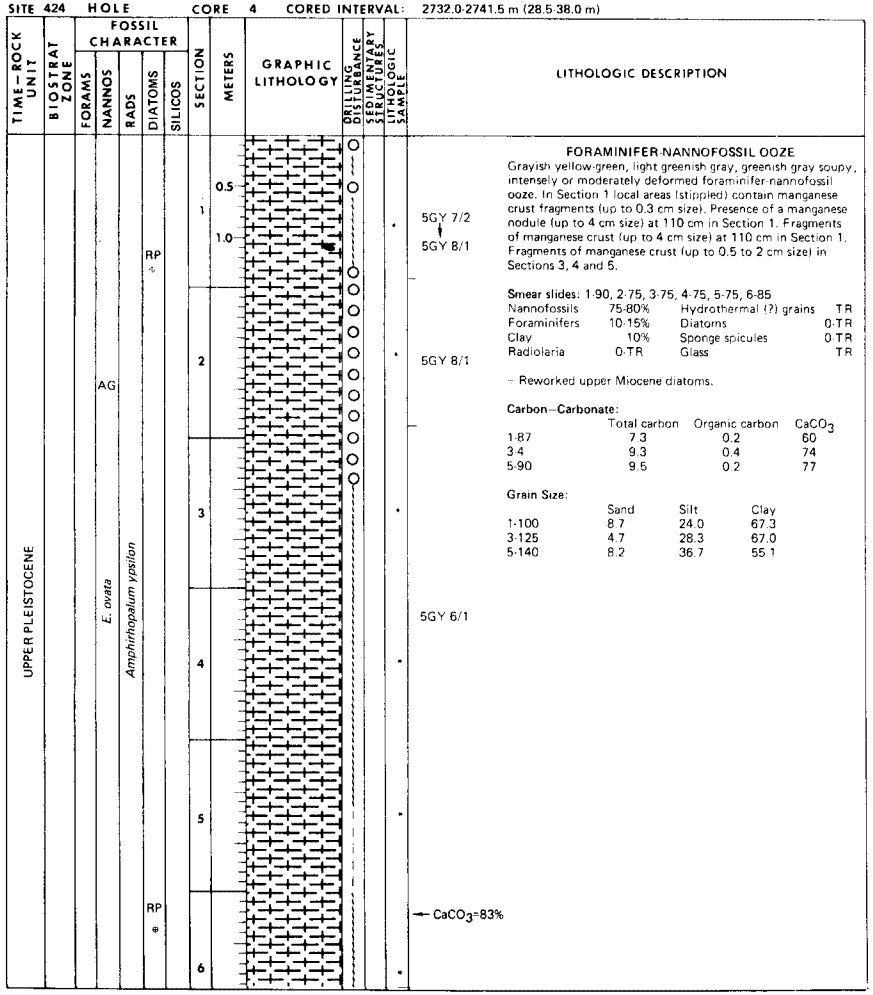
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-130	0.6	0.3	2
3-125	9.0	0.3	73
4-55	7.6	0.4	60
5-91	8.5	0.3	68
6-64	8.7	0.3	70

Grain Size:

	Sand	Silt	Clay
2-110	1.9	41.3	56.8
3-130	3.6	29.7	66.7
4-50	0.9	26.4	72.7
6-126	1.6	26.8	71.7

SITE 424 HOLE CORE 4 CORED INTERVAL: 2732.0-2741.5 m (28.5-38.0 m)



FORAMINIFER-NANNOFOSSIL OOZE

Grayish yellow-green, light greenish gray, greenish gray soupy, intensely or moderately deformed foraminifer-nannofossil ooze. In Section 1 local areas (stippled) contain manganese crust fragments (up to 0.3 cm size). Presence of a manganese nodule (up to 4 cm size) at 110 cm in Section 1. Fragments of manganese crust (up to 4 cm size) at 110 cm in Section 1. Fragments of manganese crust (up to 0.5 to 2 cm size) in Sections 3, 4 and 5.

Smear slides: 1-90, 2-75, 3-75, 4-75, 5-75, 6-85

Nannofossils	75-80%	Hydrothermal (?) grains	TR
Foraminifers	10-15%	Diatoms	0-TR
Clay	10%	Sponge spicules	0-TR
Radiolaria	0-TR	Glass	TR

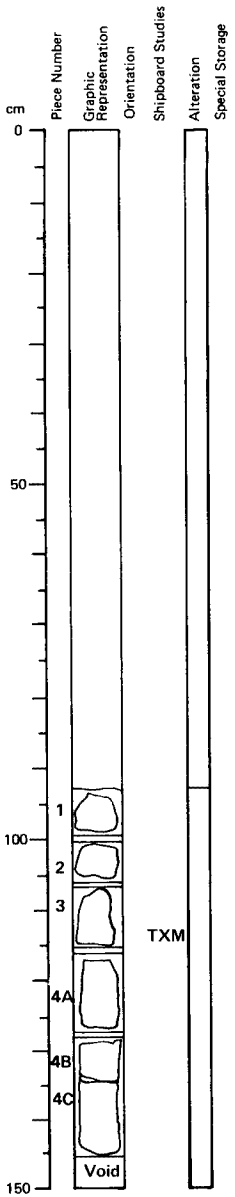
⊕ Reworked upper Miocene diatoms.

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-87	7.3	0.2	60
3-4	9.3	0.4	74
5-90	9.5	0.2	77

Grain Size:

	Sand	Silt	Clay
1-100	8.7	24.0	67.3
3-125	4.7	28.3	67.0
5-140	8.2	36.7	55.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE	SECT.
5	4	4	2	4	4	6

Depth: 2732.0 m to 2741.5 m

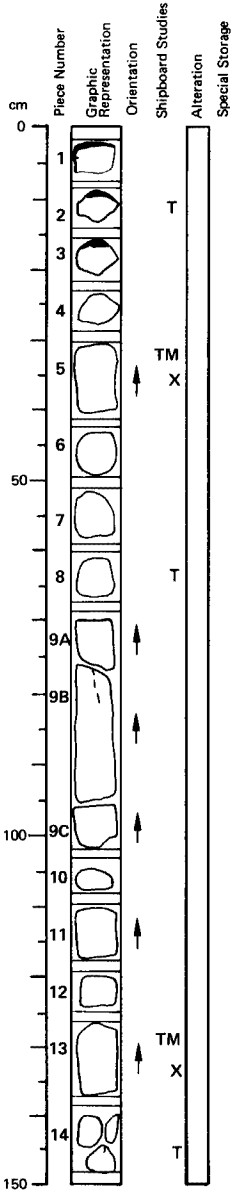
0-94 cm described on previous barrel sheet. Two basalt pieces in Core Catcher fit with last piece in Section 6. They are numbered consecutively as though they were in Section 6.

ROCK TYPE AND STRUCTURE
Very sparsely plagioclase phyric basalts.

TEXTURE
Aphanitic; sparse vesicles ~1 mm in size. Pebbles 1 and 2 glassier than 3 and 4.

MINERALOGY
Plagioclase laths <2 mm in size. Groundmass unresolvable in hand specimens.

ALTERATION
Green clays in vesicles; fractures in 3 and 4 coated with green clays; samples basically fresh.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE	SECT.
5	4	4	2	4	5	1

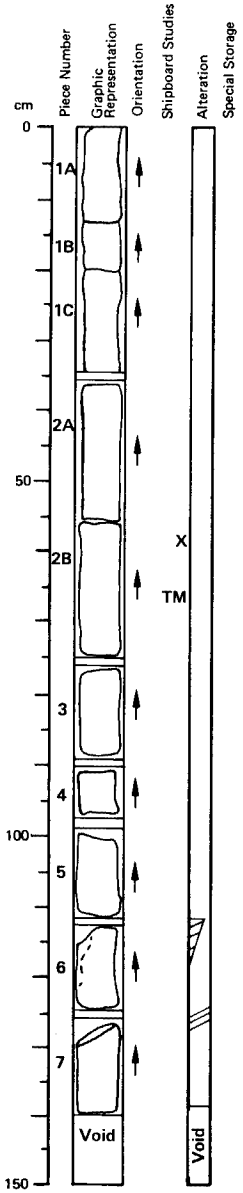
Depth: 2741.5 m to 2750.0 m

ROCK TYPE AND STRUCTURE
Very sparsely plagioclase phyric basalt.

TEXTURE
Aphanitic; vesicles up to 1 mm in size. Pieces 1-6 have glassy rinds.

MINERALOGY
Only occasional plagioclase laths visible.

ALTERATION
Samples basically fresh; vesicles filled with green clay minerals; clays in fracture surfaces, Pieces 9A, 9C, and 11.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

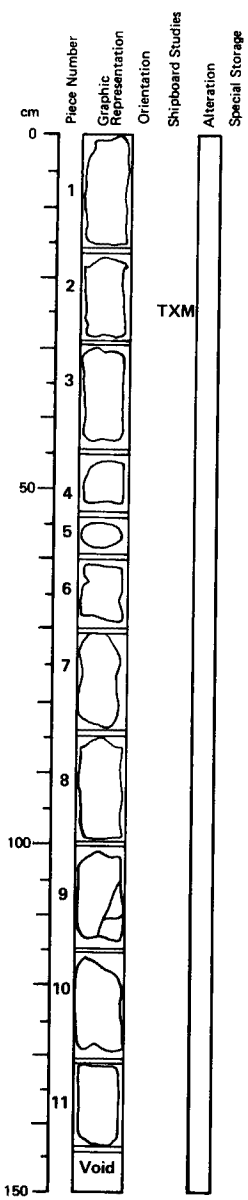
LEG		SITE			HOLE		CORE		SECT.	
5	4	4	2	4				5		2

ROCK TYPE AND STRUCTURE
Very sparsely plagioclase-phyric basalt.

TEXTURE
Aphanitic; vesicles up to 2 mm in size; coarsest grained areas near top.

MINERALOGY
Only occasional plagioclase laths visible.

ALTERATION
Rinds on Pieces 6-7; green clays on fracture surfaces, Pieces 3, 6, and 7.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

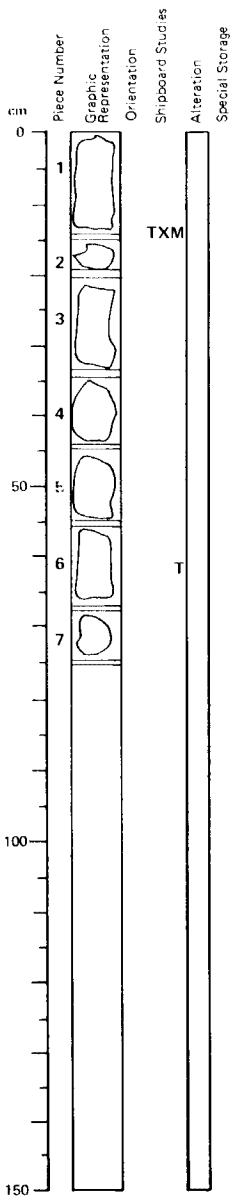
LEG		SITE			HOLE		CORE		SECT.	
5	4	4	2	4				5		3

ROCK TYPE AND STRUCTURE
Fine-grained basalt.

TEXTURE
Aphanitic; some vesicles and vugs present.

MINERALOGY
No phyric crystals present.

ALTERATION
Fresh basalt; some vesicles contain greenish secondary minerals along tissues.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

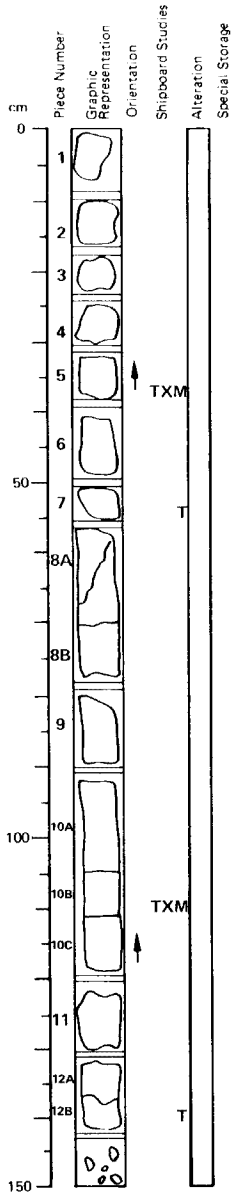
LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	4		5	4

ROCK TYPE AND STRUCTURE
Fine grained basalt.

TEXTURE
Aphanitic; some vesicles present.

MINERALOGY
No phyric crystals observed.

ALTERATION
Basically fresh material; some filled vesicles.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	4		6	1

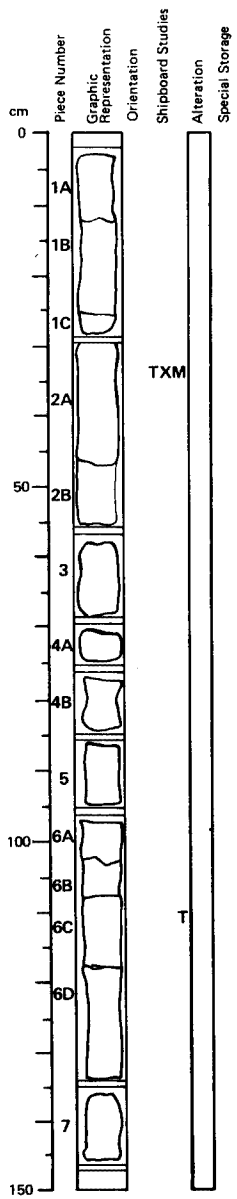
Depth: 2750.0 m

ROCK TYPE AND STRUCTURE
Fine grained basalt.

TEXTURE
Aphanitic; some vugs and vesicles present.

MINERALOGY
Some plagioclase and clinopyroxene present, < 2 mm in size.

ALTERATION
Basically fresh except for some green clays in vugs and vesicles.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

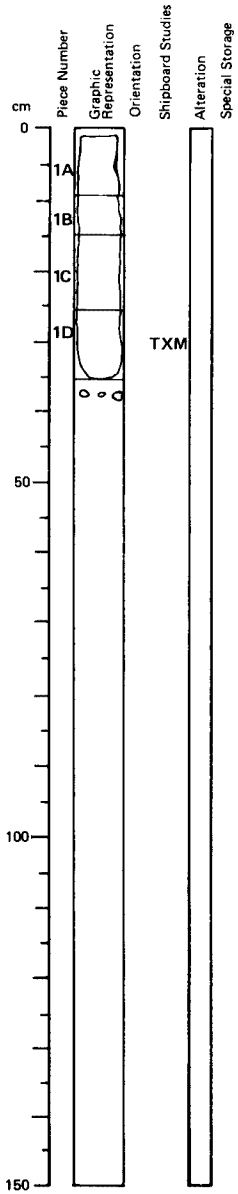
LEG		SITE			HOLE	CORE		SECT.
5	4	4	2	4		6		2

ROCK TYPE AND STRUCTURE
Fine-grained basalt

TEXTURE
Aphanitic; some vugs and vesicles up to 2 mm in size.

MINERALOGY
Some phyric plagioclase present.

ALTERATION
Basically fresh material, some green clay patches and vesicle fillings.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

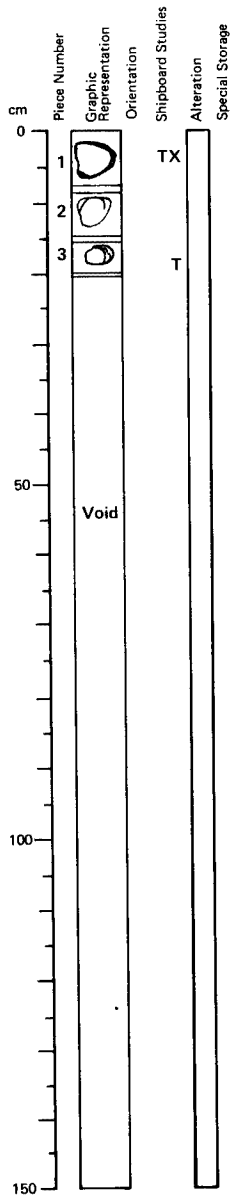
LEG		SITE			HOLE	CORE		SECT.
5	4	4	2	4		6		3

ROCK TYPE AND STRUCTURE
Fine-grained basalt.

TEXTURE
Aphanitic; some vesicles present.

MINERALOGY
Rare phyric plagioclase present.

ALTERATION
Fresh basalt.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	4		7	1

ROCK TYPE AND STRUCTURE
Fine-grained basalt.

TEXTURE
Aphanitic; some vesicles present.

MINERALOGY
No phyric crystals observed.

ALTERATION
Fresh basalt.

SITE SUMMARY SHEET

SITE 424 HOLE 424A

Date occupied	24 May 1977 0750 hrs. LCT
Date departed	24 May 1977 2400 hrs. LCT
Time on hole	16.2 hours
Position: latitude	00° 35.33'N
longitude	86° 07.81'W
Water depth (sea level)	no PDR depth
Water depth (rig floor)	no PDR depth
Bottom felt at	2708.0 meters, drill pipe
Penetration	34.0 meters
Number of holes	1
Number of cores	3 plus 1X
Total length of cored section	34.0 meters
Total core recovered	13.13 meters
Percentage core recovery	39%

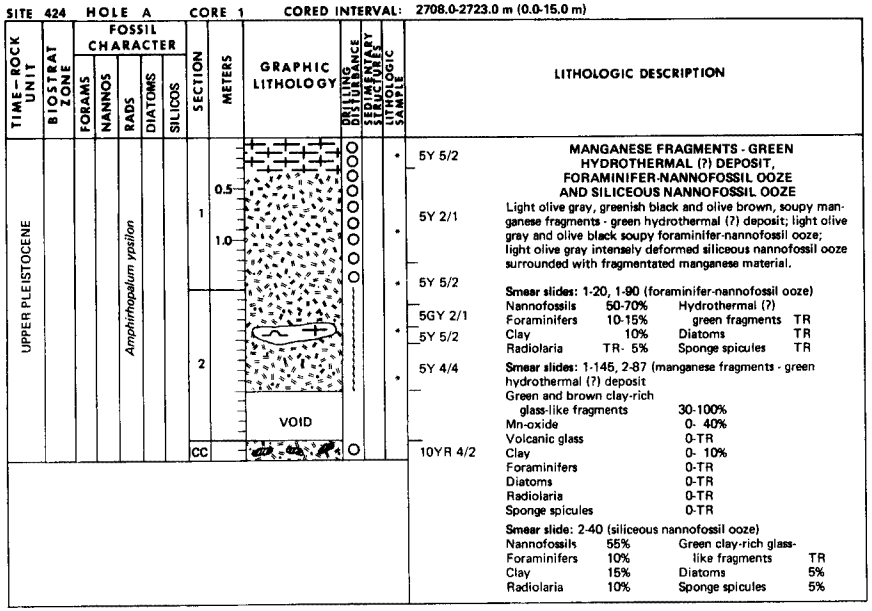
Oldest Sediment Cored

Depth sub-bottom	33.90 meters
Nature	Mn-Fe sediment interlayered with nannofossil ooze
Age	200,000 - 400,000 years
Measured velocity	none km/sec

Basement

Depth sub-bottom	0.61 meters
Nature	basaltic rock
Velocity range	5.7 km/sec

SITE 424 HOLE A CORE 1 CORED INTERVAL: 2708.0-2723.0 m (0.0-15.0 m)



MANGANESE FRAGMENTS - GREEN HYDROTHERMAL (?) DEPOSIT, FORAMINIFER-NANNOFOSSIL OOZE AND SILICEOUS NANNOFOSSIL OOZE

Light olive gray, greenish black and olive brown, soupy manganese fragments - green hydrothermal (?) deposit; light olive gray and olive black soupy foraminifer-nannofossil ooze; light olive gray intensely deformed siliceous nannofossil ooze surrounded with fragmentated manganese material.

Smear slides: 1-20, 1-90 (foraminifer-nannofossil ooze)

Nannofossils	50-70%	Hydrothermal (?) green fragments	TR
Foraminifers	10-15%		
Clay	10%	Diatoms	TR
Radiolaria	TR- 5%	Sponge spicules	TR

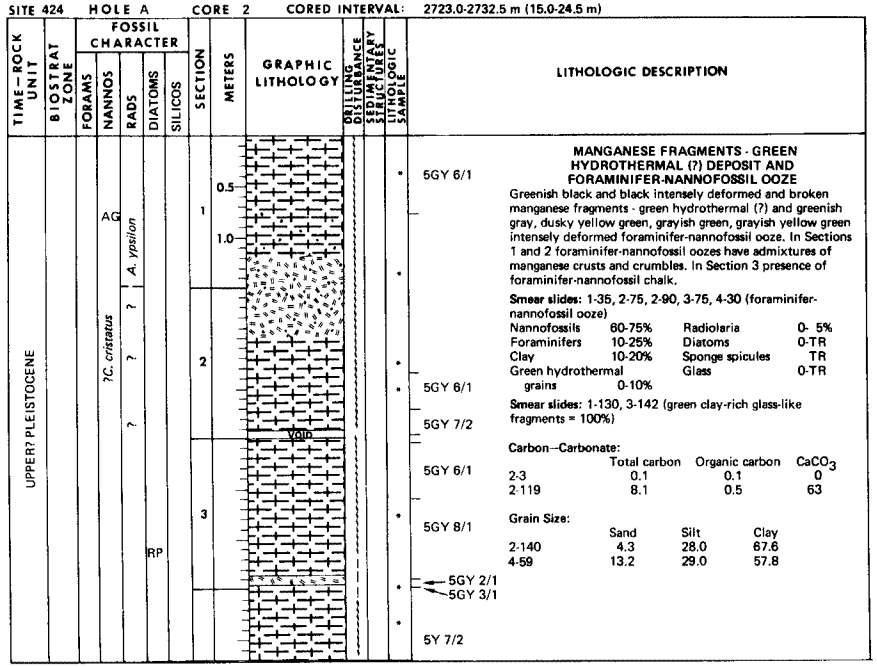
Smear slides: 1-145, 2-87 (manganese fragments - green hydrothermal (?) deposit

Green and brown clay-rich glass-like fragments	30-100%
Mn-oxide	0- 40%
Volcanic glass	0-TR
Clay	0- 10%
Foraminifers	0-TR
Diatoms	0-TR
Radiolaria	0-TR
Sponge spicules	0-TR

Smear slide: 2-40 (siliceous nannofossil ooze)

Nannofossils	55%	Green clay-rich glass-like fragments	TR
Foraminifers	10%		
Clay	15%	Diatoms	5%
Radiolaria	10%	Sponge spicules	5%

SITE 424 HOLE A CORE 2 CORED INTERVAL: 2723.0-2732.5 m (15.0-24.5 m)



MANGANESE FRAGMENTS - GREEN HYDROTHERMAL (?) DEPOSIT AND FORAMINIFER-NANNOFOSSIL OOZE

Greenish black and black intensely deformed and broken manganese fragments - green hydrothermal (?) and greenish gray, dusky yellow green, grayish green, grayish yellow green intensely deformed foraminifer-nannofossil ooze. In Sections 1 and 2 foraminifer-nannofossil oozes have admixtures of manganese crusts and crumbles. In Section 3 presence of foraminifer-nannofossil chalk.

