INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 32

NORTHWEST PACIFIC OCEAN

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

UNIVERSITY OF CALIFORNIA, SAN DIEGO

BERKELEY · DAVIS · IRVINE · LOS ANGELES · RIVERSIDE · SAN DIEGO · SAN FRANCISCO

SANTA BARBARA · SANTA CRUZ

SCRIPPS INSTITUTION OF OCEANOGRAPHY

POST OFFICE BOX 1529
LA JOLLA, CALIFORNIA 92037

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 being honored one year after 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 as known six (6) months post-cruise. These data, while completely adequate for almost all sample selection needs, will be subject to possible slight change by the time of issue of the formal cruise report, 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,

N. Terence Edgar
Chief Scientist
Deep Sea Drilling Project

NTE:eb

INITIAL CORE DESCRIPTION (ICD)

DEEP SEA DRILLING PROJECT

LEG 32

AUGUST 16, 73 — OCTOBER 10, 73

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

MEMBER ORGANIZATIONS

Lamont-Doherty Geological Observatory, Columbia University
Rosenstiel School of Marine and Atmospheric Science, University of Miami
Scripps Institution of Oceanography, University of California
University of Washington
Woods Hole Oceanographic Institution
Institute of Oceanology, Moscow, USSR

PARTICIPATING SCIENTISTS

Roger L. Larson, Ralph Moberly, David Bukry,
Helen P. Foreman, James V. Gardner, John B. Keene,
Yves Lancelot, Hanspeter Luterbacher,
Monte C. Marshall, Albert Matter

INITIAL CORE DESCRIPTION - LEG 32

INTRODUCTION

Leg 32 of the Deep Sea Drilling Project departed Hakodate, Japan August 16, 1973 for 56 days of drilling in the Northwest Pacific (Fig. 1).

The main scientific goals of Leg 32 fell into three categories:

1. Sites 303, 304, 307: Determine the development of the Western Pacific, including the nature of its basement rocks and the age, lithology, and fossil content of the sedimentary rocks overlying seismic basement. Linear magnetic anomaly patterns that do not match the well-dated latest Cretaceous through Tertiary reversal sequence are present east of Japan, west of the Hawaiian Ridge, near the Phoenix Islands, and bordering the North Atlantic. A principal aim of Leg 32 was to test correlations of these old anomalies by drilling specific sites on the then unsampled Japanese and Hawaiian sets.

2. Sites 305, 306, 310: Establish standard mid-Mesozoic to Recent paleontological-biostratigraphic reference sections for the present-day northwest Pacific. Shatsky Rise (Sites 305, 306) and Hess Rise (Site 310) are the northern-most of the few broad and irregularly shaped areas of the sea floor that are sufficiently shallow so as to have probabilities of good preservation of planktonic fossils, yet surrounded by water of sufficient depth to preclude dilution by hemipelagic or turbidite deposition.

3. Sites 308, 309, 311: Determine the volcanic history of parts of Central North Pacific seamount chains. In particular, to determine the paleo-latitude of a specific period of volcanicity on the Emperor

Seamount Chain (Koko Guyot Sites 308 and 309), which when compared with the paleo-latitude of Midway Islands and the present-day latitude of the active volcanoes on Hawaii, can test a version of the hot-spot theory: that a source of magma generation has remained fixed in the earth's mesosphere while the Pacific lithospheric plate has moved across it, with resultant volcanoes forming first the Emperor Seamounts and, after a change in direction of plate motion, the Hawaiian Ridge.

4. Site 313: Sample a pre-Maastrichtian section in the north-eastern Mid-Pacific Mountains and date the volcanic basement.

A total of 12 holes were drilled at ten sites but, due to prevalent chert horizons and bad weather, only 739 meters of sediment and basement rocks were recovered.