Smear slides: 1-35, 2-75, 2-90, 3-75, 4-30 (foraminifer-nannofossil ooze)

Nannofossils	60-75%	Radiolaria	0- 5%
Foraminifers	10-25%	Diatoms	0-TR
Clay	10-20%	Sponge spicules	TR
Green hydrothermal grains	0-10%	Glass	0-TR

Smear slides: 1-130, 3-142 (green clay-rich glass-like fragments = 100%)

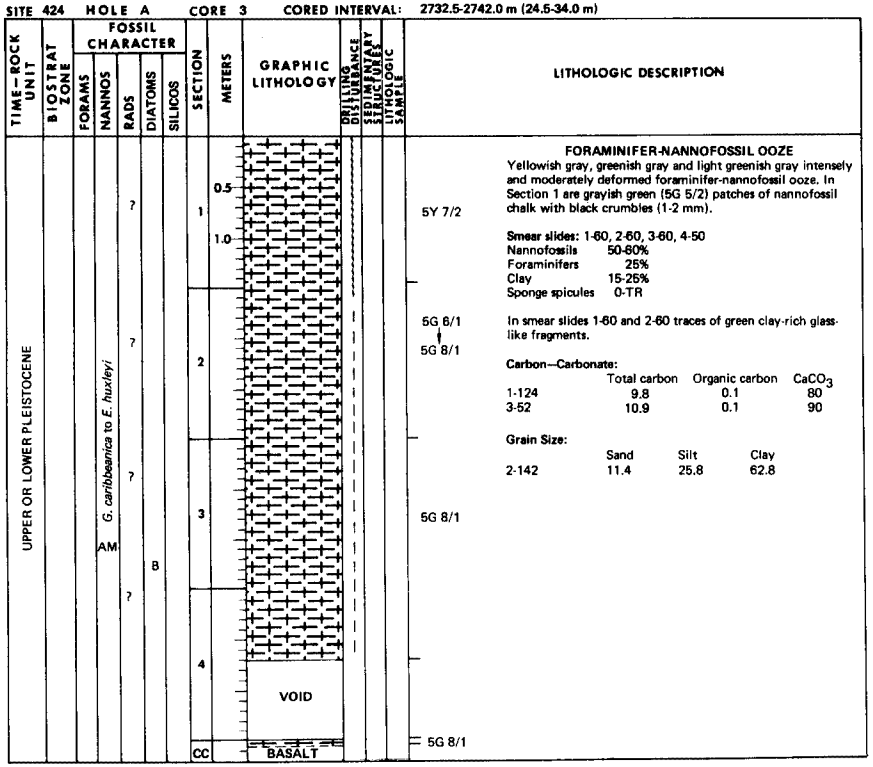
Carbon--Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-3	0.1	0.1	0
2-119	8.1	0.5	63

Grain Size:

	Sand	Silt	Clay
2-140	4.3	28.0	67.6
4-59	13.2	29.0	57.8

SITE 424 HOLE A CORE 3 CORED INTERVAL: 2732.5-2742.0 m (24.5-34.0 m)



FORAMINIFER-NANNOFOSSIL OOZE

Yellowish gray, greenish gray and light greenish gray intensely and moderately deformed foraminifer-nannofossil ooze. In Section 1 are grayish green (5G 5/2) patches of nannofossil chalk with black crumbles (1-2 mm).

Smear slides: 1-60, 2-60, 3-60, 4-50

Nannofossils	50-80%
Foraminifers	25%
Clay	15-25%
Sponge spicules	0-TR

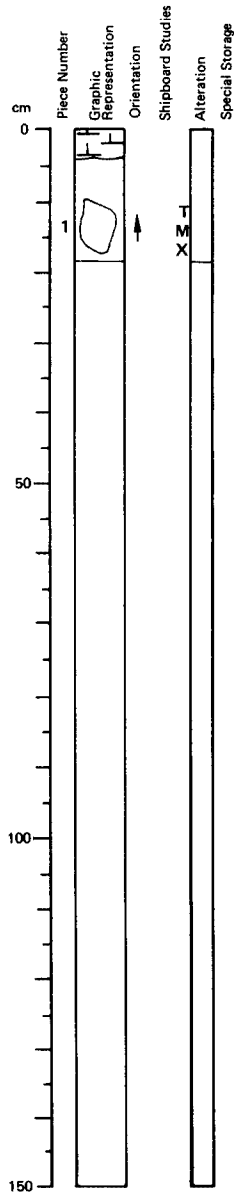
In smear slides 1-60 and 2-60 traces of green clay-rich glass-like fragments.

Carbon--Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-124	9.8	0.1	80
3-52	10.9	0.1	90

Grain Size:

	Sand	Silt	Clay
2-142	11.4	25.8	62.8



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.
5	4	4	2	4	A			3	CC

Depth: 2732.5 m to 2742.0 m

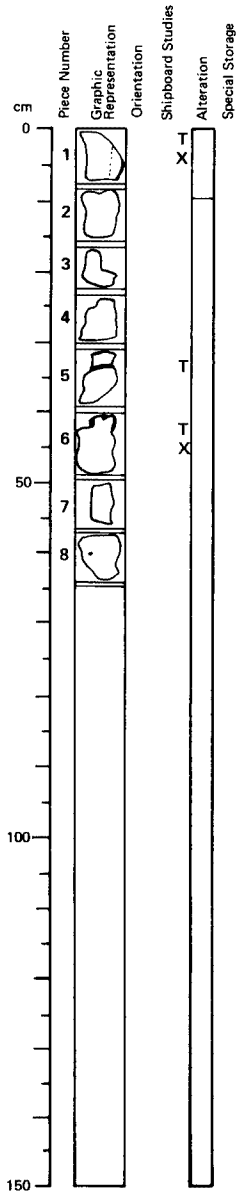
0-70 cm of Core 3, Section 4 described on previous barrel sheet. The basalt in the Core Catcher of Core 3 is described here.

ROCK TYPE AND STRUCTURE
Aphyric basalt.

TEXTURE
Aphanitic; vesicular.

MINERALOGY
Fine-grained matrix unresolvable.

ALTERATION
Fresh, except for blue clay mineral in vesicles.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.
5	4	4	2	4	A				*

Depth: 2742.0 m

* All pieces are just rubble, no stratigraphic orientation.

ROCK TYPE AND STRUCTURE
Sparsely plagioclase-phyric basalt; Piece 5 is lithified nannofossil foram ooze. All pieces rubble, no stratigraphic orientation.

TEXTURE
Aphanitic; gaining slightly in coarseness in Pieces 2, 3, 4; glassy margin on Pieces 1 and 6; vugs and vesicles present.

MINERALOGY
Phyric plagioclase in Pieces 3, 4, 6, 7, 8; groundmass in general unresolvable.

ALTERATION
Blue clay minerals and calcite in vugs; vein in Piece 4 is filled with green clay mineral; Pieces 2 and 3 very fresh.

SITE SUMMARY SHEET

SITE 424 HOLE 424B

Date occupied	25 May 1977 0030 hrs. LCT
Date departed	25 May 1977 1048 hrs. LCT
Time on hole	10.75 hours
Position: latitude	00° 35.82'N
longitude	86° 07.82'W
Water depth (sea level)	2705 corrected meters, echo sounding
Water depth (rig floor)	2696 corrected meters, echo sounding
Bottom felt at	2706 meters, drill pipe
Penetration	46.5 meters
Number of holes	1
Number of cores	6
Total length of cored section	46.5 meters
Total core recovered	29.30 meters
Percentage core recovery	63%

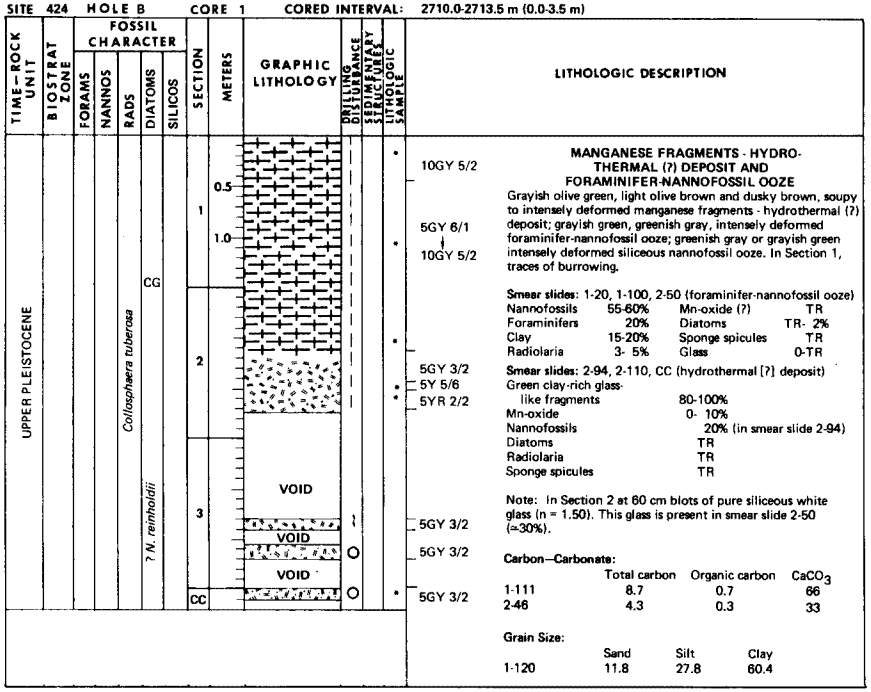
Oldest Sediment Cored

Depth sub-bottom	32.0 meters
Nature	nannofossil-foraminiferal ooze
Age	<200,000 years
Measured velocity	

Basement

Depth sub-bottom	14.5 meters
Nature	basaltic rock
Velocity range	5.7 km/sec

SITE 424 HOLE B CORE 1 CORED INTERVAL: 2710.0-2713.5 m (0.0-3.5 m)



MANGANESE FRAGMENTS - HYDROTHERMAL (?) DEPOSIT AND FORAMINIFER-NANNOFOSSIL OOZE

Grayish olive green, light olive brown and dusky brown, soupy to intensely deformed manganese fragments - hydrothermal (?) deposit; grayish green, greenish gray, intensely deformed foraminifer-nannofossil ooze; greenish gray or grayish green intensely deformed siliceous nannofossil ooze. In Section 1, traces of burrowing.

Smear slides: 1-20, 1-100, 2-50 (foraminifer-nannofossil ooze)

Nannofossils	55-60%	Mn-oxide (?)	TR
Foraminifers	20%	Diatoms	TR- 2%
Clay	15-20%	Sponge spicules	TR
Radiolaria	3- 5%	Glass	0-TR

Smear slides: 2-94, 2-110, CC (hydrothermal [?] deposit)

Green clay-rich glass-like fragments	80-100%
Mn-oxide	0- 10%
Nannofossils	20% (in smear slide 2-94)
Diatoms	TR
Radiolaria	TR
Sponge spicules	TR

Note: In Section 2 at 60 cm blots of pure siliceous white glass (n = 1.50). This glass is present in smear slide 2-50 (≈30%).

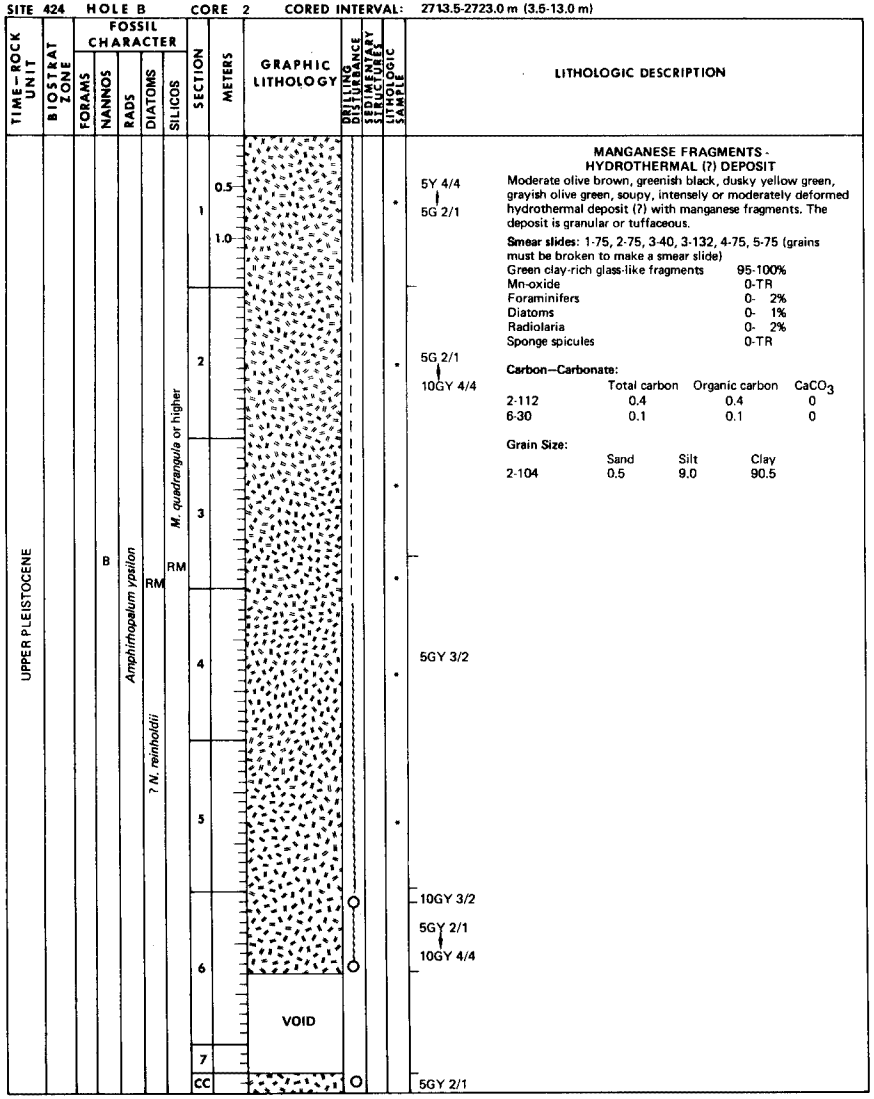
Carbon—Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-111	8.7	0.7	66
2-46	4.3	0.3	33

Grain Size:

	Sand	Silt	Clay
1-120	11.8	27.8	60.4

SITE 424 HOLE B CORE 2 CORED INTERVAL: 2713.5-2723.0 m (3.5-13.0 m)



MANGANESE FRAGMENTS - HYDROTHERMAL (?) DEPOSIT

Moderate olive brown, greenish black, dusky yellow green, grayish olive green, soupy, intensely or moderately deformed hydrothermal deposit (?) with manganese fragments. The deposit is granular or tuffaceous.

Smear slides: 1-75, 2-75, 3-40, 3-132, 4-75, 5-75 (grains must be broken to make a smear slide)

Green clay-rich glass-like fragments	95-100%
Mn-oxide	0-TR
Foraminifers	0- 2%
Diatoms	0- 1%
Radiolaria	0- 2%
Sponge spicules	0-TR

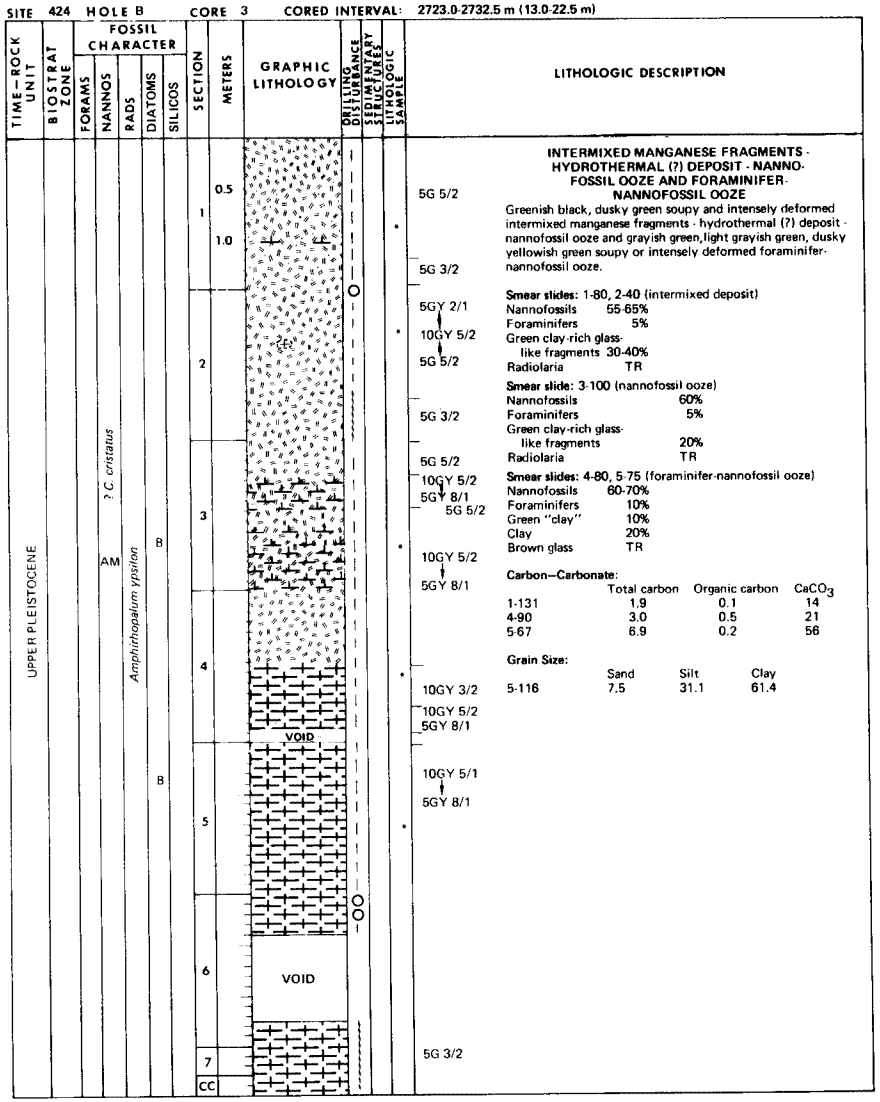
Carbon—Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-112	0.4	0.4	0
6-30	0.1	0.1	0

Grain Size:

	Sand	Silt	Clay
2-104	0.5	9.0	90.5

SITE 424 HOLE B CORE 3 CORED INTERVAL: 2723.0-2732.5 m (13.0-22.5 m)



INTERMIXED MANGANESE FRAGMENTS · HYDROTHERMAL (?) DEPOSIT · NANNO-FOSSIL OOZE AND FORAMINIFER-NANNOFOSSIL OOZE

Greenish black, dusky green soupy and intensely deformed intermixed manganese fragments · hydrothermal (?) deposit · nannofossil ooze and grayish green, light grayish green, dusky yellowish green soupy or intensely deformed foraminifer-nannofossil ooze.

Smear slides: 1-80, 2-40 (intermixed deposit)

Nannofossils	55-65%
Foraminifers	5%
Green clay-rich glass-like fragments	30-40%
Radiolaria	TR

Smear slide: 3-100 (nannofossil ooze)

Nannofossils	60%
Foraminifers	5%
Green clay-rich glass-like fragments	20%
Radiolaria	TR

Smear slides: 4-80, 5-75 (foraminifer-nannofossil ooze)

Nannofossils	60-70%
Foraminifers	10%
Green "clay"	10%
Clay	20%
Brown glass	TR

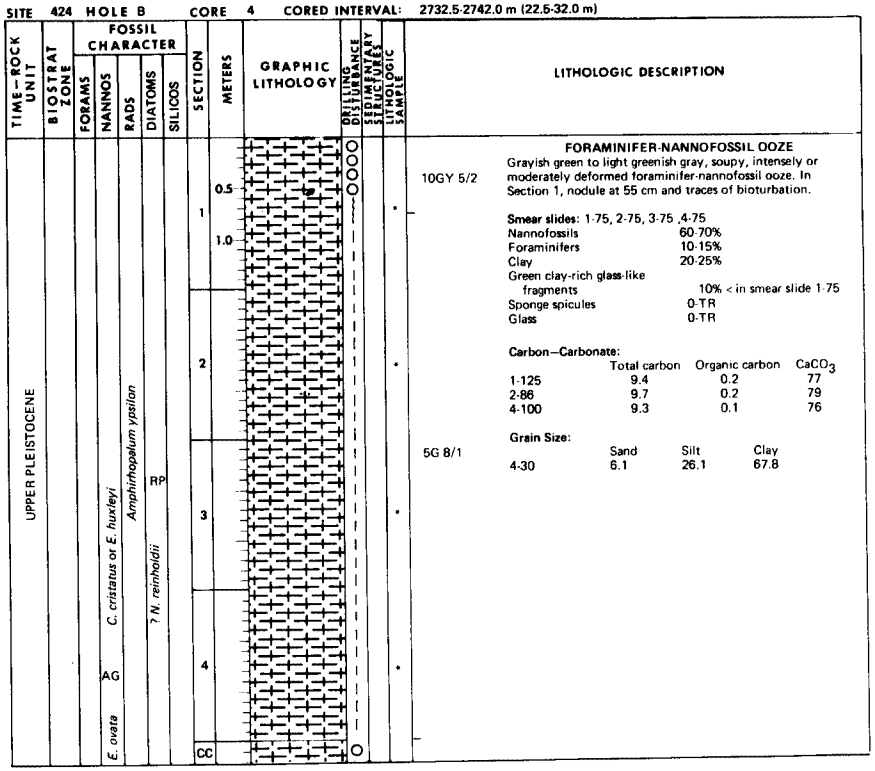
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-131	1.9	0.1	14
4-90	3.0	0.5	21
5-67	6.9	0.2	56

Grain Size:

	Sand	Silt	Clay
5-116	7.5	31.1	61.4

SITE 424 HOLE B CORE 4 CORED INTERVAL: 2732.5-2742.0 m (22.5-32.0 m)



FORAMINIFER-NANNOFOSSIL OOZE

10GY 5/2 Grayish green to light greenish gray, soupy, intensely or moderately deformed foraminifer-nannofossil ooze. In Section 1, nodule at 55 cm and traces of bioturbation.

Smear slides: 1-75, 2-75, 3-75, 4-75

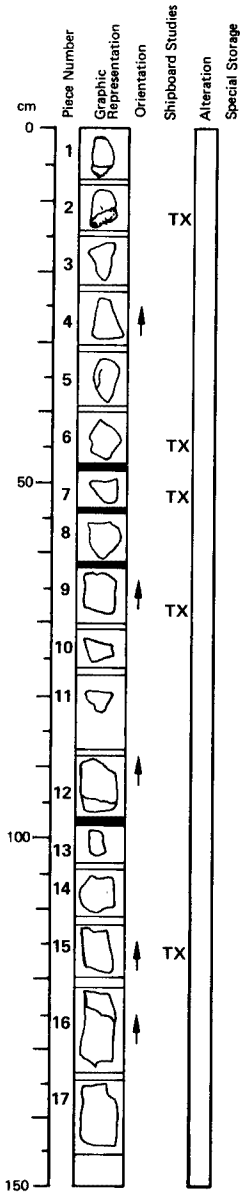
Nannofossils	60-70%
Foraminifers	10-15%
Clay	20-25%
Green clay-rich glass-like fragments	10% < in smear slide 1-75
Sponge spicules	0-TR
Glass	0-TR

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-125	9.4	0.2	77
2-86	9.7	0.2	79
4-100	9.3	0.1	76

Grain Size:

	Sand	Silt	Clay
5G 8/1 4-30	6.1	26.1	67.8



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 4	B	5	1

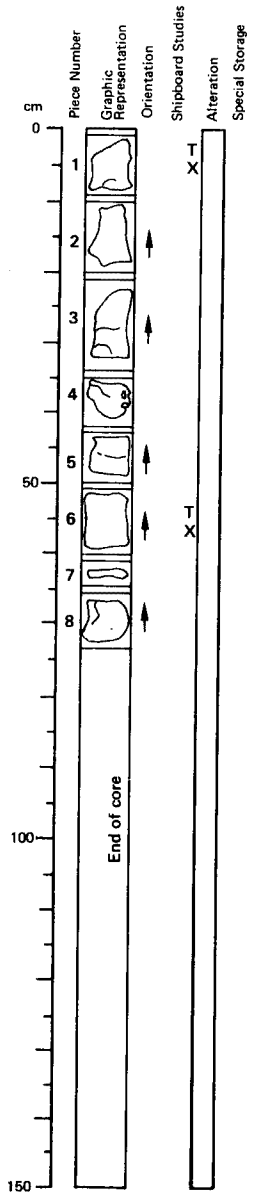
Depth: 2742.0 m to 2743.5 m

ROCK TYPE AND STRUCTURE
Sparsely plagioclase-phyric basalt.

TEXTURE
Aphanitic (Pieces 10, 17 slightly coarser); variolitic texture and cut surface of most pieces; glassy areas on Piece 2; vesicles present.

MINERALOGY
Plagioclase phenocrysts present in most pieces; sulfides visible in Piece 2; clinopyroxene in Pieces 3 and 14.

ALTERATION
Most pieces fresh; some vesicles filled with zeolite and blue clay mineral.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 4	B	5	2

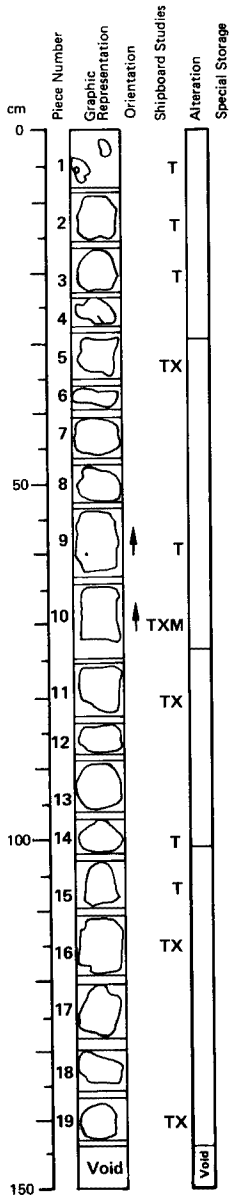
Depth: 2343.5 m to 2344.25 m

ROCK TYPE AND STRUCTURE
Slightly plagioclase-phyric basalt.

TEXTURE
Aphanitic, especially Piece 1; vesicles.

MINERALOGY
Rare plagioclase phenocrysts; groundmass in general unresolvable.

ALTERATION
Very fresh material aside from vesicle fillings of blue clay mineral and lesser zeolites; Piece 4 has vugs with botryoidal manganese.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	4	4	2	4	B		6	1

Depth: 2751.5 m to 2761.0 m

ROCK TYPE AND STRUCTURE
Aphyric dark gray basalt.

TEXTURE
Aphanitic; glass coatings in Pieces 5, 16; abundant vesicles and vugs 0.1-0.2 mm.

MINERALOGY
Only rare plagioclase crystals visible in Piece 19; possible clinopyroxene aggregate in Piece 16; in general, mineralogy unresolvable.

ALTERATION
Resonably fresh except for lining of vesicles with bluish clay minerals.

SITE SUMMARY SHEET

SITE 424 HOLE 424C

Date occupied	25 May 1977 1048 hrs. LCT
Date departed	25 May 1977
Time on hole	
Position: latitude	00° 35.93'N
longitude	86° 07.82'W
Water depth (sea level)	2699.0 corrected meters, echo sounding
Water depth (rig floor)	2710.5 corrected meters, echo sounding
Bottom felt at	2710.5 meters, drill pipe
Penetration	34.5 meters
Number of holes	1
Number of cores	3
Total length of cored section	16.5 meters
Total core recovered	7.81 meters
Percentage core recovery	47%

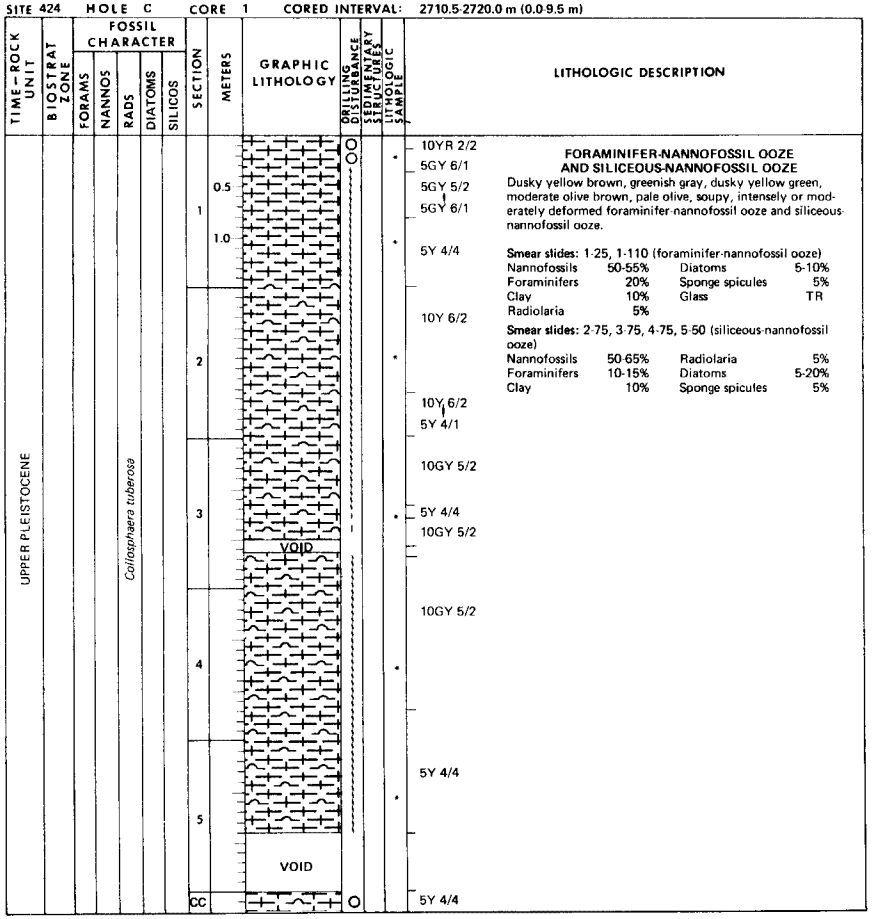
Oldest Sediment Cored

Depth sub-bottom	26.7 meters
Nature	foraminiferal-nannofossil ooze
Age	
Measured velocity	

Basement

Depth sub-bottom	7.8 meters
Nature	basaltic rock
Velocity range	5.7 km/sec

SITE 424 HOLE C CORE 1 CORED INTERVAL: 2710.5-2720.0 m (0.0-9.5 m)



FORAMINIFER-NANNOFOSSIL OOZE AND SILICEOUS-NANNOFOSSIL OOZE

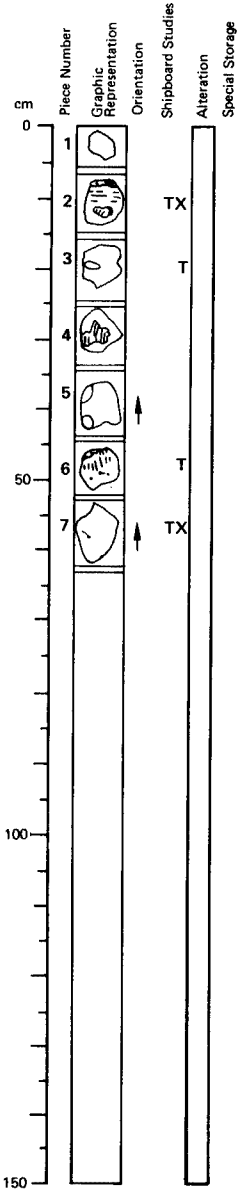
Dusky yellow brown, greenish gray, dusky yellow green, moderate olive brown, pale olive, soupy, intensely or moderately deformed foraminifer-nannofossil ooze and siliceous-nannofossil ooze.

Smear slides: 1-25, 1-110 (foraminifer-nannofossil ooze)

Nannofossils	50-55%	Diatoms	5-10%
Foraminifers	20%	Sponge spicules	5%
Clay	10%	Glass	TR
Radiolaria	5%		

Smear slides: 2-75, 3-75, 4-75, 5-50 (siliceous-nannofossil ooze)

Nannofossils	50-65%	Radiolaria	5%
Foraminifers	10-15%	Diatoms	5-20%
Clay	10%	Sponge spicules	5%



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 4	C	2	1

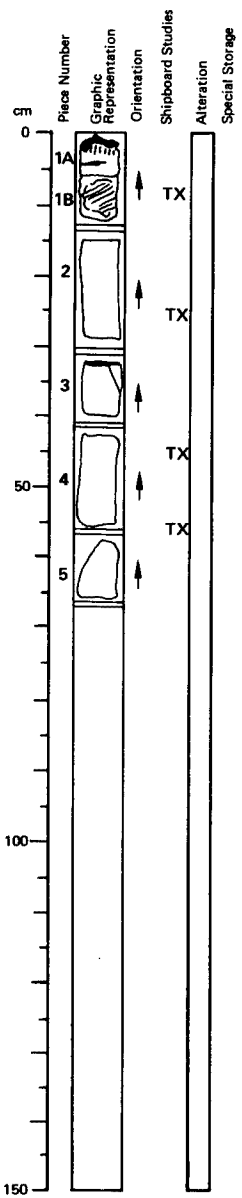
Depth: 2738.0 m to 2742.0 m

ROCK TYPE AND STRUCTURE
Slightly microporphyritic basalt.

TEXTURE
Aphanitic; some glassy margins on Pieces 2, 6; vesicles and vugs common, up to 2 mm in size.

MINERALOGY
Microphenocrysts of plagioclase in Pieces 2, 3, 4. Most mineralogy too fine-grained to resolve.

ALTERATION
Essentially fresh material with vugs free of secondary minerals.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 4	C	3	1

Depth: 2742.0 m to 2745.0 m

ROCK TYPE AND STRUCTURE
Aphyric basalt.

TEXTURE
Aphanitic; glassy fringes on Piece 1; some vesicles present, 0.5 mm.

MINERALOGY
Only rare microphenocrysts of plagioclase, Pieces 2, 3; groundmass too fine-grained to resolve.

ALTERATION
Essentially fresh material; rust-colored and greenish secondary minerals in vugs of Pieces 1B, 4.

SITE SUMMARY SHEET

SITE 425 HOLE 425

Date occupied	26 May 1977 0800 hrs. LCT
Date departed	27 May 1977 0600 hrs. LCT
Time on hole	22 hours
Position: latitude	01°23.68'N
longitude	86°04.22'W
Water depth (sea level)	2850 corrected meters, echo sounding
Water depth (rig floor)	2862 corrected meters, echo sounding
Bottom felt at	2872 meters, drill pipe
Penetration	110.0 meters
Number of holes	1
Number of cores	9
Total length of cored section	81.5 meters
Total core recovered	43.42 meters
Percentage core recovery	53%

Oldest Sediment Cored

Depth sub-bottom	91.0 meters
Nature	foraminiferal-nannofossil ooze
Age	early Pleistocene
Measured velocity	

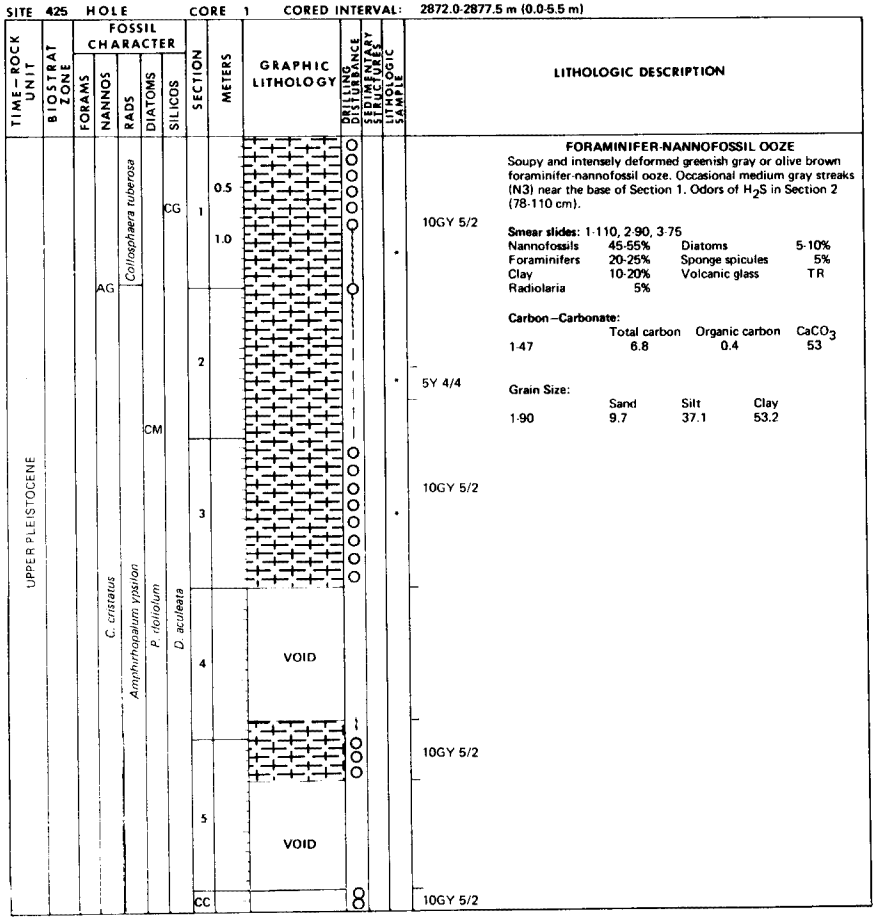
Basement

Depth sub-bottom	28.5 meters
Nature	massive basalt
Velocity range	5.6-6.2 km/sec

Principal Results:

Site located 62 km north of Galapagos Spreading Center just beyond Olduvai magnetic event (slightly older than 1.8 m.y.) in sediment-filled topographic depression, known to be characterized by high heat flow (~5 HFV). Spot cored through 79 meters of sediment, recovering 37.76 meters of foraminiferal-nannofossil ooze and siliceous nannofossil ooze. Penetrated about 30 meters into basement, recovering 5.66 meters of basalt or dolerite representing seven petrographic units. Major rock types are classed as pyroxene-plagioclase sparsely phyric, plagioclase phyric and sparsely phyric, olivine-clinopyroxene-plagioclase sparsely phyric, and olivine-plagioclase sparsely phyric. Basement rocks show extensive evidence of hydrothermal solutions.

SITE 425 HOLE CORE 1 CORED INTERVAL: 2872.0-2877.5 m (0.0-5.5 m)



LITHOLOGIC DESCRIPTION

FORAMINIFER-NANNOFOSSIL OOZE

Soupy and intensely deformed greenish gray or olive brown foraminifer-nannofossil ooze. Occasional medium gray streaks (N3) near the base of Section 1. Odors of H_2S in Section 2 (78-110 cm).

Smear slides: 1-110, 2-90, 3-75

Nannofossils	45-55%	Diatoms	5-10%
Foraminifers	20-25%	Sponge spicules	5%
Clay	10-20%	Volcanic glass	TR
Radiolaria	5%		

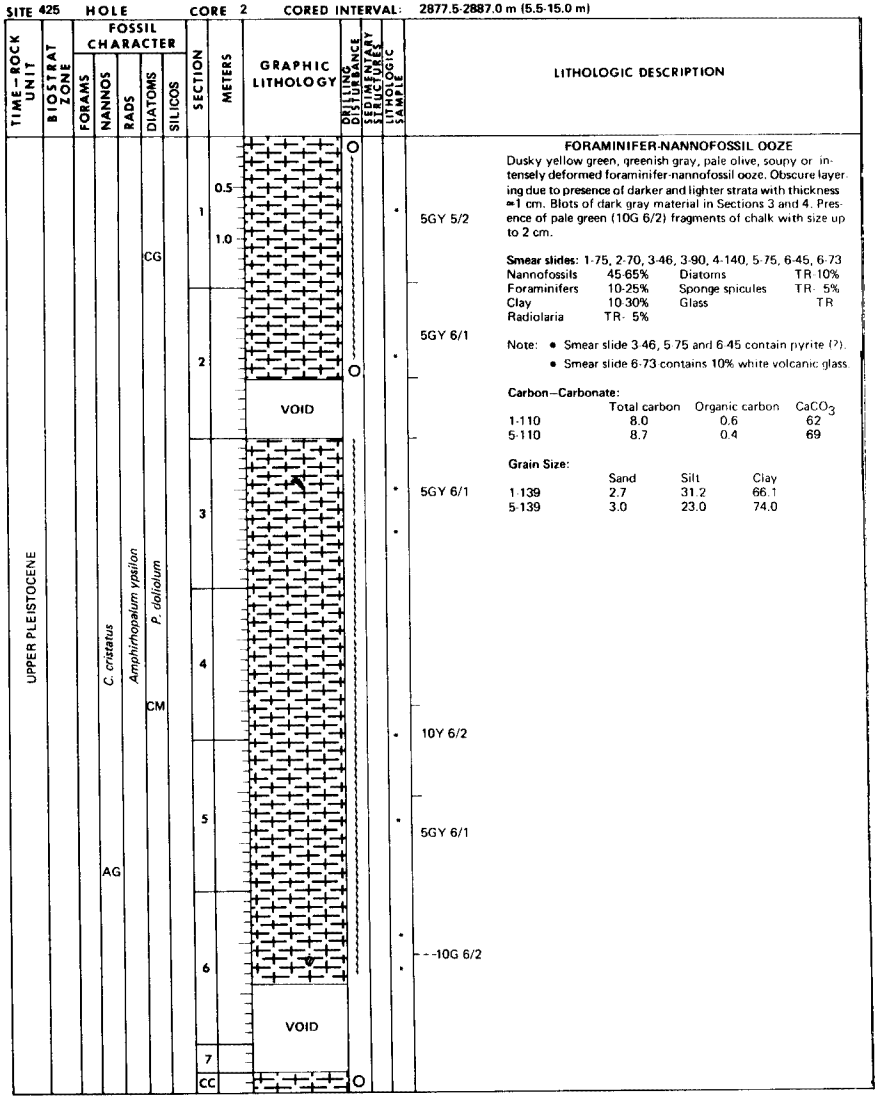
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-47	6.8	0.4	53

Grain Size:

	Sand	Silt	Clay
1-90	9.7	37.1	53.2

SITE 425 HOLE CORE 2 CORED INTERVAL: 2877.5-2887.0 m (5.5-15.0 m)



LITHOLOGIC DESCRIPTION

FORAMINIFER-NANNOFOSSIL OOZE

Dusky yellow green, greenish gray, pale olive, soupy or intensely deformed foraminifer-nannofossil ooze. Obscure layering due to presence of darker and lighter strata with thickness ≈1 cm. Blots of dark gray material in Sections 3 and 4. Presence of pale green (10G 6/2) fragments of chalk with size up to 2 cm.

Smear slides: 1-75, 2-70, 3-46, 3-90, 4-140, 5-75, 6-45, 6-73

Nannofossils	45-65%	Diatoms	TR-10%
Foraminifers	10-25%	Sponge spicules	TR-5%
Clay	10-30%	Glass	TR
Radiolaria	TR-5%		

Note: • Smear slide 3-46, 5-75 and 6-45 contain pyrite (?).
• Smear slide 6-73 contains 10% white volcanic glass.

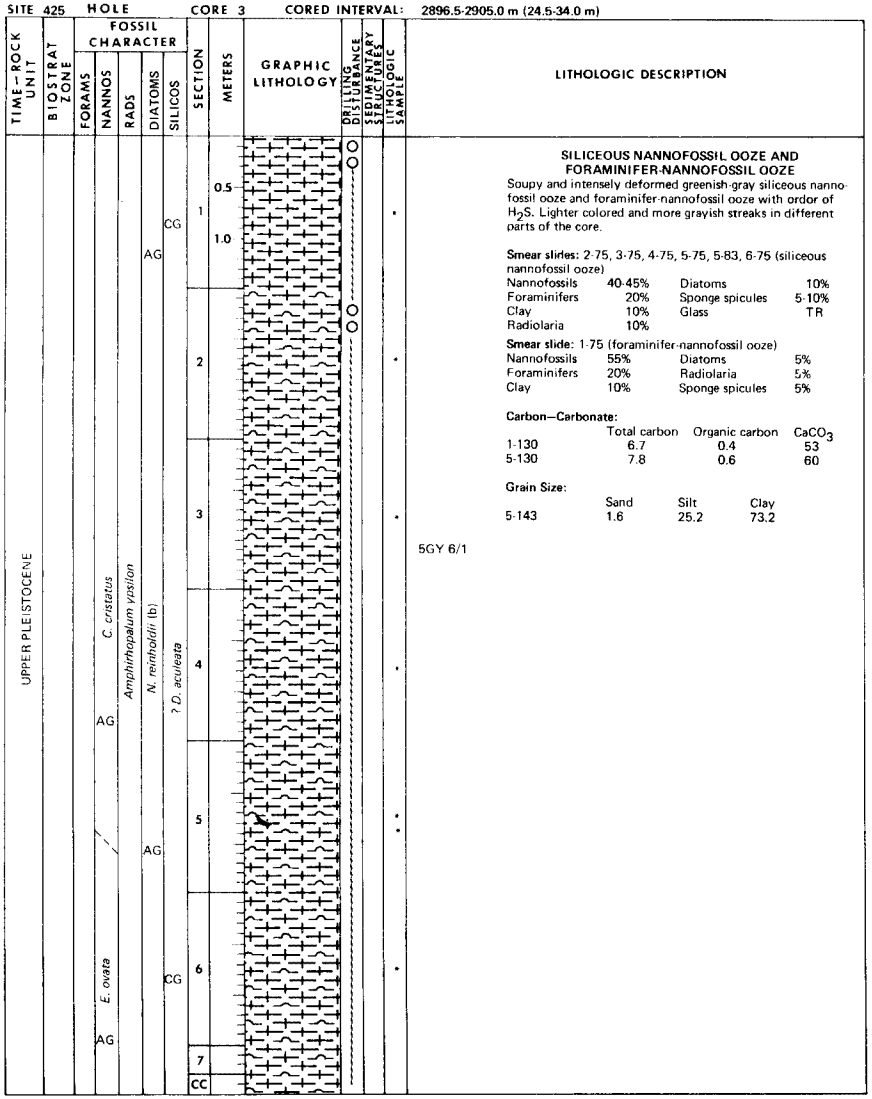
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-110	8.0	0.6	62
5-110	8.7	0.4	69

Grain Size:

	Sand	Silt	Clay
1-139	2.7	31.2	66.1
5-139	3.0	23.0	74.0

SITE 425 HOLE CORE 3 CORED INTERVAL: 2896.5-2905.0 m (24.5-34.0 m)



SILICEOUS NANNOFOSSIL OOZE AND FORAMINIFER-NANNOFOSSIL OOZE

Soupy and intensely deformed greenish-gray siliceous nannofossil ooze and foraminifer-nannofossil ooze with ordor of H_2S. Lighter colored and more grayish streaks in different parts of the core.

Smear slides: 2-75, 3-75, 4-75, 5-75, 5-83, 6-75 (siliceous nannofossil ooze)

Nannofossils	40-45%	Diatoms	10%
Foraminifers	20%	Sponge spicules	5-10%
Clay	10%	Glass	TR
Radiolaria	10%		

Smear slide: 1-75 (foraminifer-nannofossil ooze)

Nannofossils	55%	Diatoms	5%
Foraminifers	20%	Radiolaria	5%
Clay	10%	Sponge spicules	5%

Carbon—Carbonate:

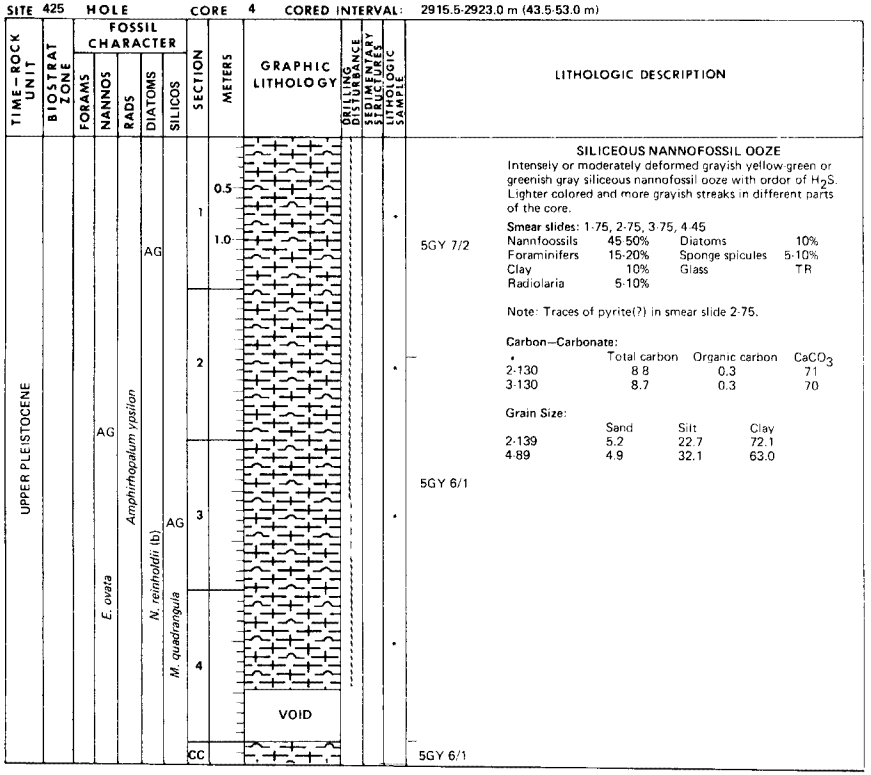
	Total carbon	Organic carbon	$CaCO_3$
1-130	6.7	0.4	53
5-130	7.8	0.6	60

Grain Size:

	Sand	Silt	Clay
5-143	1.6	25.2	73.2

5GY 6/1

SITE 425 HOLE CORE 4 CORED INTERVAL: 2915.5-2923.0 m (43.5-53.0 m)



SILICEOUS NANNOFOSSIL OOZE

Intensely or moderately deformed grayish yellow-green or greenish gray siliceous nannofossil ooze with ordor of H_2S. Lighter colored and more grayish streaks in different parts of the core.

Smear slides: 1-75, 2-75, 3-75, 4-45

Nannfoossils	45-50%	Diatoms	10%
Foraminifers	15-20%	Sponge spicules	5-10%
Clay	10%	Glass	TR
Radiolaria	5-10%		

Note: Traces of pyrite(?) in smear slide 2-75.

Carbon—Carbonate:

•	Total carbon	Organic carbon	$CaCO_3$
2-130	8.8	0.3	71
3-130	8.7	0.3	70

Grain Size:

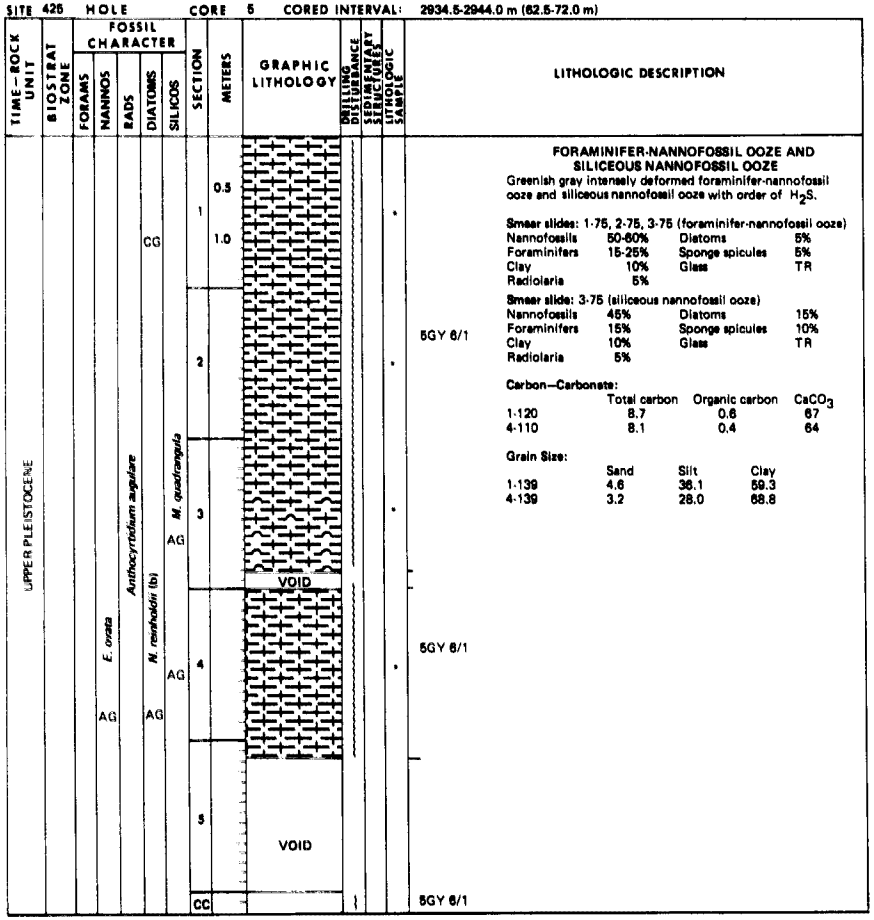
	Sand	Silt	Clay
2-139	5.2	22.7	72.1
4-89	4.9	32.1	63.0

5GY 7/2

5GY 6/1

5GY 6/1

SITE 425 HOLE CORE 5 CORED INTERVAL: 2934.5-2944.0 m (62.5-72.0 m)



FORAMINIFER-NANNOFOSSIL OOZE AND SILICEOUS NANNOFOSSIL OOZE

Greenish gray intensely deformed foraminifer-nannofossil ooze and siliceous nannofossil ooze with order of H_2S.

Smear slides: 1-75, 2-75, 3-75 (foraminifer-nannofossil ooze)

Nannofossils	50-60%	Diatoms	5%
Foraminifers	15-25%	Sponge spicules	5%
Clay	10%	Glass	TR
Radiolaria	5%		

Smear slide: 3-75 (siliceous nannofossil ooze)

Nannofossils	45%	Diatoms	15%
Foraminifers	15%	Sponge spicules	10%
Clay	10%	Glass	TR
Radiolaria	5%		

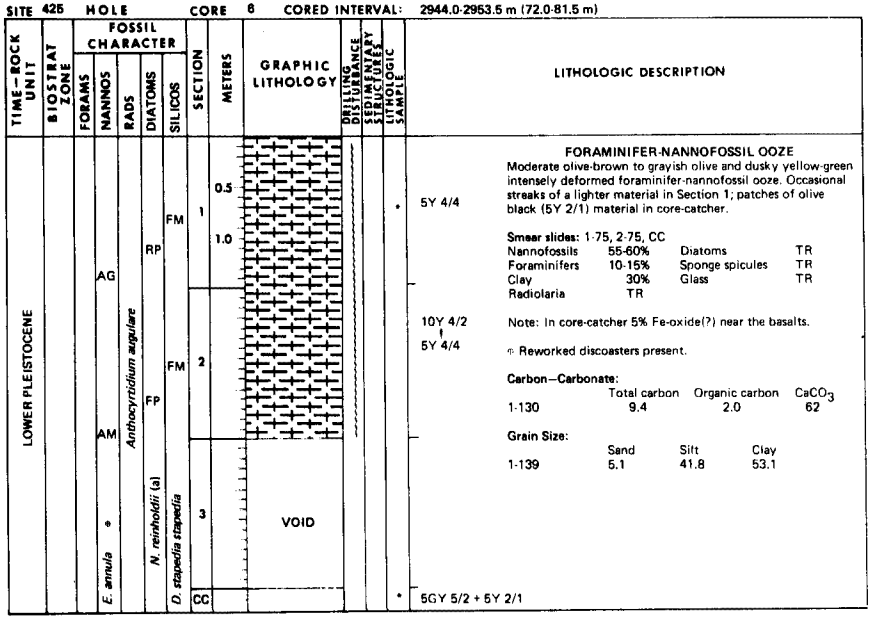
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	8.7	0.6	67
4-110	8.1	0.4	64

Grain Size:

	Sand	Silt	Clay
1-139	4.6	36.1	59.3
4-139	3.2	28.0	68.8

SITE 425 HOLE CORE 6 CORED INTERVAL: 2944.0-2953.5 m (72.0-81.5 m)



FORAMINIFER-NANNOFOSSIL OOZE

Moderate olive-brown to grayish olive and dusky yellow-green intensely deformed foraminifer-nannofossil ooze. Occasional streaks of a lighter material in Section 1; patches of olive black (5Y 2/1) material in core-catcher.

Smear slides: 1-75, 2-75, CC

Nannofossils	55-60%	Diatoms	TR
Foraminifers	10-15%	Sponge spicules	TR
Clay	30%	Glass	TR
Radiolaria	TR		

Note: In core-catcher 5% Fe-oxide(?) near the basalts.

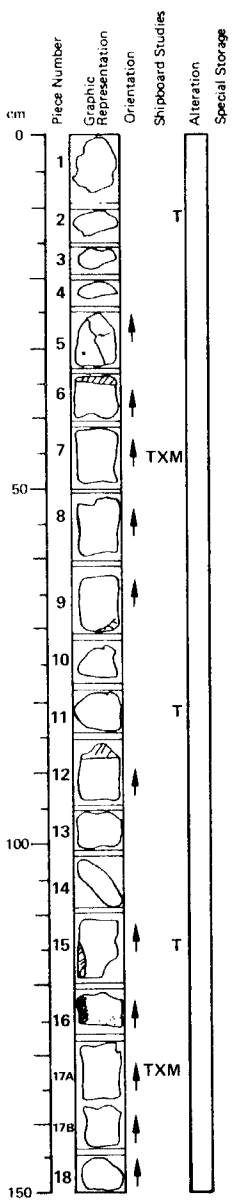
* Reworked discoasters present.

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-130	9.4	2.0	62

Grain Size:

	Sand	Silt	Clay
1-139	5.1	41.8	53.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 5		7	1

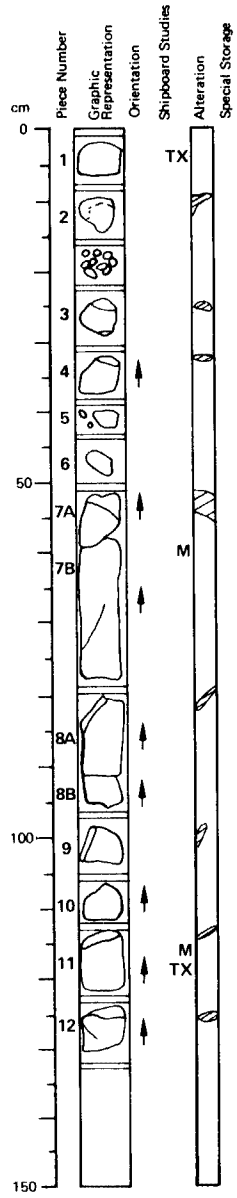
Depth: 2953.5 m to 2963.0 m

ROCK TYPE AND STRUCTURE
Fine-grained gray to gray-black basalt.

TEXTURE
Aphanitic; vugs and vesicles present, up to 2 mm in size.

MINERALOGY
Rare phyric plagioclase present; groundmass too fine-grained to resolve.

ALTERATION
Basically fresh except for Pieces 6, 9, 15, and 16 which have weathering rinds. Some vesicles filled with green secondary minerals; sulfide mineralization in microcracks of Piece 6.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 5		7	2

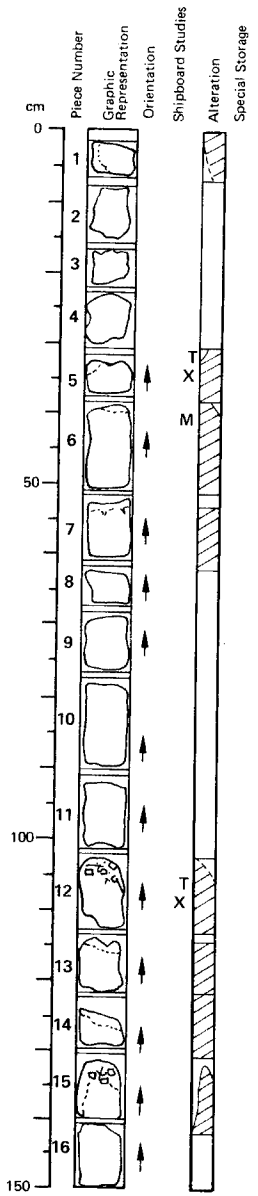
Depth: 2955.0 m to 2956.5 m

ROCK TYPE AND STRUCTURE
Medium-grained plagioclase-phyric basalt.

TEXTURE
Aphanitic to medium-grained; some microphenocrysts observed in Piece 7; vugs and vesicles present.

MINERALOGY
Plagioclase and minor clinopyroxene as microphenocrysts(?); groundmass unresolvable in hand specimen.

ALTERATION
Prominent alteration rinds, 0.5 mm thick, on most pieces; vesicles filled with green clays (zeolites, Piece 10); yellow-colored weathering on Pieces 3 and 10.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	5		8	1

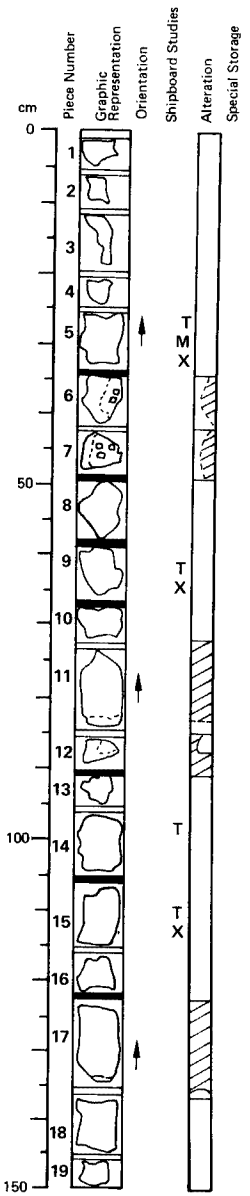
Depth: 2963.0 m to 2964.5 m

ROCK TYPE AND STRUCTURE
Sparsely plagioclase phyric basalt.

TEXTURE
Medium-grained to coarse-grained basalt; vugs and vesicles present.

MINERALOGY
Olivine, clinopyroxene, and plagioclase as phenocrysts in Piece 12; most groundmass crystals not large enough to resolve.

ALTERATION
Weathering, rinds, brownish in color, up to 5 cm thick present on Pieces 1, 5-7, 12-15; groundmass of Pieces 6-13 appears weathered; vesicles filled with blue and green clay minerals.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	5		9	1

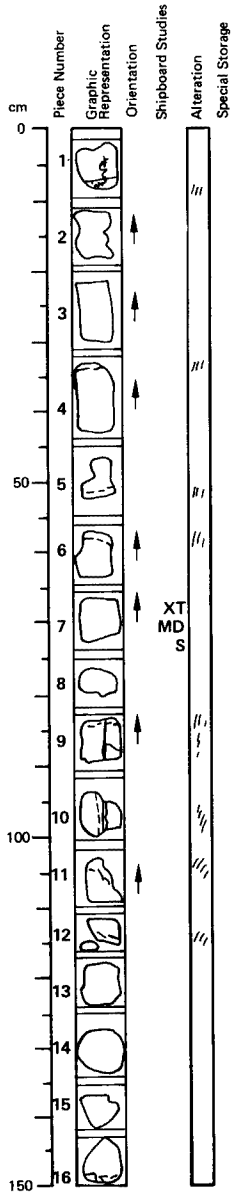
Depth: 2972.5 m to 2974.0 m

ROCK TYPE AND STRUCTURE
Sparsely plagioclase phyric basalt.

TEXTURE
Aphanitic; minor vugs and vesicles.

MINERALOGY
Plagioclase crystals (< 3 mm) as phenocrysts in Pieces 3, 4, 6, 8, 10; groundmass generally unresolvable in hand sample.

ALTERATION
Weathering rinds of ≤0.5 cm on Pieces 6, 7, 11, 12, 17. Vesicles filled with green and brown clays in Pieces 1-4, 6, 13, 14-19; lined white in Piece 9. Some weathering of groundmass in Pieces 6 and 10; some sulfides in Piece 14.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

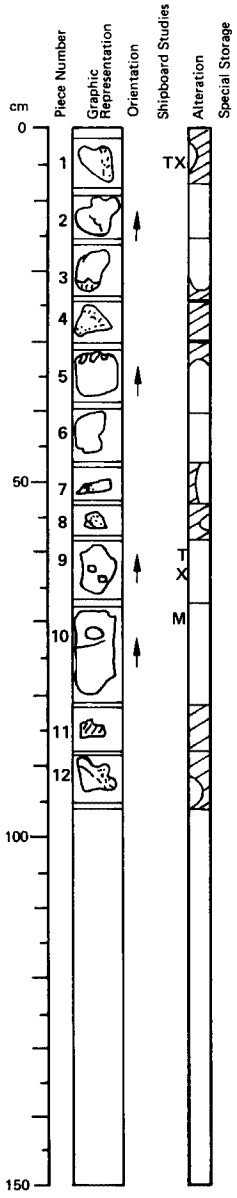
LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 5		9	2

ROCK TYPE AND STRUCTURE
Very sparsely plagioclase phyric basalt.

TEXTURE
Fine-grained holocrystalline; uniform from top to bottom; non-vesicular.

MINERALOGY
Plagioclase crystals visible under 10X magnification; Pieces 3, 8, 13 have rare 2-3 mm plagioclase phenocrysts.

ALTERATION
Weathering rinds on Pieces 1, 4, 5, 6, 9-12, and 16; alteration minerals prominent in veins and cracks and on fracture surfaces of all pieces (probably chlorite, calcite, hydrous Fe-oxides). Groundmass appears to have pervasive minor alteration.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 5		9	3

ROCK TYPE AND STRUCTURE
Plagioclase-phyric basalt.

TEXTURE
Medium-grained; vesicles rare, up 1 mm in size; glassy segregations in Pieces 4, 5, and 6.

MINERALOGY
Rare plagioclase phenocrysts; most material too fine-grained to resolve.

ALTERATIONS
Prominent weathering rinds green to brown in color on most pieces; vesicle filling appear to be zeolites and calcite; Piece 11 badly altered; Piece 7 has vein of secondary minerals.

SITE SUMMARY SHEET

SITE 426 HOLE 426

Date occupied	3 June 1977 0400 hrs. LCT
Date departed	3 June 1977 2000 hrs. LCT
Time on hole	16 hours
Position: latitude	08° 47.28'N
longitude	104° 15.27'W
Water depth (sea level)	2617, 2621, 2632 corrected meters, echo sounding
Water depth (rig floor)	
Bottom felt at	2624, 2628, 2666 meters, drill pipe
Penetration	
Number of holes	
Number of cores	
Total length of cored section	
Total core recovered	
Percentage core recovery	

Oldest Sediment Cored

- Depth sub-bottom
- Nature
- Age
- Measured velocity

Basement

- Depth sub-bottom
- Nature
- Velocity range

02

SITE SUMMARY SHEET

SITE 427 HOLE 427

Date occupied	4 June 1977 0612 hrs. LCT
Date departed	5 June 1977 1538 hrs. LCT
Time on hole	33.5 hours
Position: latitude	08°06.79'N
longitude	104°36.35'W
Water depth (sea level)	3834 corrected meters, echo sounding
Water depth (rig floor)	3850 corrected meters, echo sounding
Bottom felt at	3848 meters, drill pipe
Penetration	174.5 meters
Number of holes	1
Number of cores	11
Total length of cored section	98.5 meters
Total core recovered	57.26 meters
Percentage core recovery	58%

Oldest Sediment Cored

Depth sub-bottom	146.0 meters
Nature	foraminiferal-nannofossil ooze
Age	Pleistocene
Measured velocity	1.5-2.0 km/sec

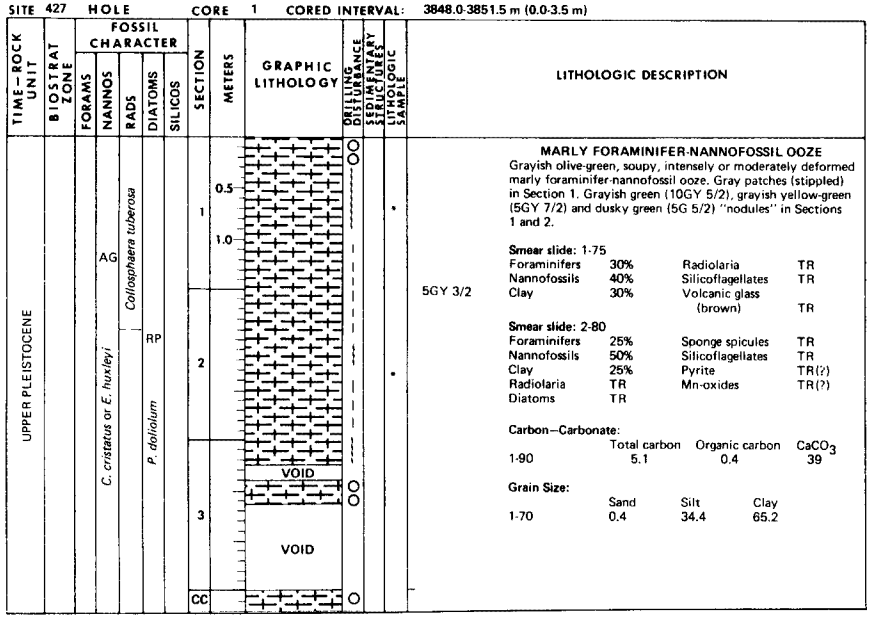
Basement

Depth sub-bottom	28.5 meters
Nature	basaltic rock
Velocity range	5.7 km/sec

Principal Results:

Site located in deepest known trough in Siqueiros Fracture Zone on thick sediment pile floored by flat and reflective basement. Spot cored through 146 meters of sediment, recovering 70 meters of marly foraminiferal-nannofossil ooze, siliceous nannofossil ooze, calcareous siliceous ooze, calcareous clay, and pyrite-rich diatom nannofossil ooze. Penetrated 29 meters of basalt, recovering 12.51 meters of massive plagioclase-pyroxene basalt showing traces of hydrothermal mineralization. Basalt represents single cooling unit of single magnetic polarity probably ponded in trough while near or at junction with EPR. Magnetic age of adjacent crust is about 3.3 m.y.

SITE 427 HOLE CORE 1 CORED INTERVAL: 3848.0-3851.5 m (0.0-3.5 m)



MARLY FORAMINIFER-NANNOFOSSIL OOZE

Grayish olive-green, soupy, intensely or moderately deformed marly foraminifer-nannofossil ooze. Gray patches (stippled) in Section 1. Grayish green (10GY 5/2), grayish yellow-green (5GY 7/2) and dusky green (5G 5/2) "nodules" in Sections 1 and 2.

Smear slide: 1-75

Foraminifers	30%	Radiolaria	TR
Nannofossils	40%	Silicoflagellates	TR
Clay	30%	Volcanic glass (brown)	TR

Smear slide: 2-80

Foraminifers	25%	Sponge spicules	TR
Nannofossils	50%	Silicoflagellates	TR
Clay	25%	Pyrite	TR(?)
Radiolaria	TR	Mn-oxides	TR(?)
Diatoms	TR		

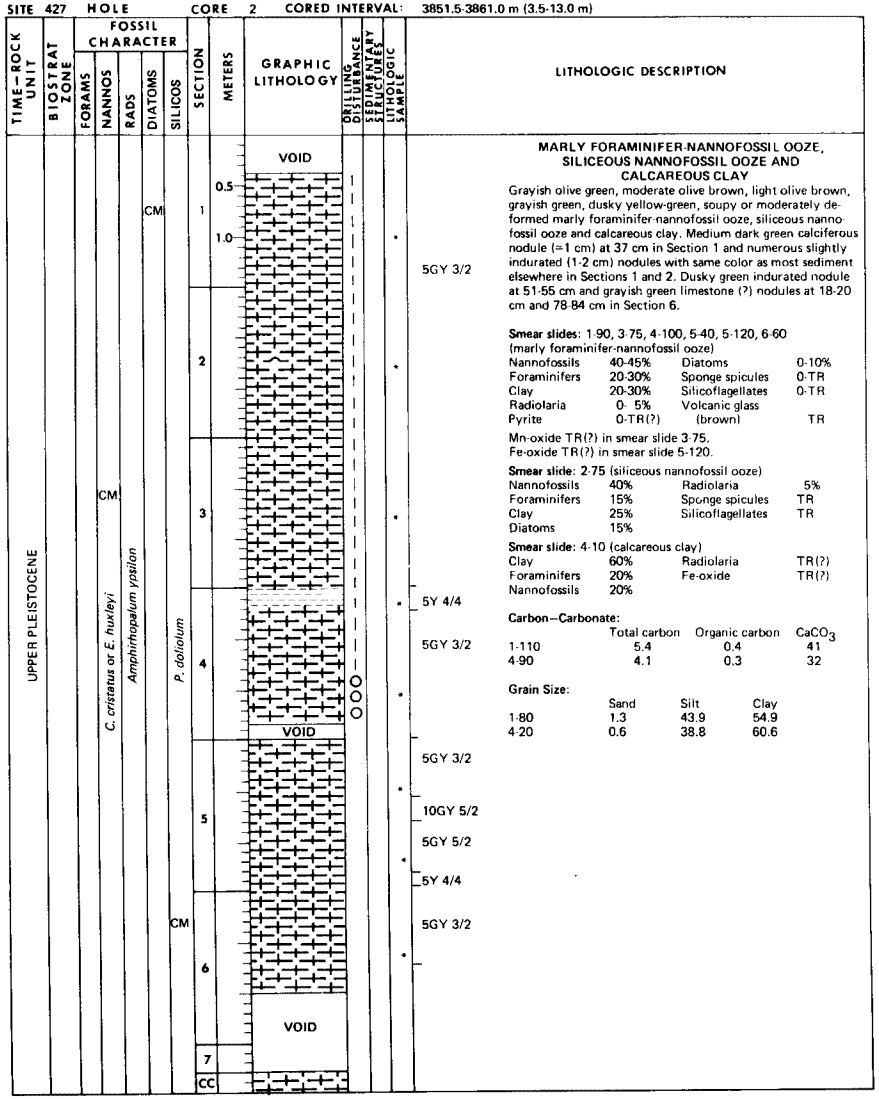
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-90	5.1	0.4	39

Grain Size:

	Sand	Silt	Clay
1-70	0.4	34.4	65.2

SITE 427 HOLE CORE 2 CORED INTERVAL: 3851.5-3861.0 m (3.5-13.0 m)



MARLY FORAMINIFER-NANNOFOSSIL OOZE, SILICEOUS NANNOFOSSIL OOZE AND CALCAREOUS CLAY

Grayish olive green, moderate olive brown, light olive brown, grayish green, dusky yellow-green, soupy or moderately deformed marly foraminifer-nannofossil ooze, siliceous nannofossil ooze and calcareous clay. Medium dark green calciferous nodule (=1 cm) at 37 cm in Section 1 and numerous slightly indurated (1-2 cm) nodules with same color as most sediment elsewhere in Sections 1 and 2. Dusky green indurated nodule at 51-55 cm and grayish green limestone (?) nodules at 18-20 cm and 78-84 cm in Section 6.

Smear slides: 1-90, 3-75, 4-100, 5-40, 5-120, 6-60 (marly foraminifer-nannofossil ooze)

Nannofossils	40-45%	Diatoms	0-10%
Foraminifers	20-30%	Sponge spicules	0-TR
Clay	20-30%	Silicoflagellates	0-TR
Radiolaria	0- 5%	Volcanic glass (brown)	TR
Pyrite	0-TR(?)		

Mn-oxide TR(?) in smear slide 3-75.
Fe-oxide TR(?) in smear slide 5-120.

Smear slide: 2-75 (siliceous nannofossil ooze)

Nannofossils	40%	Radiolaria	5%
Foraminifers	15%	Sponge spicules	TR
Clay	25%	Silicoflagellates	TR
Diatoms	15%		

Smear slide: 4-10 (calcareous clay)

Clay	60%	Radiolaria	TR(?)
Foraminifers	20%	Fe-oxide	TR(?)
Nannofossils	20%		

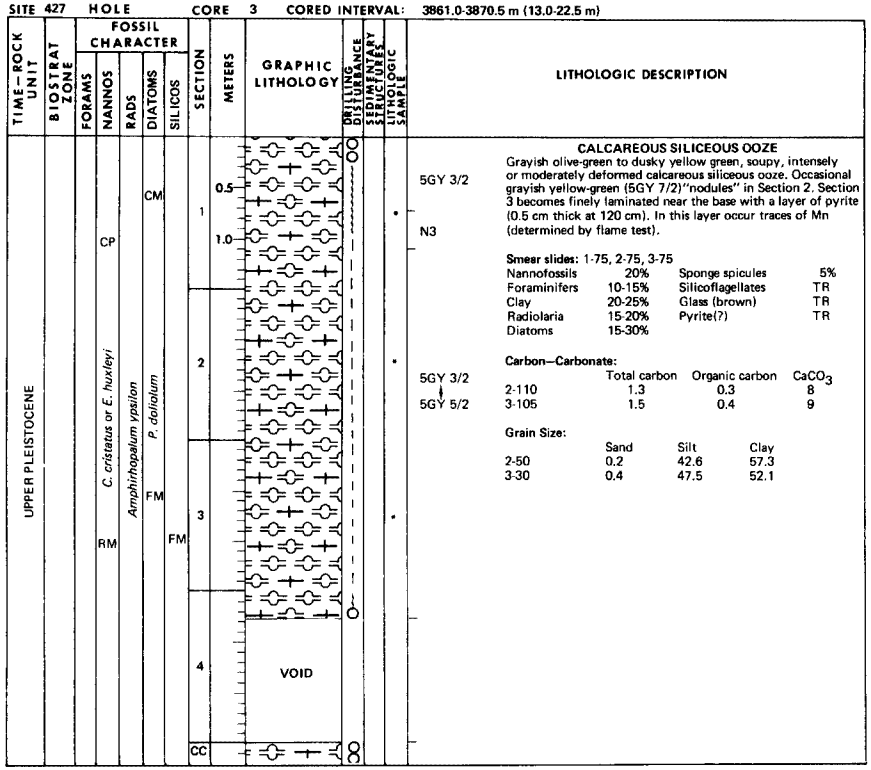
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-110	5.4	0.4	41
4-90	4.1	0.3	32

Grain Size:

	Sand	Silt	Clay
1-80	1.3	43.9	54.9
4-20	0.6	38.8	60.6

SITE 427 HOLE CORE 3 CORED INTERVAL: 3861.0-3870.5 m (13.0-22.5 m)



CALCAREOUS SILICEOUS OOZE

Grayish olive-green to dusky yellow green, soupy, intensely or moderately deformed calcareous siliceous ooze. Occasional grayish yellow-green (5GY 7/2) "nodules" in Section 2. Section 3 becomes finely laminated near the base with a layer of pyrite (0.5 cm thick at 120 cm). In this layer occur traces of Mn (determined by flame test).

Smear slides: 1-75, 2-75, 3-75

Nannofossils	20%	Sponge spicules	5%
Foraminifers	10-15%	Silicoflagellates	TR
Clay	20-25%	Glass (brown)	TR
Radiolaria	15-20%	Pyrite(?)	TR
Diatoms	15-30%		

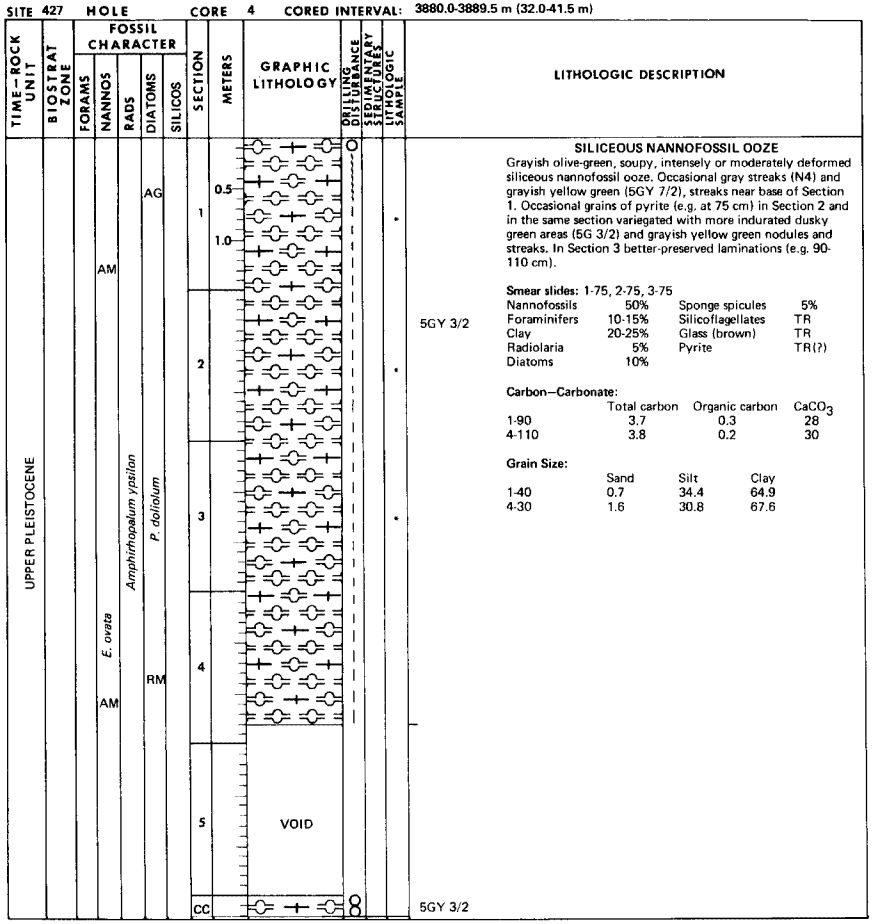
Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-110	1.3	0.3	8
3-105	1.5	0.4	9

Grain Size:

	Sand	Silt	Clay
2-50	0.2	42.6	57.3
3-30	0.4	47.5	52.1

SITE 427 HOLE CORE 4 CORED INTERVAL: 3880.0-3889.5 m (32.0-41.5 m)



SILICEOUS NANNOFOSSIL OOZE

Grayish olive-green, soupy, intensely or moderately deformed siliceous nannofossil ooze. Occasional gray streaks (N4) and grayish yellow green (5GY 7/2), streaks near base of Section 1. Occasional grains of pyrite (e.g. at 75 cm) in Section 2 and in the same section variegated with more indurated dusky green areas (5G 3/2) and grayish yellow green nodules and streaks. In Section 3 better-preserved laminations (e.g. 90-110 cm).

Smear slides: 1-75, 2-75, 3-75

Nannofossils	50%	Sponge spicules	5%
Foraminifers	10-15%	Silicoflagellates	TR
Clay	20-25%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR(?)
Diatoms	10%		

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-90	3.7	0.3	28
4-110	3.8	0.2	30

Grain Size:

	Sand	Silt	Clay
1-40	0.7	34.4	64.9
4-30	1.6	30.8	67.6

SITE 427 HOLE CORE 5 CORED INTERVAL: 3899.0-3908.5 m (51.0-60.5 m)

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	DIATOMS	SILICOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE
UPPER PLEISTOCENE				*Amphirhopalum ypsilon*			6	0.5 1.0	VOID			
							7					
							CC					

DIATOM-NANNOFOSSIL OOZE

Dark green soupy diatom-nannofossil ooze.

Smear slide: CC

Nannofossils	40%	Sponge spicules	TR
Foraminifers	10%	Silicoflagellates	TR
Diatoms	30%	Volcanic glass	TR
Radiolaria	TR	Pyrite	TR
Clay	20%		

Note: A part of the diatoms are black (pyrite-rich).

SITE 427 HOLE CORE 6 CORED INTERVAL: 3908.5-3918.0 m (60.5-70.0 m)

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	DIATOMS	SILICOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	
UPPER PLEISTOCENE		*E. ovata*	AM	*Amphirhopalum ypsilon*	CM		1	0.5 1.0					5GY 7/2 5GY 2/1
							2						5GY 4/1 10G 4/2
					N. reinholdii (b)		3						5GY 4/1 10G 4/2
							4						5GY 3/2 5GY 6/1 5GY 4/1
						RP	5		VOID				5G 4/1

MARLY FORAMINIFER-NANNOFOSSIL OOZE AND SILICEOUS NANNOFOSSIL OOZE

Greenish black, dark greenish-gray, grayish green, dusky green, grayish olive-green, soupy, intensely or moderately deformed marly foraminifer-nannofossil ooze and siliceous nannofossil ooze. Pebbles of grayish yellow green (5GY 7/2) limestone (size up to 5 cm), partially cavernous at top of Sections 1 and 2. In different parts of the core, a few pebbles of limestone are present; also patches and streaks of dark greenish black (5GY 2/1) material.

Smear slides: 1-75, 1-118, 2-75, 3-140, 4-25, 4-140 (marly foraminifer-nannofossil ooze)

Nannofossils	55-75%	Silicoflagellates	0-TR
Foraminifers	15-20%	Sponge spicules	0-TR
Clay	15-30%	Volcanic glass (brown)	TR
Radiolaria	TR-5%	Pyrite	TR
Diatoms	TR-5%		

Smear slide: 4-85 (siliceous nannofossil ooze)

Nannofossils	40%	Silicoflagellates	TR
Foraminifers	10%	Sponge spicules	TR
Clay	20%	Volcanic glass (brown)	TR
Radiolaria	TR		
Diatoms	30%		

Carbon-Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-89	3.6	0.3	28
4-111	4.9	0.1	40

Grain Size:

	Sand	Silt	Clay
2-142	0.2	27.0	72.9
4-143	0.8	21.3	77.9

SITE 427 HOLE CORE 7 CORED INTERVAL: 3937.0-3946.5 m (89.0-98.5 m)

TIME-ROCK UNIT	BIOSTRAT ZONE	FOSSIL CHARACTER: FORAMS	NANNOS	RADS	DIATOMS	SILICOS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	LITHOLOGIC SAMPLE	
UPPER PLEISTOCENE		*E. ovata*	AP	*Amphirhopalum ypsilon*	FP		1	0.5 1.0	P				5GY 2/1 5G 4/1 5G 2/1 5Y 3/2
					N. reinholdii (b)		2		VOID				5GY 3/2 5G 4/1
			AM		FP		3						5GY 4/1 5GY 3/2
					M. quadrangula	RP	4		P VOID				5GY 2/1 5Y 3/2
							CC						5Y 3/2

SILICEOUS NANNOFOSSIL OOZE, MARLY FORAMINIFER-NANNOFOSSIL OOZE AND PYRITE-RICH DIATOM OOZE

Greenish black, dark greenish gray, olive gray, grayish olive green, soupy, intensely or moderately deformed siliceous nannofossil ooze, foraminifer-nannofossil ooze and pyrite-rich diatom ooze. In Section 1 from 50 to 120 cm; streaks of olive black (5Y 2/1) material and fragments of grayish yellow green limestone up to several cm. In Section 2 from 0 to 22 cm fragments of limestone up to 2 cm. Streaks and patches of lighter material in different parts of the core.

Smear slides: 2-75, 3-75, 3-125, 4-30 (siliceous nannofossil ooze)

Nannofossils	40-50%	Sponge spicules	TR
Foraminifers	10-15%	Silicoflagellates	0-TR
Clay	15-20%	Glass (brown)	TR
Radiolaria	TR-10%	Pyrite	TR
Diatoms	10-30%		

Smear slides: 2-31, 4-55 (pyrite-rich diatom ooze)

Diatoms	85-90%	Nannofossils	10%
Radiolaria	TR	Clay	TR-5%
Sponge spicules	TR	Volcanic glass (brown)	TR

Note: The half (=) of the diatoms are black pyrite.

Smear slide: 1-100 (marly foraminifer-nannofossil ooze)

Nannofossils	60%	Sponge spicules	TR
Foraminifers	25%	Silicoflagellates	TR
Clay	15%	Glass (brown)	TR
Radiolaria	TR	Pyrite	TR
Diatoms	TR		

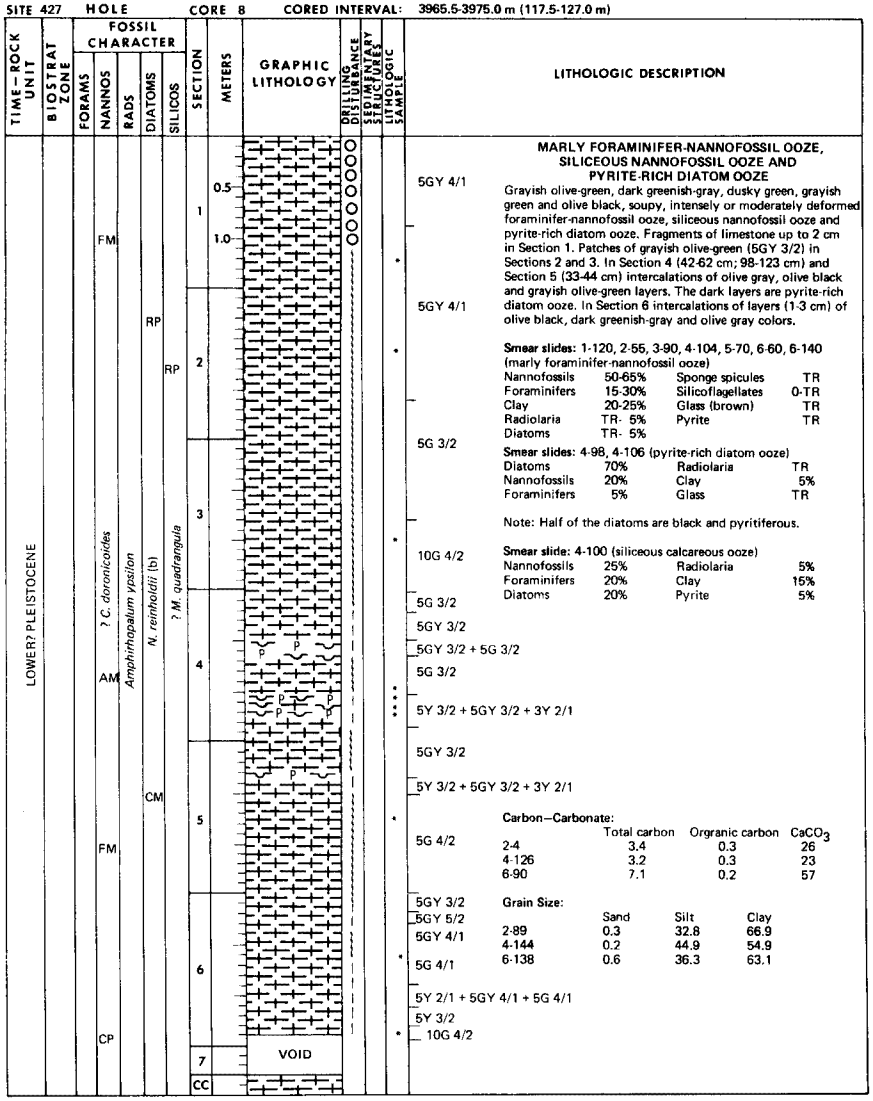
Carbon-Carbonate:

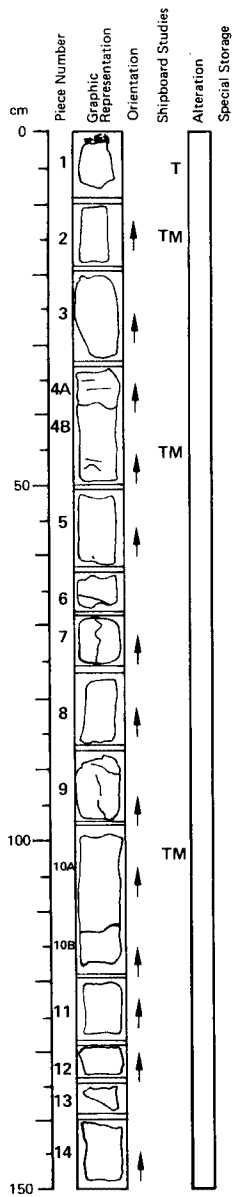
	Total carbon	Organic carbon	$CaCO_3$
1-109	4.5	0.3	35
3-125	3.1	0.3	23

Grain Size:

	Sand	Silt	Clay
1-139	0.3	41.2	58.5
3-139	0.6	36.3	63.0

SITE 427 HOLE CORE 8 CORED INTERVAL: 3965.5-3975.0 m (117.5-127.0 m)





VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 7		9	1

Depth: 3994.0 m to 4003.5 m

ROCK TYPE AND STRUCTURE

Coarse- to medium-grained aphyric to slightly plagioclase phyric basalt. Although the silicates and matrix glass appear quite fresh, most of the vesicles are filled with smectite and calcite. Several planes of microfracturing are present. Glassy rind at top of Piece 1.

TEXTURE

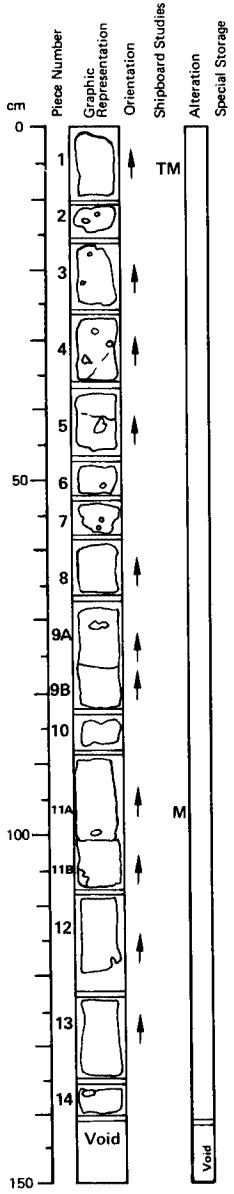
Aphanitic to glassy, with scattered round vesicles (1 mm to 3 mm). Vesicles approach 5% in most pieces. Very large vesicles (5-10 mm) in Piece 4.

MINERALOGY

Rare plagioclase phenocrysts. Groundmass unidentifiable in hand sample.

ALTERATION

Vesicles filled with calcite, zeolites(?), and clays. Chlorite replaces clinopyroxene and olivine in Piece 1.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 7		9	2

Depth: 3994.0 m to 4003.5 m

ROCK TYPE AND STRUCTURE

Fine- to medium-grained aphyric basalt. General morphology is apparently massive with few cracks or microstructures.

TEXTURE

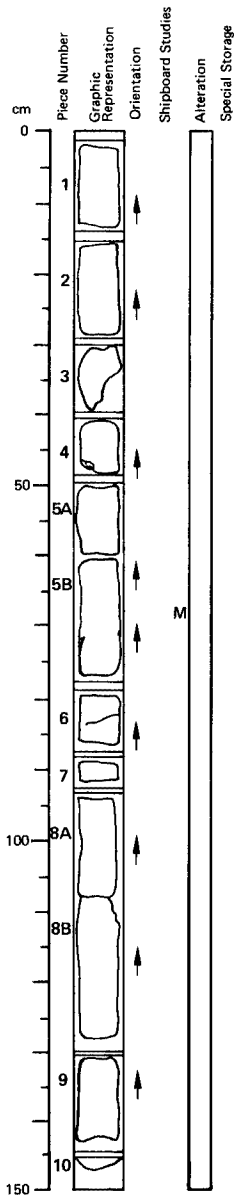
Aphanitic with abundant vesicles. Vesicles are more common in the upper half of the section. Very large (5-10 mm) vesicles in Pieces 4 and 5.

MINERALOGY

Very rare plagioclase and clinopyroxene phenocryst in very fine-grained matrix.

ALTERATION

Very minor to absent. Vesicles are filled with blue or green clays, calcite and denteric(?) pyrite.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	4	4	2	7				9		3

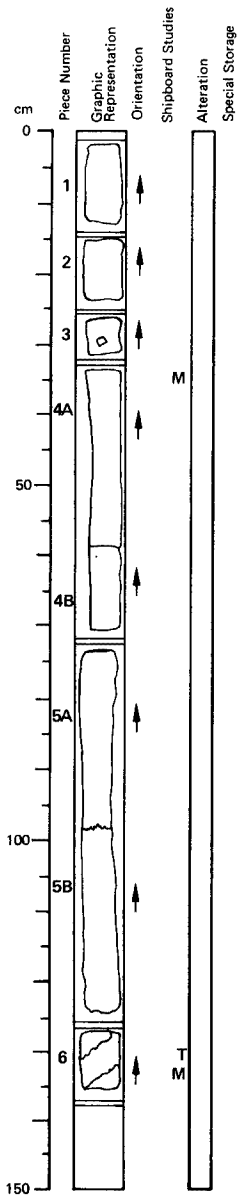
Depth: 3994.0 m to 4003.5 m

ROCK TYPE AND STRUCTURE
Fine-grained aphyric basalt in upper 10 cm of section. Medium-grained basalt in remainder of section. Medium-grained basalt is sparsely plagioclase phyric.

TEXTURE
Aphanitic to glassy, with glassy segregations in Pieces 1, 8A, and 8B. Rare tiny (< 1 mm) vesicles scattered throughout.

MINERALOGY
Rare plagioclase phenocrysts in megascopically unidentifiable matrix.

ALTERATION
Fresh, vesicles partly lined with green clay and zeolites(?).



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	4	4	2	7				9		4

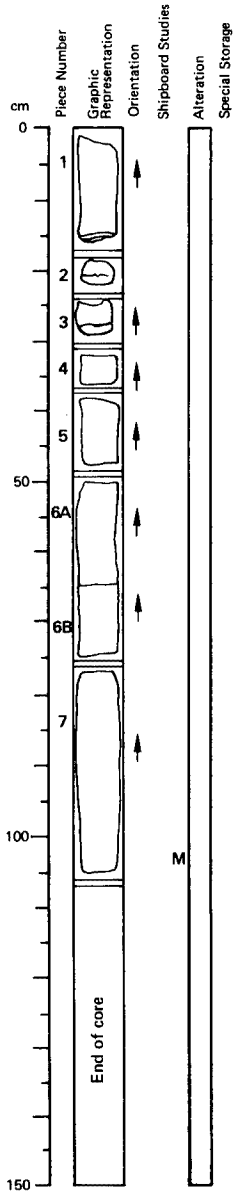
Depth: 3994.0 m to 4003.5 m

ROCK TYPE AND STRUCTURE
Massive, sparsely plagioclase and clinopyroxene phyric basalt. Continuous throughout section.

TEXTURE
Aphanitic to glassy. Non-vesicular.

MINERALOGY
Rare 1-2 mm plagioclase laths and subhedral clinopyroxenes. Large (~1 cm) plagioclase phenocryst in Piece 3.

ALTERATION
Fresh.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
54	427		9	5

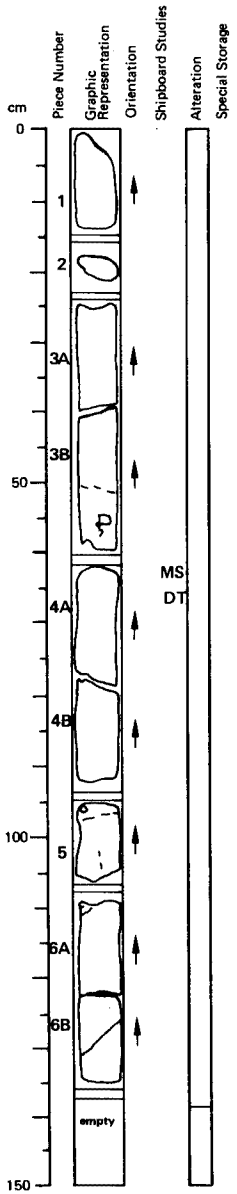
Depth: 3994.0 m to 4003.5 m

ROCK TYPE AND STRUCTURE
Medium-grained sparsely plagioclase phyric basalt. Tiny cracks in Pieces 1, 2, and 3. Cracks are parallel to the horizontal.

TEXTURE
Aphanitic. Non-vesicular.

MINERALOGY
Rare plagioclase phenocrysts and small glomerocrysts (plagioclase and clinopyroxene).

ALTERATION
Glass is about 10% by volume altered to smectite. Cracks filled with zeolite and calcite.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
54	427		10	1

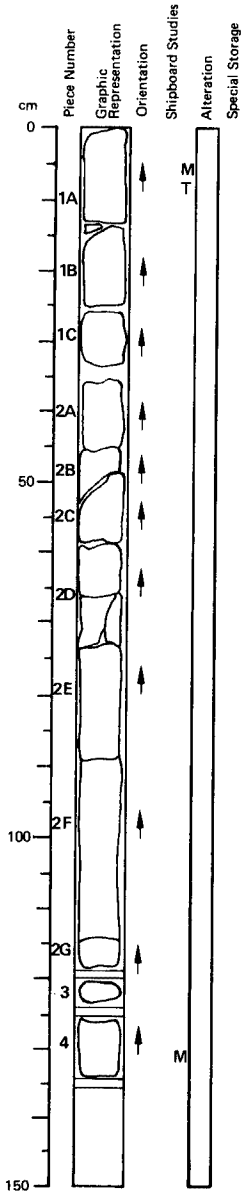
Depth: 4003.5 m to 4013.0 m

ROCK TYPE AND STRUCTURE
Aphyric, medium-grained basalt. Generally massive with a few tiny cracks in Pieces 3B, 5, and 6B.

TEXTURE
Aphanitic to glassy. Very few tiny scattered vesicles. One large (3 mm) vesicles in Piece 5.

MINERALOGY
Tiny (<1 mm) plagioclase laths and clinopyroxene clots in groundmass. Scattered glassy segregations.

ALTERATION
Megascopically fresh appearance. In thin section, 5% of glass altered to clay and iron oxide.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 7		1 0	2

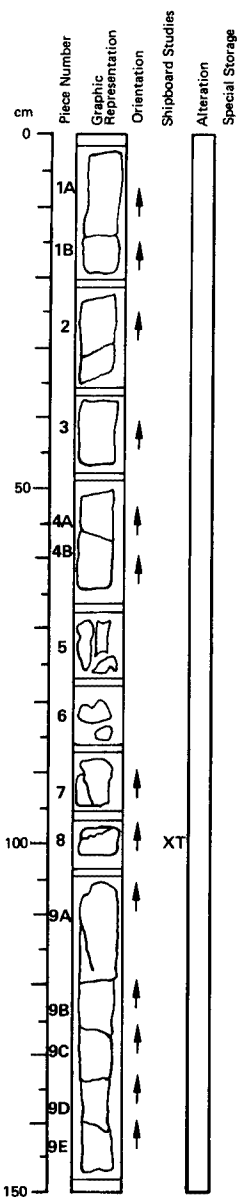
Depth: 4003.5 m to 4013.0 m

ROCK TYPE AND STRUCTURE
Entire section comprises medium-grained aphyric basalt. No noticeable joints, fractures, or other structural elements.

TEXTURE
Aphanitic to glassy, non-vesicular.

MINERALOGY
Very rare plagioclase phenocrysts in fine-grained to medium-grained matrix.

ALTERATION
Less than 1% of glass altered to clay. Calcite and brown clay coat and fill very rare vesicles.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 7		1 0	3

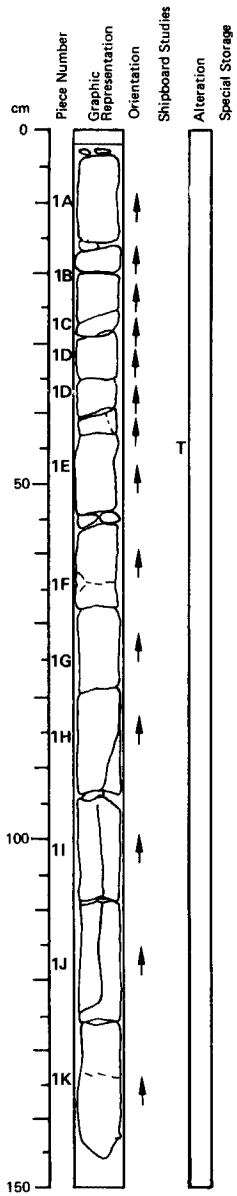
Depth: 4003.5 m to 4013.0 m

ROCK TYPE AND STRUCTURE
Medium-grained to coarse-grained sparsely plagioclase phyric basalt. Fractures occur nearly parallel to the horizontal and steeply inclined (~80°) to the horizontal.

TEXTURE
Aphanitic to medium-grained. Very sparsely vesicular.

MINERALOGY
Rare plagioclase phenocrysts, amber clinopyroxene interstitial in matrix.

ALTERATION
Generally fresh. Slight alteration of glass to palagonite. Zeolites and other secondary minerals coat fractures.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	4	4	2	7		1	0	4

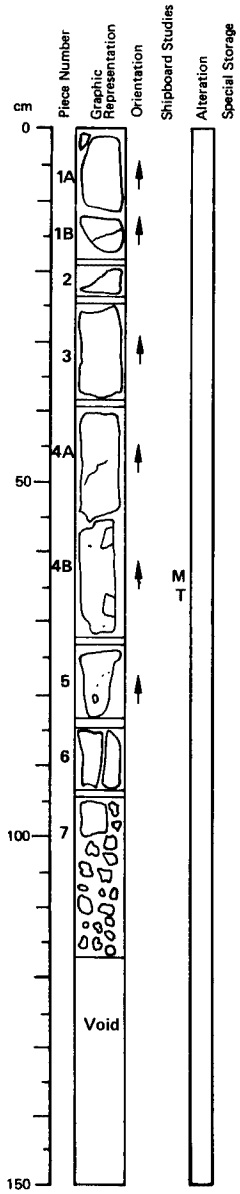
Depth: 4003.5 m to 4013.0 m

ROCK TYPE AND STRUCTURE
Aphyric medium-grained basalt. Apparently one massive flow continuously cored. Fractures occur nearly parallel to horizontal and steeply inclined (~90°) to horizontal.

TEXTURE
Aphanitic to glassy. Minor, <1 mm, vesicles common.

MINERALOGY
Fine-grained plagioclase laths and clinopyroxene clots comprise most of matrix.

ALTERATION
Generally fresh. Zeolites, clays, and calcite coat fractures.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.
5	4	4	2	7		1	0	5

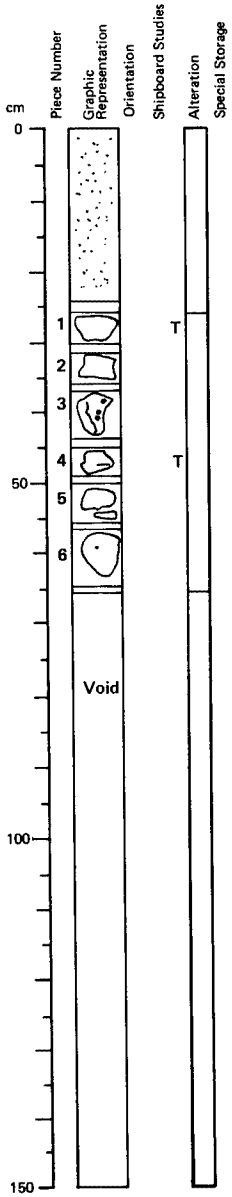
Depth: 4003.5 m to 4013.0 m

ROCK TYPE AND STRUCTURE
Medium-grained aphyric basalt. A few vertical fractures. Slightly finer-grained than overlying core.

TEXTURE
Medium-grained to aphanitic and glassy. Few scattered small vesicles.

MINERALOGY
Very scarce plagioclase phenocrysts. Groundmass unresolvable.

ALTERATION
Fresh. A few vesicles are filled with white clay mineral. Piece 1A has a white vein cutting it. Bottom 15 cm of section contains small pieces of fractured and weathered basalt probably ground up by drilling.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE		CORE		SECT.	
5	4	4	2	7			1	1		1

Depth: 4013.0 m to 4022.5 m

ROCK TYPE AND STRUCTURE

Fine-grained aphyric to sparsely plagioclase-phyric basalt. Pieces are partly drill rounded and broken. Top 14 cm of core comprised drill cuttings.

TEXTURE

Fine-grained to aphanitic and glassy. Tabular vesicles and vugs scattered throughout.

MINERALOGY

Rare plagioclase phenocrysts. Groundmass unresolvable.

ALTERATION

Vesicles are coated or filled with green and white clay minerals. Piece 4 has an altered zone near one edge that is slightly oxidized. Chlorite replaced olivine(?) in Pieces 1 and 4.

SITE SUMMARY SHEET

SITE 428 HOLE 428

Date occupied	6 June 1977 1200 hrs. LCT
Date departed	7 June 1977 0300 hrs. LCT
Time on hole	33 hours
Position: latitude	09°02.77'N
longitude	105°26.14'W
Water depth (sea level)	3295 corrected meters, echo sounding
Water depth (rig floor)	3299 corrected meters, echo sounding
Bottom felt at	3301 meters, drill pipe
Penetration	76.5 meters
Number of holes	1
Number of cores	6
Total length of cored section	54.5 meters
Total core recovered	36.34 meters
Percentage core recovery	67%

Oldest Sediment Cored

Depth sub-bottom	66.24 meters
Nature	foraminiferal-nannofossil ooze
Age	1.2-1.8 m.y.
Measured velocity	

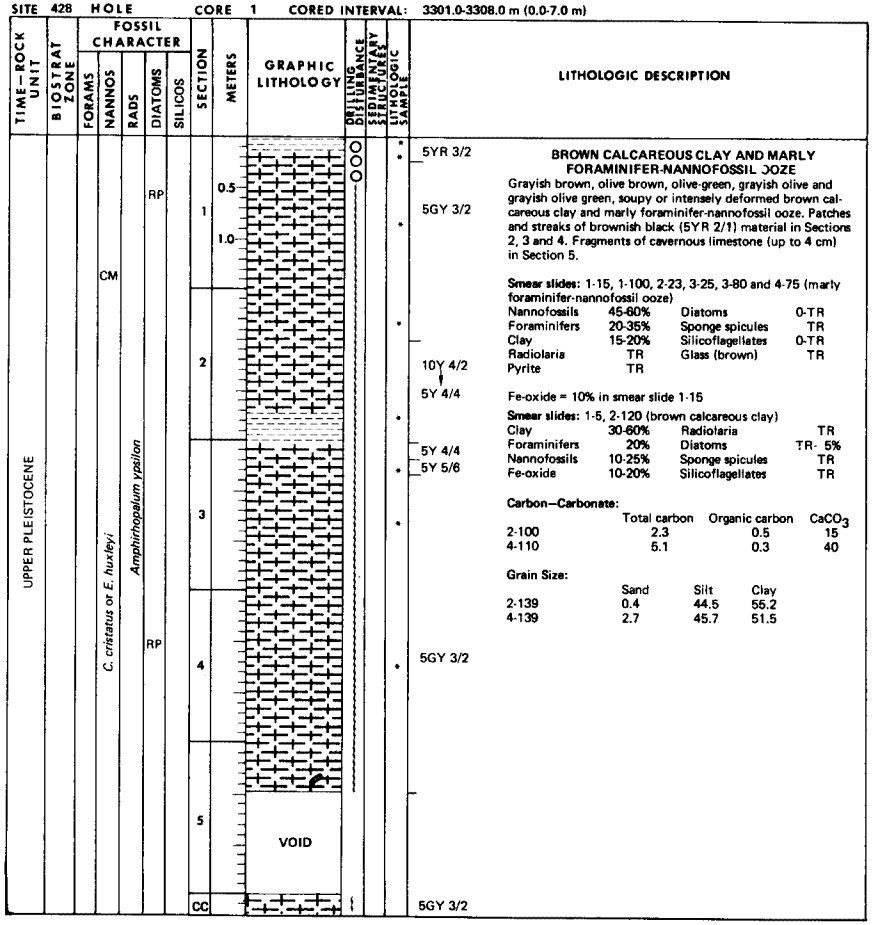
Basement

Depth sub-bottom	10.26 meters
Nature	basaltic rock
Velocity range	

Principal Results:

Site located about 125 km from EPR immediately south of OCP Ridge on transition zone between it and EPR fabric. Site placed in Matuyama reversed epoch just beyond Olduvai normal event. Continuously cored 61 meters of sediment and 15 meters of basalt at Hole 428. Recovered 33.44 meters of brown calcareous clay, marly foraminiferal-nannofossil ooze, siliceous nannofossil ooze, and basaltic volcanic sand, and 2.14 meters of basalt. Penetrated 52.5 meters of basalt at Hole 428A, recovering 12.6 meters of plagioclase-pyroxene-olivine-bearing and olivine-free basaltic rock representing a number of cooling units. On basis of mineralogy, grain size and drillability, Site 428 basaltic rocks more closely aligned to Site 422 (OCP Moat) dolerite than fabric basalts recovered at other PAC-4 holes. Since magnetic polarity of samples agrees with placement in Matuyama epoch, likely that 428 rocks crystallized about the same time as adjacent fabric basalts.

SITE 428 HOLE CORE 1 CORED INTERVAL: 3301.0-3308.0 m (0.0-7.0 m)



BROWN CALCAREOUS CLAY AND MARLY FORAMINIFER-NANNOFOSSIL OOZE

Grayish brown, olive brown, olive-green, grayish olive and grayish olive green, soupy or intensely deformed brown calcareous clay and marly foraminifer-nannofossil ooze. Patches and streaks of brownish black (5YR 2/1) material in Sections 2, 3 and 4. Fragments of cavernous limestone (up to 4 cm) in Section 5.

Smear slides: 1-15, 1-100, 2-23, 3-25, 3-80 and 4-75 (marly foraminifer-nannofossil ooze)

Nannofossils	45-60%	Diatoms	0-TR
Foraminifers	20-35%	Sponge spicules	TR
Clay	15-20%	Silicoflagellates	0-TR
Radiolaria	TR	Glass (brown)	TR
Pyrite	TR		

Fe-oxide = 10% in smear slide 1-15

Smear slides: 1-5, 2-120 (brown calcareous clay)

Clay	30-60%	Radiolaria	TR
Foraminifers	20%	Diatoms	TR- 5%
Nannofossils	10-25%	Sponge spicules	TR
Fe-oxide	10-20%	Silicoflagellates	TR

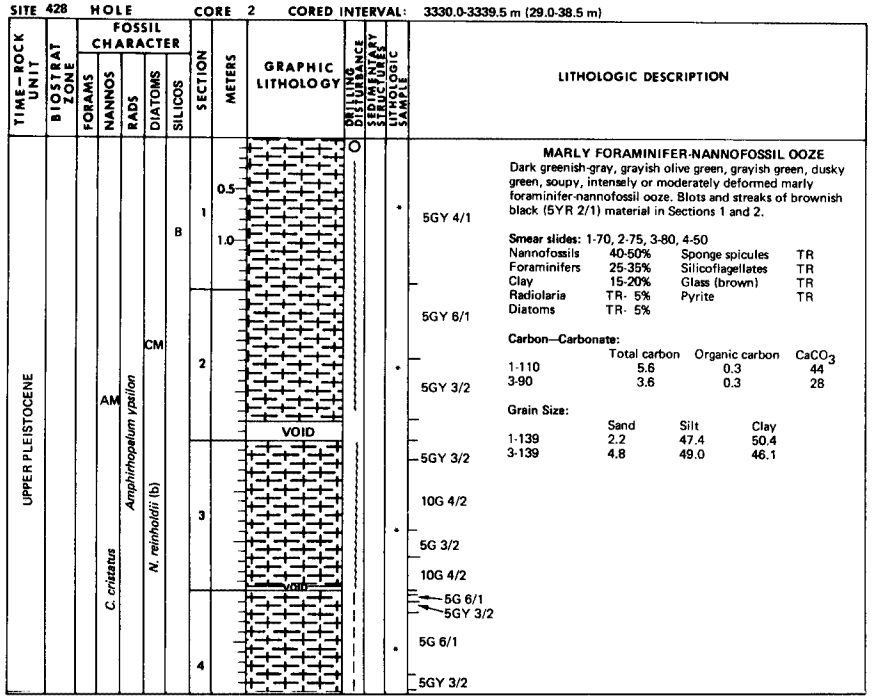
Carbon—Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-100	2.3	0.5	15
4-110	5.1	0.3	40

Grain Size:

	Sand	Silt	Clay
2-139	0.4	44.5	55.2
4-139	2.7	45.7	51.5

SITE 428 HOLE CORE 2 CORED INTERVAL: 3330.0-3339.5 m (29.0-38.5 m)



MARLY FORAMINIFER-NANNOFOSSIL OOZE

Dark greenish-gray, grayish olive green, grayish green, dusky green, soupy, intensely or moderately deformed marly foraminifer-nannofossil ooze. Blots and streaks of brownish black (5YR 2/1) material in Sections 1 and 2.

Smear slides: 1-70, 2-75, 3-80, 4-50

Nannofossils	40-50%	Sponge spicules	TR
Foraminifers	25-35%	Silicoflagellates	TR
Clay	15-20%	Glass (brown)	TR
Radiolaria	TR- 5%	Pyrite	TR
Diatoms	TR- 5%		

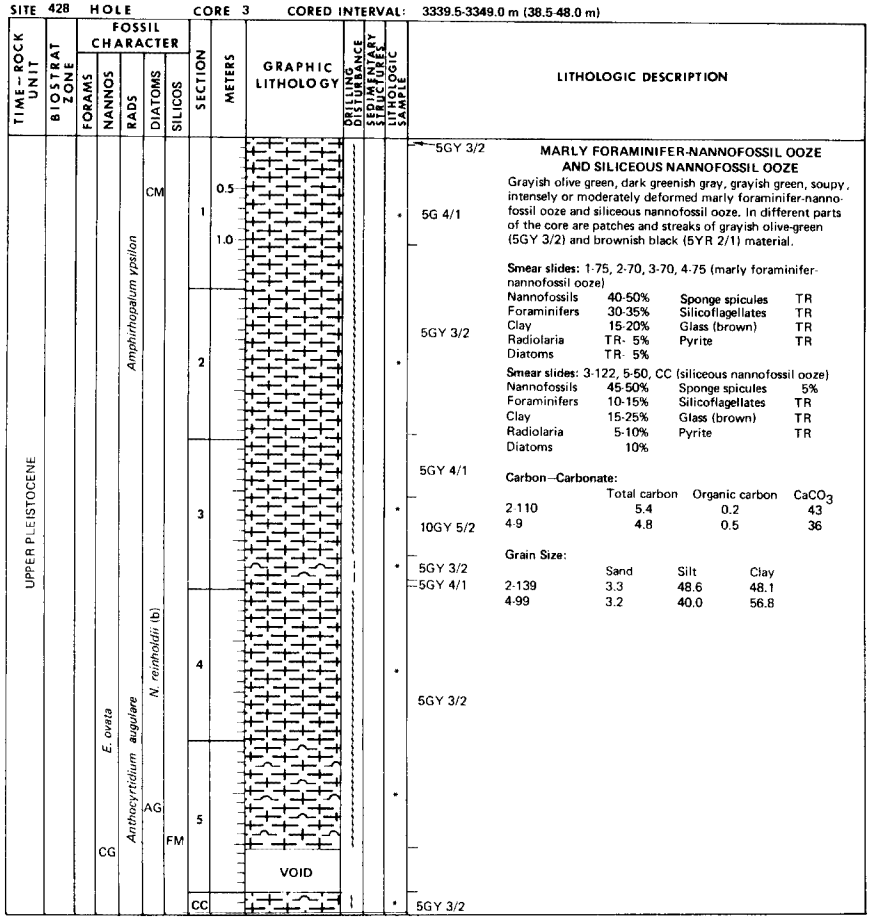
Carbon—Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-110	5.6	0.3	44
3-90	3.6	0.3	28

Grain Size:

	Sand	Silt	Clay
1-139	2.2	47.4	50.4
3-139	4.8	49.0	46.1

SITE 428 HOLE CORE 3 CORED INTERVAL: 3339.5-3349.0 m (38.5-48.0 m)



LITHOLOGIC DESCRIPTION

MARLY FORAMINIFER-NANNOFOSSIL OOZE AND SILICEOUS NANNOFOSSIL OOZE

Grayish olive green, dark greenish gray, grayish green, soupy, intensely or moderately deformed marly foraminifer-nannofossil ooze and siliceous nannofossil ooze. In different parts of the core are patches and streaks of grayish olive-green (5GY 3/2) and brownish black (5YR 2/1) material.

Smear slides: 1-75, 2-70, 3-70, 4-75 (marly foraminifer-nannofossil ooze)

Nannofossils	40-50%	Sponge spicules	TR
Foraminifers	30-35%	Silicoflagellates	TR
Clay	15-20%	Glass (brown)	TR
Radiolaria	TR- 5%	Pyrite	TR
Diatoms	TR- 5%		

Smear slides: 3-122, 5-50, CC (siliceous nannofossil ooze)

Nannofossils	45-50%	Sponge spicules	5%
Foraminifers	10-15%	Silicoflagellates	TR
Clay	15-25%	Glass (brown)	TR
Radiolaria	5-10%	Pyrite	TR
Diatoms	10%		

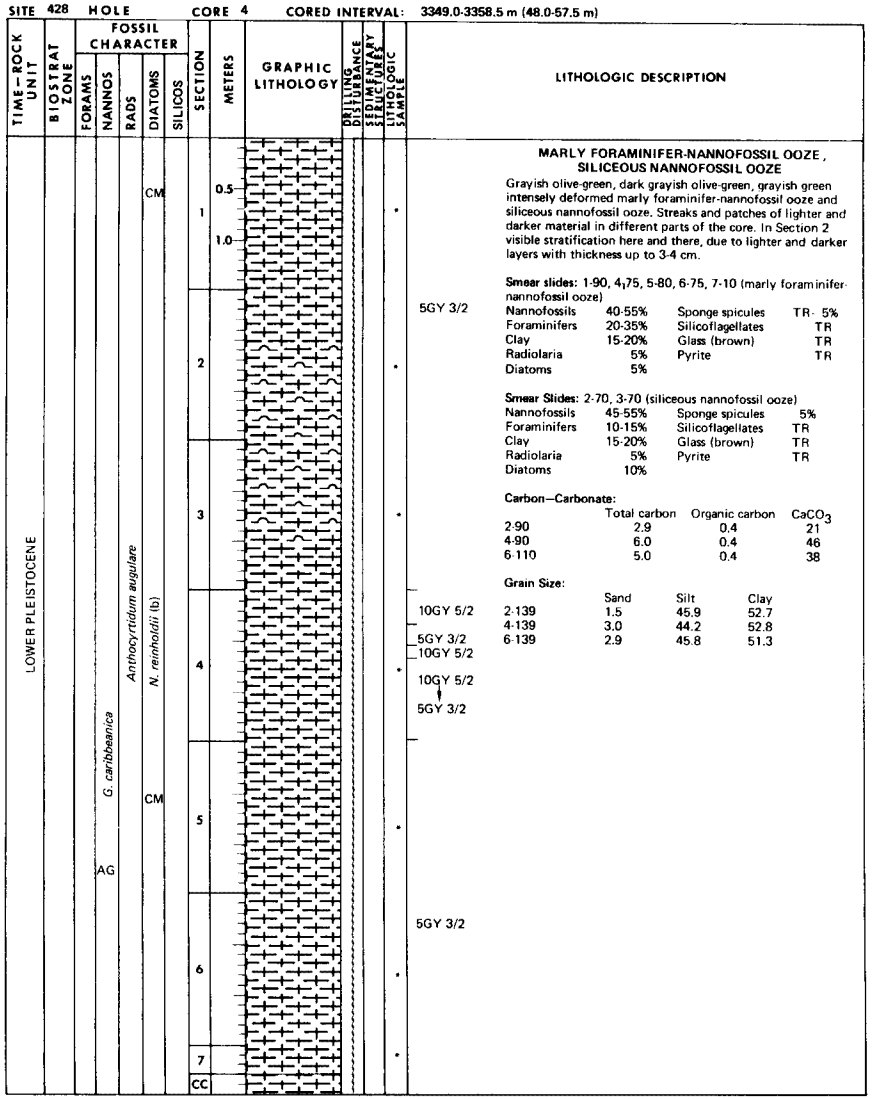
Carbon—Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-110	5.4	0.2	43
4-9	4.8	0.5	36

Grain Size:

	Sand	Silt	Clay
2-139	3.3	48.6	48.1
4-99	3.2	40.0	56.8

SITE 428 HOLE CORE 4 CORED INTERVAL: 3349.0-3358.5 m (48.0-57.5 m)



LITHOLOGIC DESCRIPTION

MARLY FORAMINIFER-NANNOFOSSIL OOZE, SILICEOUS NANNOFOSSIL OOZE

Grayish olive-green, dark grayish olive-green, grayish green intensely deformed marly foraminifer-nannofossil ooze and siliceous nannofossil ooze. Streaks and patches of lighter and darker material in different parts of the core. In Section 2 visible stratification here and there, due to lighter and darker layers with thickness up to 3-4 cm.

Smear slides: 1-90, 4,75, 5-80, 6-75, 7-10 (marly foraminifer-nannofossil ooze)

Nannofossils	40-55%	Sponge spicules	TR- 5%
Foraminifers	20-35%	Silicoflagellates	TR
Clay	15-20%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR
Diatoms	5%		

Smear Slides: 2-70, 3-70 (siliceous nannofossil ooze)

Nannofossils	45-55%	Sponge spicules	5%
Foraminifers	10-15%	Silicoflagellates	TR
Clay	15-20%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR
Diatoms	10%		

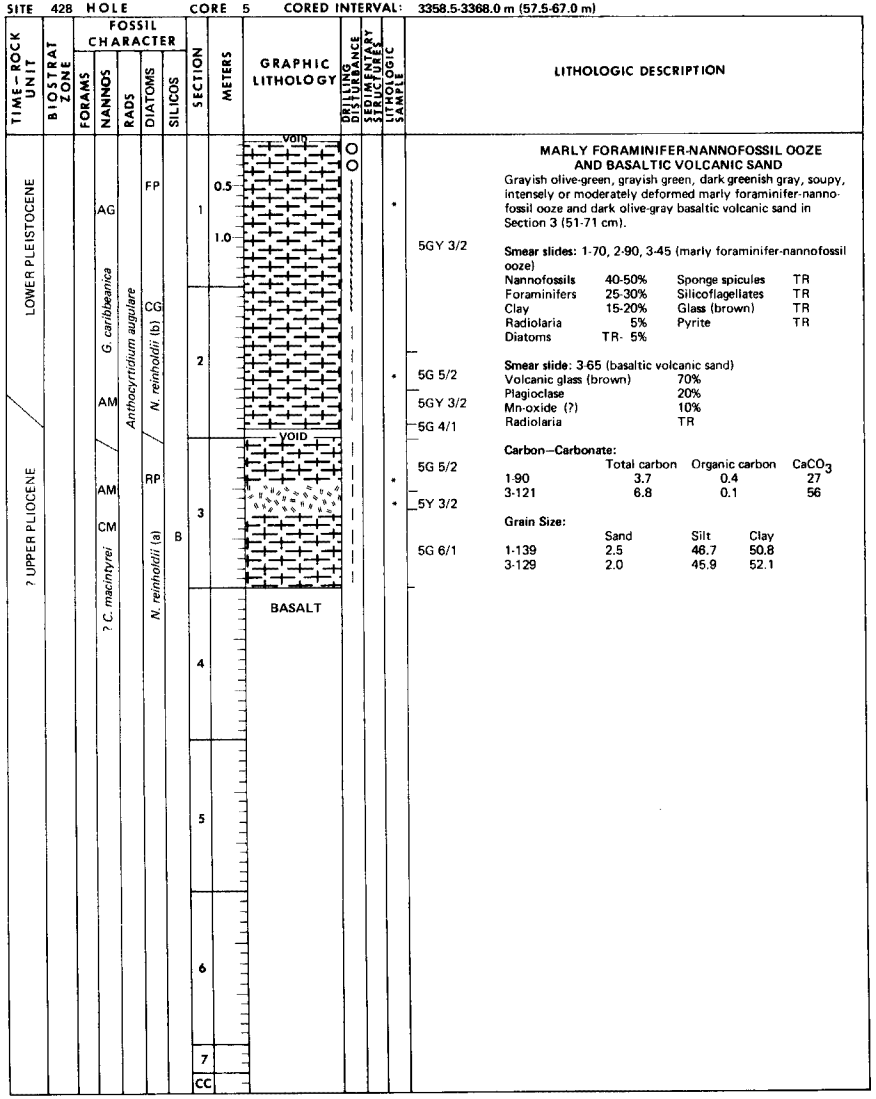
Carbon—Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
2-90	2.9	0.4	21
4-90	6.0	0.4	46
6-110	5.0	0.4	38

Grain Size:

	Sand	Silt	Clay
2-139	1.5	45.9	52.7
4-139	3.0	44.2	52.8
6-139	2.9	45.8	51.3

SITE 428 HOLE CORE 5 CORED INTERVAL: 3358.5-3368.0 m (57.5-67.0 m)



MARLY FORAMINIFER-NANNOFOSSIL OOZE AND BASALTIC VOLCANIC SAND

Grayish olive-green, grayish green, dark greenish gray, soupy, intensely or moderately deformed marly foraminifer-nannofossil ooze and dark olive-gray basaltic volcanic sand in Section 3 (51-71 cm).

Smear slides: 1-70, 2-90, 3-45 (marly foraminifer-nannofossil ooze)

Nannofossils	40-50%	Sponge spicules	TR
Foraminifers	25-30%	Silicoflagellates	TR
Clay	15-20%	Glass (brown)	TR
Radiolaria	5%	Pyrite	TR
Diatoms	TR- 5%		

Smear slide: 3-65 (basaltic volcanic sand)

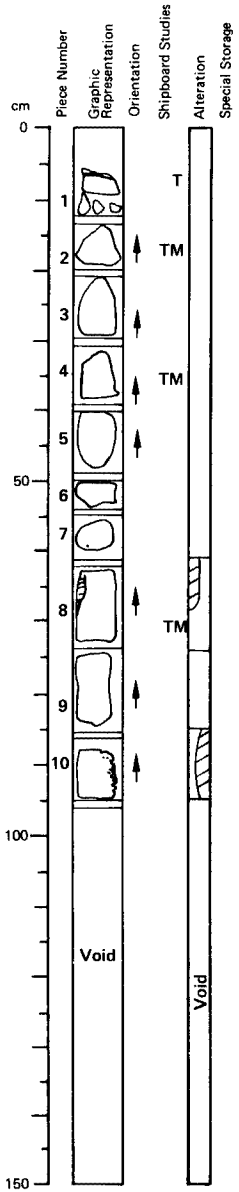
Volcanic glass (brown)	70%
Plagioclase	20%
Mn-oxide (?)	10%
Radiolaria	TR

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-90	3.7	0.4	27
3-121	6.8	0.1	56

Grain Size:

	Sand	Silt	Clay
1-139	2.5	46.7	50.8
3-129	2.0	45.9	52.1



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 8		5	4

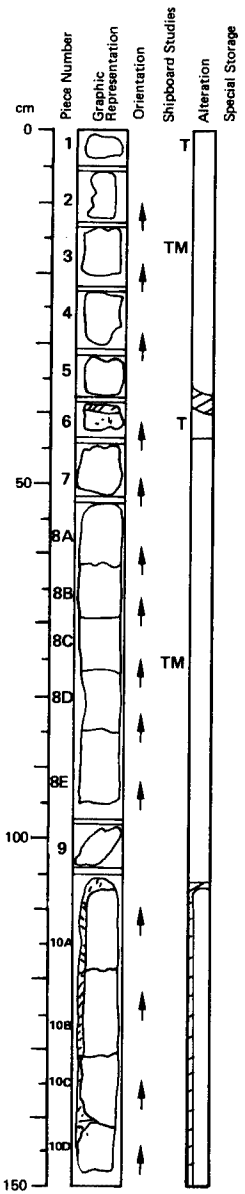
Depth: 3358.5 m to 3368.0 m

ROCK TYPE AND STRUCTURE
Very fine-grained aphyric basalt. Chilled rind on Piece 1 indicates top of cooling unit. Weathering is parallel to vertical joints in Pieces 8 and 10.

TEXTURE
Aphanitic to glassy with scattered, < 1 mm, vesicles.

MINERALOGY
Olivine detectable in thin section as well as plagioclase and devitrified glass.

ALTERATION
Oxidation rinds in Pieces 8 and 10. Clay and/or calcite vesicle fillings common throughout. Glass matrix devitrified.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 8		6	1

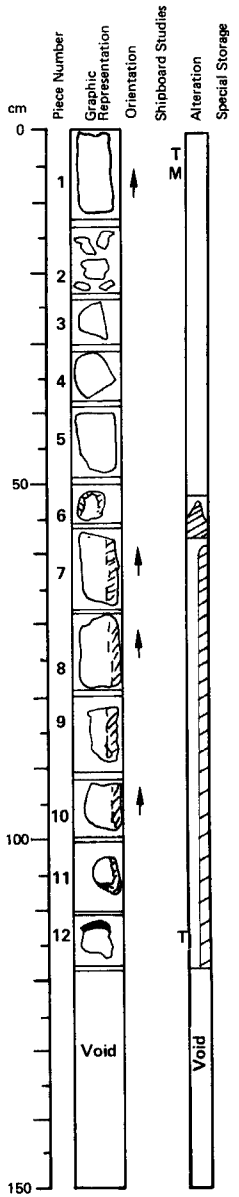
Depth: 3368.0 m to 3377.5 m

ROCK TYPE AND STRUCTURE
Fine- to medium-grained aphyric basalt. Vertical fractures control weathering in Pieces 10A, 10B, 10C, and 10D; horizontal fracture controls weathering in Piece 6. Vertical joints bound the left side of core.

TEXTURE
Aphanitic and glassy to medium-grained. Scoria-like structures in altered rind of Piece 6. Large vesicles confined to Piece 6, small vesicles scattered throughout.

MINERALOGY
Olivine, plagioclase, and clinopyroxene identifiable in thin section. Groundmass in glass.

ALTERATION
Weathered, oxidized rind parallels joints in Pieces 6, 10A, 10B, 10C, and 10D. Vesicles partly filled with calcite in Sample 6.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.	
5	4	4	2	8				6		2

Depth: 3368.0 m to 3377.5 m

ROCK TYPE AND STRUCTURE
Fine- to medium-grained aphyric basalt. Vertical joint controls weathering in Pieces 7, 8, 9, 10, and 11. Piece 12 is topped by a chilled margin.

TEXTURE
Aphanitic to glassy. Small, pin-point, vesicles scattered in Pieces 1, 2, 3, and 4.

MINERALOGY
Olivine, plagioclase, and clinopyroxene indentifiable in thin section.

ALTERATION
Oxidized rind is parallel to joint in Pieces 6 through 12. Vesicles are generally empty.

SITE SUMMARY SHEET

SITE 428 HOLE 428A

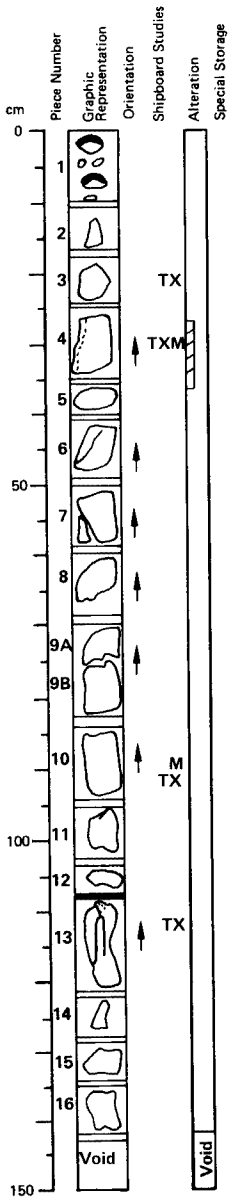
Date occupied	7 June 1977 0518 hrs. LCT
Date departed	8 June 1977 1526 hrs. LCT
Time on hole	34.1 hours
Position: latitude	09° 02.77'N
longitude	105° 26.14'W
Water depth (sea level)	
Water depth (rig floor)	
Bottom felt at	3358.5 meters, drill pipe
Penetration	115.0 meters
Number of holes	1
Number of cores	7
Total length of cored section	52.5 meters
Total core recovered	16.37 meters
Percentage core recovery	31%

Oldest Sediment Cored

Depth sub-bottom	
Nature	
Age	
Measured velocity	

Basement

Depth sub-bottom	115.0 meters
Nature	basaltic rock
Velocity range	



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	8	A	1	1

Depth: 3358.5 m to 3368.0 m

ROCK TYPE AND STRUCTURE

Fine- to medium-grained plagioclase phyric basalt. Most exterior surfaces are joints or fracture planes. Top 10 cm of section comprise dense, glassy drill cuttings. Vertical cracks and joints control shape of samples and weathering rinds where they exist.

TEXTURE

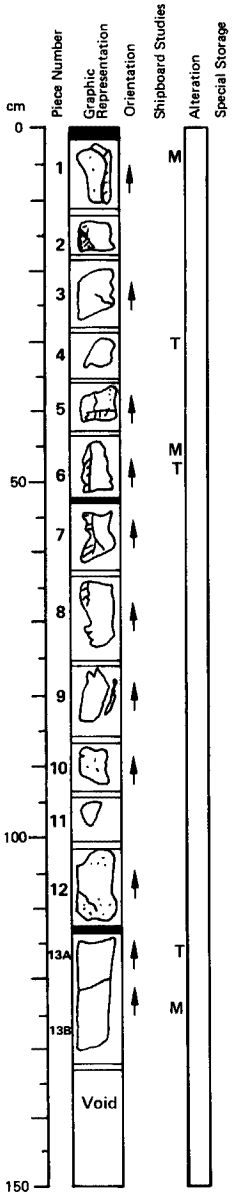
Medium- to fine-grained. Pieces 1-12 were tentatively identified as one cooling unit due to regular variation in grain size (coarsening toward the middle of the unit — Pieces 9A and 9B). Samples are sparsely vesicular with Pieces 9A and 9B being more abundant, tube-like vesicles and vugs. Bottom half of section has numerous vesicles filled with calcite and zeolites. Piece 16 is nearly scoriaceous.

MINERALOGY

Plagioclase phenocrysts and clinopyroxene glomerocrysts. Olivine seen in thin sections.

ALTERATION

Weathering evident in Piece 4 and in top most drill cuttings. Zeolites and clays coat fractures (Piece 13) and fill vesicles (Pieces 9A, 9B, 10, 11 and 15).



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	8	A	1	2

Depth: 3358.5 m to 3368.0 m

ROCK TYPE AND STRUCTURE

Fine- to medium-grained plagioclase phyric basalt. Exterior surfaces and weathering rinds controlled by fractures and joints. Pieces 1-6 defined as a cooling unit on basis of grain size variations.

TEXTURE

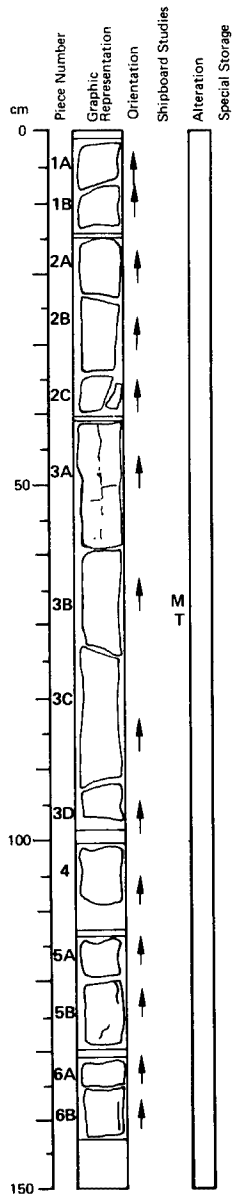
Aphanitic to medium-grained. Sparsely vesicular with Pieces 1, 5, 10, and 12 having larger vesicles filled or coated with clays, calcite, and/or zeolites.

MINERALOGY

Plagioclase phenocrysts, some clinopyroxene seen in groundmass. Altered olivine in groundmass.

ALTERATION

Weathering rinds of Fe-oxides throughout the section. Vesicles filled with clays, calcite and zeolites in Pieces 1, 5, 10 and 12. Olivine altered to talc(?) in Piece 4.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.
5	4	4	2	8	A			1	3

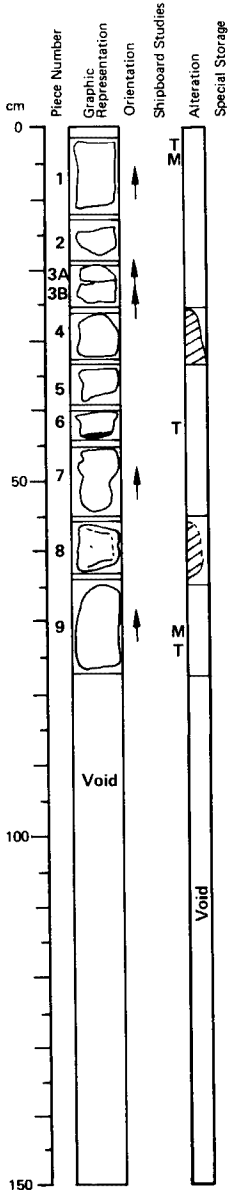
Depth: 3358.5 m to 3368.0 m

ROCK TYPE AND STRUCTURE
Entire section comprises coarse-grained, aphyric, massive basalt. A few fractures seen in Pieces 2C and 3A. These may represent vertical jointing.

TEXTURE
Coarse-grained diabasic, nonvesicular. Very sparse pinpoint vesicles.

MINERALOGY
Plagioclase, clinopyroxene, and olivine described in thin section.

ALTERATION
Fresh. Few vesicles filled with blue clay.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.
5	4	4	2	8	A			1	4

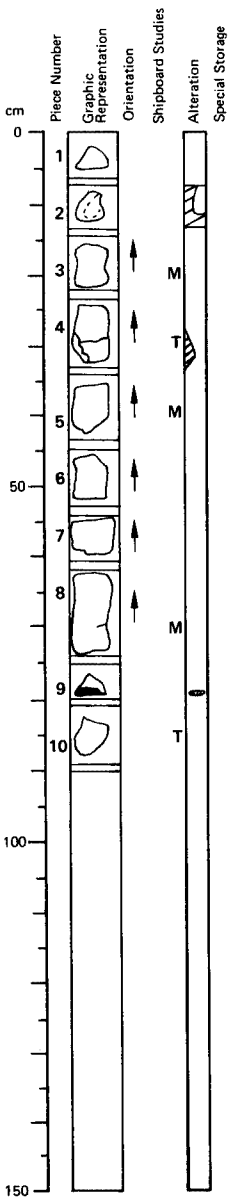
Depth: 3358.5 m to 3368.0 m

ROCK TYPE AND STRUCTURE
Very fine-grained to medium-grained sparsely plagioclase phyric basalt. Dominant jointing is horizontal and does not control weathering. Glassy margin on unoriented Piece 6.

TEXTURE
Aphanitic with glassy segregations (Pieces 6 and 7) to medium-grained. Pinpoint vesicles scattered throughout.

MINERALOGY
Plagioclase, clinopyroxene, and olivine reported in thin section.

ALTERATION
Pieces 4 and 8 almost completely weathered. Clay filled vesicles occur in Pieces 1, 3A, 3B, and 6. Piece 6 has a thin coating of blue clay.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	8	A	2	1

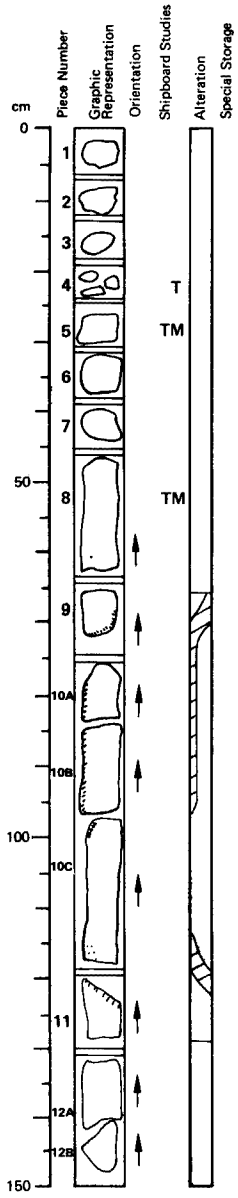
Depth: 3368.0 to 3377.5 m

ROCK TYPE AND STRUCTURE
Medium- to coarse-grained aphyric basalt. Jointing not apparent. Chilled margin in Piece 9. Entire section similar in appearance.

TEXTURE
Diabase to coarse-grained. Pinpoint vesicles in Pieces 2, 3 and 4.

MINERALOGY
Olivine plagioclase, and clinopyroxene seen in thin section.

ALTERATION
Oxidized rind in Pieces 2, 4, and 9. Vesicles partly filled with green clay.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.
5	4	4	2	8	A	3	1

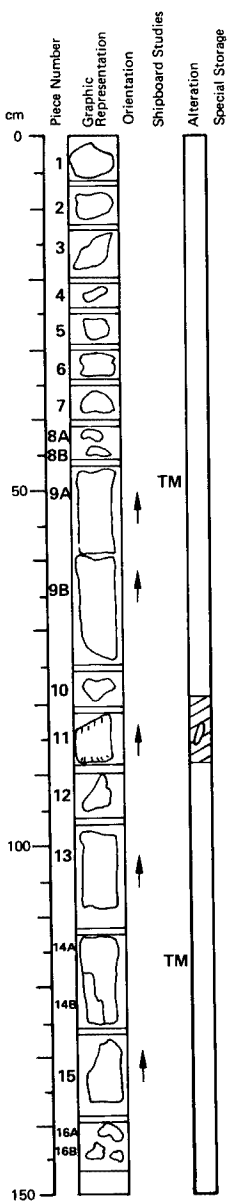
Depth: 3377.5 m to 3382.5 m

ROCK TYPE AND STRUCTURE
Entire section comprises very fine-grained, vertically jointed aphyric basalt.

TEXTURE
Aphanitic; rare, pinpoint vesicles.

MINERALOGY
Olivine, plagioclase, and clinopyroxene observed in thin section.

ALTERATION
Scattered vesicles filled with green/blue clay. Pieces 9 through 11 have weathered surfaces parallel to fractures.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.	
5	4	4	2	8	A			4		1

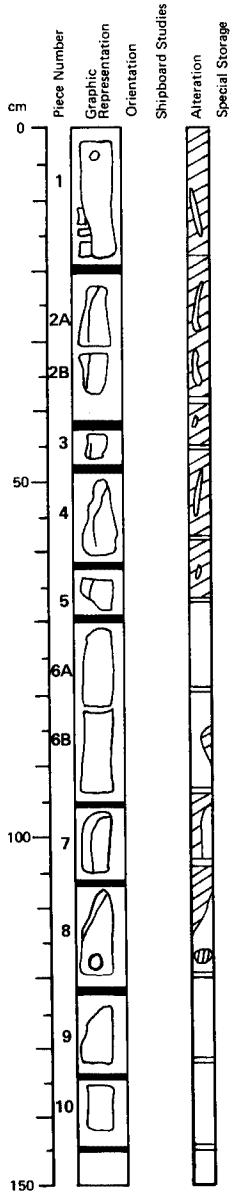
Depth: 3382.5 m to 3387.0 m

ROCK TYPE AND STRUCTURE
Fine- to medium-grained, aphyric basalt. Prominent fracture directions are inclined 45° from horizontal.

TEXTURE
Aphanitic to glassy. Dark, glassy segregations common throughout. Pinpoint vesicles common.

MINERALOGY
Plagioclase and clinopyroxene observed in thin section. Scarce olivine also present.

ALTERATION
Olivine altered to talc or chlorite. Vesicles (especially in 9A and 9B) and fracture surface (11 and 15) coated with white secondary minerals. Vesicles contain calcite fillings throughout.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE			SECT.	
5	4	4	2	8	A			4		2

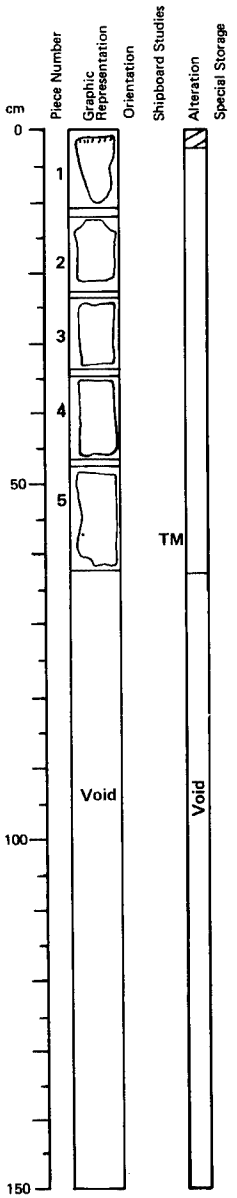
Depth: 3382.5 m to 3387.0 m

ROCK TYPE AND STRUCTURE
Very fine-grained, aphyric, vertically jointed basalt. Joints control weathering rinds.

TEXTURE
Aphanitic, with scattered pinpoint vesicles.

MINERALOGY
Plagioclase and clinopyroxene quench phases in glass.

ALTERATION
Weathering rinds of Fe-oxide staining are parallel to vertical joints. Veinlet of carbonate in Piece 2. Vesicles commonly filled with calcite or zeolites and green clays.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.	
5	4	4	2	8	A		4	3

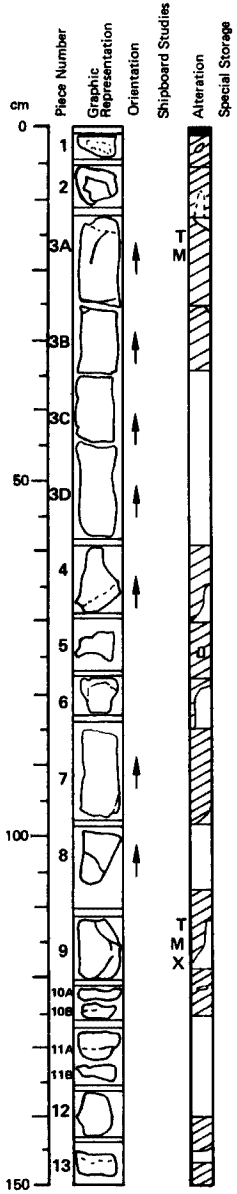
Depth: 3382.5 m to 3387.0 m

ROCK TYPE AND STRUCTURE
Medium-grained, aphyric basalt. Horizontal joints dominate and control weathering.

TEXTURE
Medium-grained, rare vesicles.

MINERALOGY
Plagioclase-clinopyroxene quench phases in glass.

ALTERATION
Fe-stained rind in Piece 1. Vesicles filled with clays in Piece 1. Piece 3 has quartz, zeolite, and calcite vesicle filling.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.	
5	4	4	2	8	A		5	1

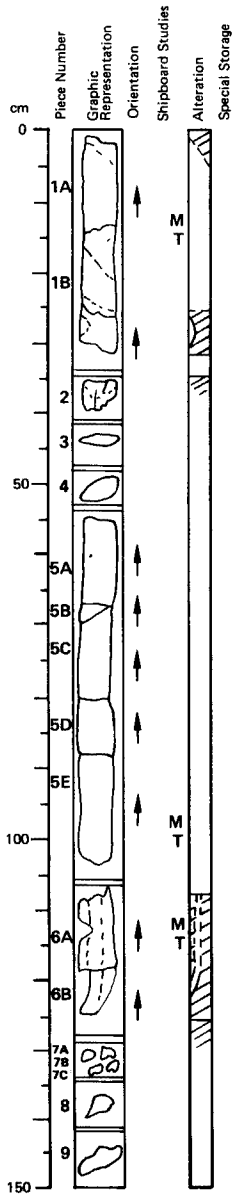
Depth: 3387.0 m to 3396.5 m

ROCK TYPE AND STRUCTURE
Very fine-grained, aphyric to coarse-grained plagioclase phyric basalt. Both vertical and horizontal joints control weathering rinds. Chilled margin at top of Piece 1.

TEXTURE
Pieces 1 and 2 are aphanitic to glassy with scattered small, empty vesicles. Pieces 3A through 13 are coarse- to medium-grained with filled vesicles up to 2 cm in diameter (Piece 3A).

MINERALOGY
Plagioclase and clinopyroxene as phenocrysts and also as quench phases.

ALTERATION
Weathering rinds of Fe-staining throughout. Zeolites fill vesicles in Pieces 7 and 8. Oxide vein cuts Piece 9.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 8	A	5	2

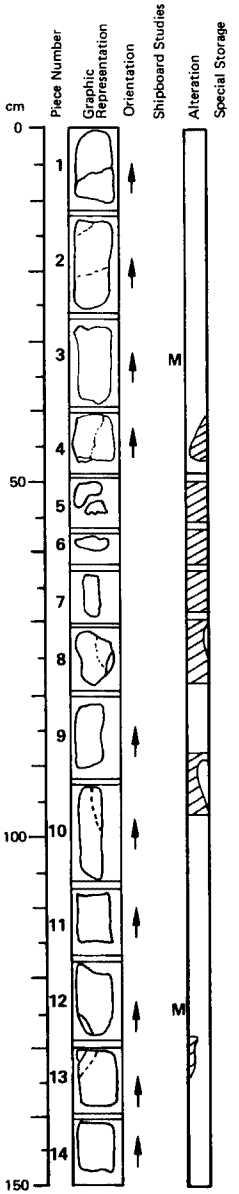
Depth: 3387.0 m to 3396.5 m

ROCK TYPE AND STRUCTURE
Coarse-grained plagioclase/clinopyroxene glomerocryst phyric basalt throughout section. Angular fractures, inclined 45°-60° to horizontal, control weathering.

TEXTURE
Subophitic to intersertal, vesicles scattered throughout.

MINERALOGY
Plagioclase and clinopyroxene as phenocrysts and groundmass phases. Minor spatile reported from thin section.

ALTERATION
Weathered rind of Fe-stain on Pieces 1A, 1B, 6A, 6B and 7A, 7B, and 7C. Blue clays fill vesicles and coat fractures throughout.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
5 4	4 2 8	A	5	3

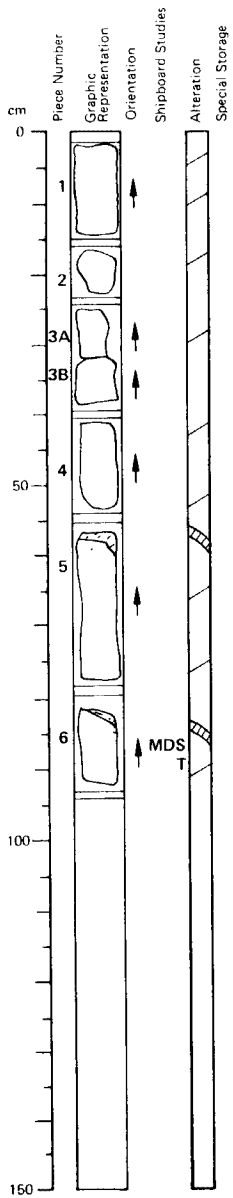
Depth: 3387.0 m to 3396.5 m

ROCK TYPE AND STRUCTURE
Massive, coarse-grained aphyric basalt with glassy segregations (e.g. Piece 2).

TEXTURE
Intersertal to subophitic; vesicles common (2-3 mm) in upper one-quarter of section.

MINERALOGY
Plagioclase and clinopyroxene quench phases. No phenocrysts.

ALTERATION
Weathering rind of Fe-oxides prominant in central one-third of core. Vesicles filled with clays in upper one-quarter of section. Veins of clay and/or oxides in Piece 1.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	4	4	2	8	A		5		4

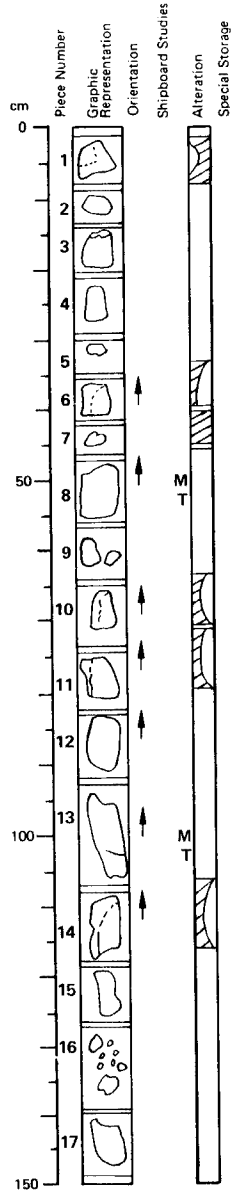
Depth: 3387.0 m to 3396.5 m

ROCK TYPE AND STRUCTURE
Aphyric, coarse- to medium-grained, massive basalt.

TEXTURE
Intersertal; radial plagioclase impart a "felty" appearance. Pin-hole vesicles common in Pieces 5 and 6.

MINERALOGY
Olivine, plagioclase, and clinopyroxene present as quench phases. No phenocrysts.

ALTERATION
Slightly altered throughout; zones of more intense weathering in Pieces 5 and 6. Fe-oxide, and calcite coating on fracture in Pieces 3A and 3B.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	4	4	2	8	A		6		1

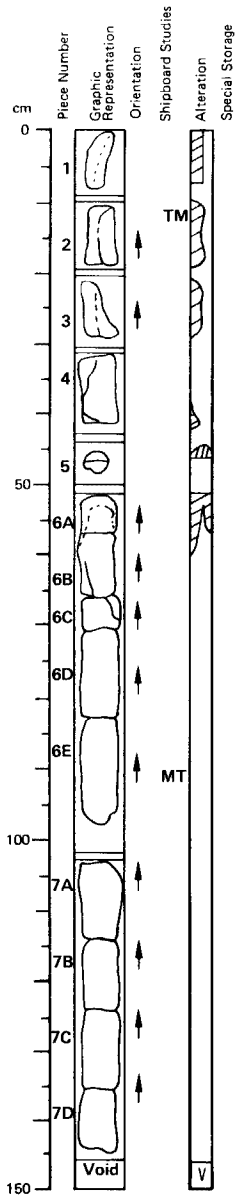
Depth: 3396.5 m to 3406.0 m

ROCK TYPE AND STRUCTURE
Fine- to coarse-grained aphyric basalt. Piece 1 is fine grained, remainder is coarser.

TEXTURE
Intersertal to subophitic. Vesicles scattered throughout; largest approach 2.5 cm in Piece 3.

MINERALOGY
Clinopyroxene and plagioclase quench phases. No phenocrysts.

ALTERATION
Fe-oxide rind in Pieces 1, 6, 7, 10, 11, and 14. Clay and zeolite fillings in vesicles of Pieces 3, 4, and 13.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
54	428	A	7	1

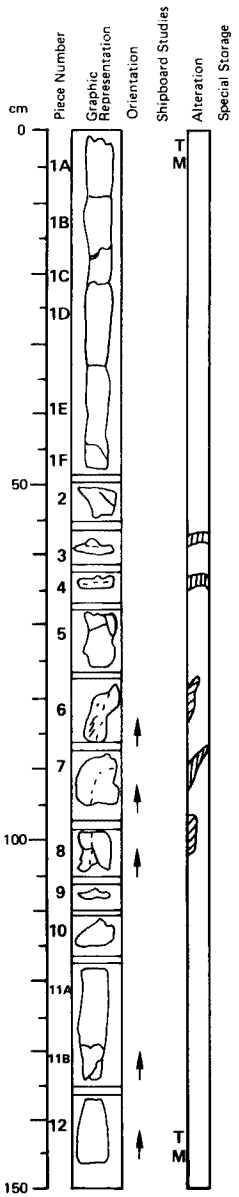
Depth: 3406.0 m to 3411.0 m

ROCK TYPE AND STRUCTURE
Medium-grained aphyric basalt with vertical joints controlling weathering rinds.

TEXTURE
Subophitic.

MINERALOGY
Olivine, plagioclase and clinopyroxene reported from thin section. No phenocrysts.

ALTERATION
Weathered rind of Fe-stain prominent in top one-third of section.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG	SITE	HOLE	CORE	SECT.
54	428	A	7	2

Depth: 3406.0 m to 3411.0 m

ROCK TYPE AND STRUCTURE
Medium-grained, holocrystalline, aphyric basalt. Indistinct weathering rinds parallel irregular joints in Pieces 3, 4, 6, 7, and 8.

TEXTURE
Subophitic. Slightly "felty" megascopic texture. Very few vesicles.

MINERALOGY
Plagioclase and clinopyroxene quench phases. No phenocrysts.

ALTERATION
Weathering rinds of Fe-oxide stain as described above.

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SITE SUMMARY SHEET

SITE 429 HOLE 429

Date occupied	9 June 1977 0708 hrs. LCT
Date departed	9 June 1977 0924 hrs. LCT
Time on hole	2.5 hours
Position: latitude	09° 02.01'N
longitude	106° 46.35'W
Water depth (sea level)	3406 corrected meters, echo sounding
Water depth (rig floor)	3422 corrected meters, echo sounding
Bottom felt at	3426 meters, drill pipe
Penetration	31.0 meters
Number of holes	1
Number of cores	1
Total length of cored section	5.0 meters
Total core recovered	4.67 meters
Percentage core recovery	93%

Oldest Sediment Cored

Depth sub-bottom	31.0 meters
Nature	nannofossil-foraminiferal ooze
Age	0.4-1.2 m.y. (mud-line core)
Measured velocity	

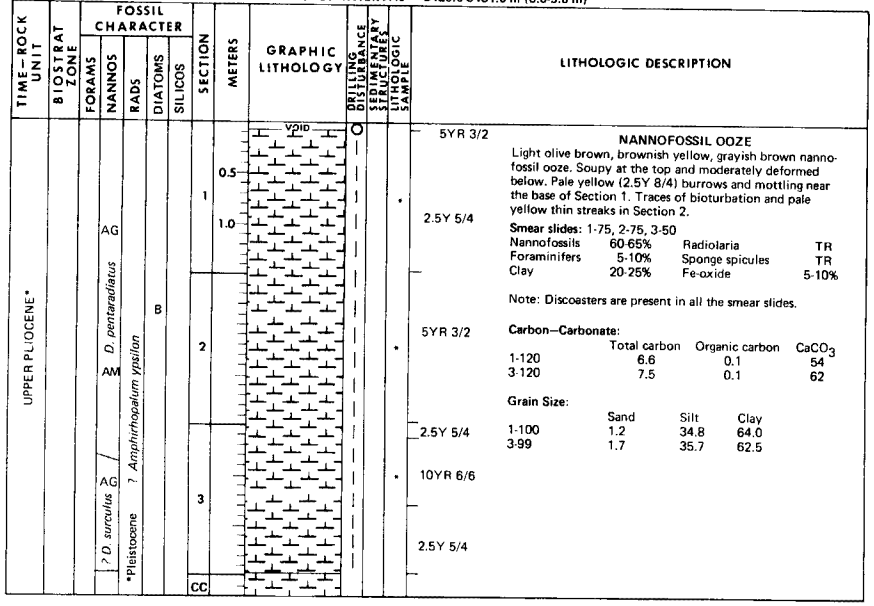
Basement

Depth sub-bottom	
Nature	
Velocity range	

Principal Results:

Site located about 264 km west of EPR centered on the negative magnetic anomaly immediately west of the Nunivat positive event in the Gilbert Magnetic epoch. Holes 429 and 429A washed down to basement, with only mud-line core taken at 429. Penetrated 21.5 meters of basalt at 429A, recovering 2.95 meters of aphyric olivine-free and olivine-bearing basalt. Magnetic polarity of lower part of Hole 429A corresponds to that predicted by magnetic anomaly, but upper part of hole has positive inclinations.

SITE 429 HOLE CORE 1 CORED INTERVAL: 3426.0-3431.0 m (0.0-5.0 m)



NANNOFOSSIL OOZE

Light olive brown, brownish yellow, grayish brown nannofossil ooze. Soupy at the top and moderately deformed below. Pale yellow (2.5Y 8/4) burrows and mottling near the base of Section 1. Traces of bioturbation and pale yellow thin streaks in Section 2.

Smear slides: 1-75, 2-75, 3-50

Nannofossils	60-65%	Radiolaria	TR
Foraminifers	5-10%	Sponge spicules	TR
Clay	20-25%	Fe-oxide	5-10%

Note: Discoasters are present in all the smear slides.

Carbon–Carbonate:

	Total carbon	Organic carbon	$CaCO_3$
1-120	6.6	0.1	54
3-120	7.5	0.1	62

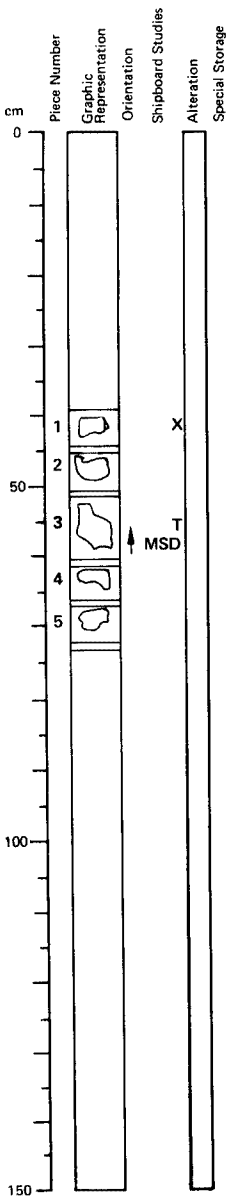
Grain Size:

	Sand	Silt	Clay
1-100	1.2	34.8	64.0
3-99	1.7	35.7	62.5

SITE SUMMARY SHEET

SITE 429 HOLE 429A

Date occupied	9 June 1977 1055 hrs. LCT
Date departed	10 June 1977 0010 hrs. LCT
Time on hole	13 hours
Position: latitude	09° 02.01'N
longitude	106° 45.87'W
Water depth (sea level)	3426 corrected meters, echo sounding
Water depth (rig floor)	
Bottom felt at	3426 PDR meters, drill pipe
Penetration	52.5 meters
Number of holes	1
Number of cores	3
Total length of cored section	21.5 meters
Total core recovered	2.95 meters
Percentage core recovery	14%
Oldest Sediment Cored	
Depth sub-bottom	31.0 meters
Nature	foraminiferal-nannofossil ooze
Age	
Measured velocity	
Basement	
Depth sub-bottom	20.5 meters
Nature	basaltic rock
Velocity range	



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE			SECT.	
5	4	4	2	9	A			1	1

Depth: 3457.0 m to 3462.5 m

0-40 cm marly nannofossil ooze. A small amount of red clay occurs 35-40 cm.

ROCK TYPE AND STRUCTURE
Fine-grained fresh aphyric basalt. Pin-hole vesicles, Pieces 1-3.

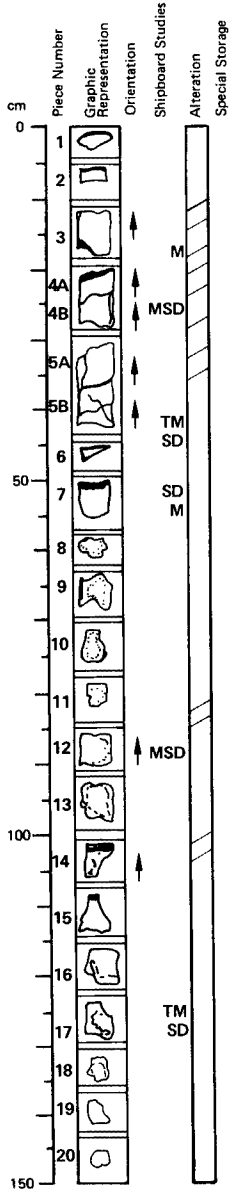
TEXTURE
Spherulitic; no glass recovered.

MINERALOGY
No phenocrysts.

ALTERATION
Minor Fe-oxides on fracture surfaces. Calcite in vesicles, Pieces 3 and 4.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Fe-oxide	Alt. + Ves.
60-63 cm (Piece 3):	42.4	35.2	1.2	8.0	4.6	10.4



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE		HOLE	CORE		SECT.	
5	4	4	2	9	A		2	1

Depth: 3462.5 m to 3467.0 m

ROCK TYPE AND STRUCTURE
Fine-grained aphyric basalt. Glass on Pieces 1-4A, 6, 7, 14 and 5. Rare pin-hole vesicles.

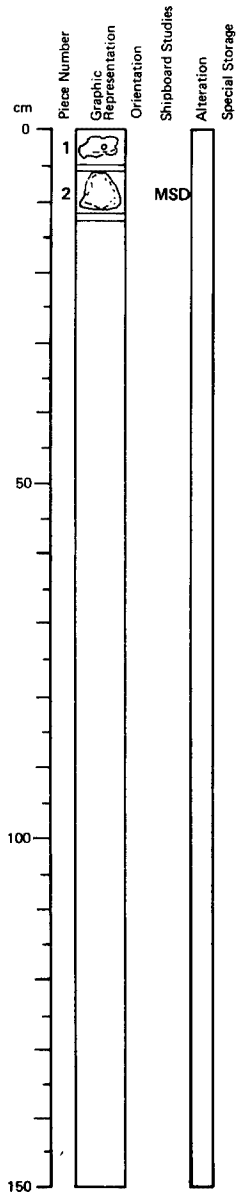
TEXTURE
Glassy to spherulitic.

MINERALOGY
No phenocrysts.

ALTERATION
Rinds up to 1 cm on Pieces 9, 10, 11, 12, 13, 14, 17, and 18. Fracture surfaces on these pieces have a bluish or dirty brown coating. Irregular calcite veins in Pieces 5A and 5B.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Opaques	Alt. + Ves.
41-44 cm (Piece 5B):	47.8	27.2	6.4	9.5	2.8	6.3
125-128 cm (Piece 17):	45.2	32.6	–	10.2	6.2	5.8

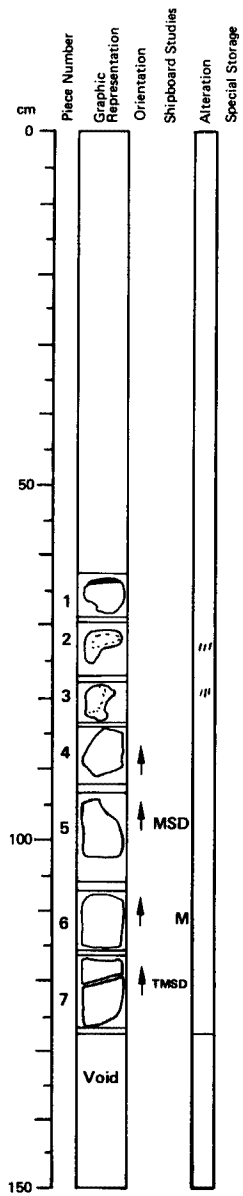


VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	4	4	2	9	A			2	2

Depth: 3467.0 m to 3471.5 m

Fine-grained aphyric sparsely vesicular basalts. Both pieces have 0.5 cm alteration rinds. Fracture surfaces on these show a greenish yellow coating.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

LEG		SITE			HOLE	CORE		SECT.	
5	4	4	2	9	A			3	1

Depth: 3472.0 m to 3478.5 m

1-65 cm highly disturbed nannofossil ooze that apparently fell down the hole.

ROCK TYPE AND STRUCTURE
Fine-grained to glassy aphyric basalt. Pin-hole vesicles in most pieces.

TEXTURE
Glassy to spherulitic.

MINERALOGY
No phenocrysts.

ALTERATION
Alteration rinds on Pieces 2 and 3. Faint Fe-oxide color on fracture surfaces. Pyrite(?) on Piece 4.

THIN SECTION DATA (1000 counts)

	Plagioclase	Clinopyroxene	Olivine	Glass	Fe-oxide	Alt. + Ves.
123-125 cm (Piece 7B):	42.8	36.4	–	6.0	7.2	5.8