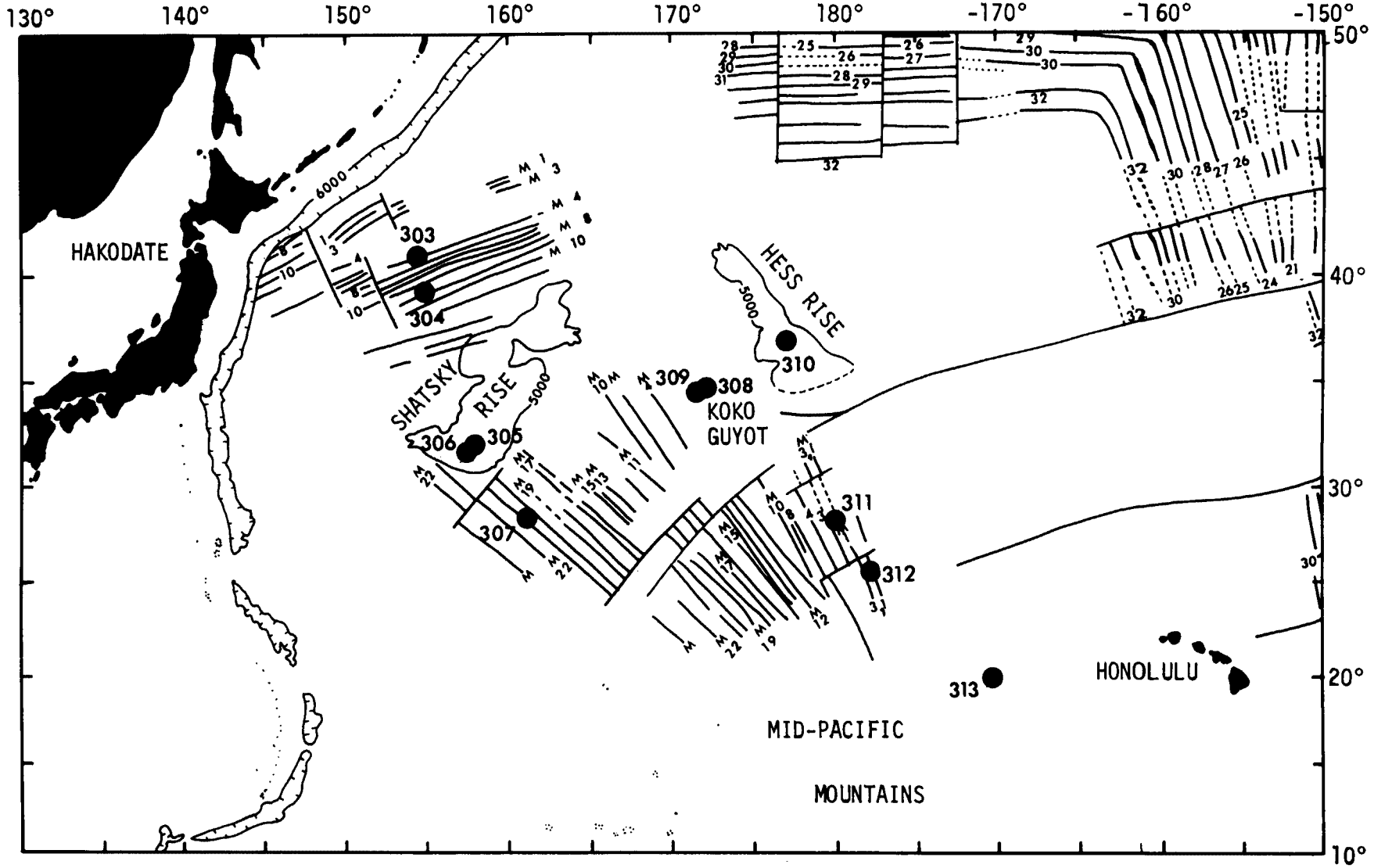


Figure 1. Location of Drill Sites, Leg 32, DSDP

EXPLANATORY NOTES

Numbering and Depth Conventions

A site number refers to a single hole or group of holes drilled in essentially the same position using the same acoustic beacon. The first hole at a site is given the number of the site. Second or subsequent holes drilled after withdrawing from the first hole and redrilling were labeled "A", "B", etc. holes (e.g. Hole 303A).

A core is taken by dropping a core barrel down the drill string and coring for 9 meters as measured by lowering of the drill string. The sediment is retained in a plastic liner 9.28 meters long inside the core barrel and in a 0.20 meter long core catcher assembly below the liner. The liner is not normally full.

On recovery the liner is cut into sections of 1.5 meters measured from the lowest point of sediment within the liner. In general the top of the core does not coincide with the top of a section. The sections are labeled from 1 for the top (incomplete) section to a figure as high as 6 for the bottom (complete) section, depending on the total length of core recovered.

By convention, when partial recovery results, the recovered sediment is assumed to represent the top of the cored sequence. The core catcher represents sediment immediately below the lowest section.

An example of accepted convention for a sample number is "32-310-3-1 (10-20 cm)." The sample represents the interval between 10 and 20 centimeters in Section 1 of Core 3, Site 310, Leg 32.

Handling of Cores

After a core section has been cut, sealed, and labeled, it is brought into the core laboratory for processing. The routine procedure listed below was usually followed:

1) GRAPE analysis for bulk density and porosity.
2) Sonic velocity determination, on selected portions of the core, using a Hamilton Frame.

After the physical measurements are made, the core is cut. One of the split halves is designated a working half. Samples, including those for grain size, X-ray mineralogy, water content, and carbon-carbonate are taken. Larger samples are taken from suitable cores for inorganic and organic geochemical analysis. These samples are generally taken before the core is split.

The working half is then sent to the paleontology laboratory. There, samples for shipboard and shorebased studies of nannoplankton, foraminifera, radiolarians, diatoms, and silicoflagellates or other paleontological studies are taken.

The other half of a split section is designated an archive half. The color, texture, structure, and composition of the various lithologic units within a section are described on standard visual core description sheets (one per section) and any unusual features noted. A smear slide is made, usually at 75 cm if the core was uniform. Otherwise, two or more smear slides are made, each for a sediment of distinct lithology. The smear slides are examined microscopically. The archive half of the core section is then photographed. Both halves are sent to cold storage on board after they had been processed.

All samples are now deposited in cold storage at the DSDP West Coast Repository at Scripps Institution of Oceanography, La Jolla, California and are available to investigators.

Sediment Analyses

Carbon-Carbonate

Sediment samples are analyzed on a Leco 70-Second Analyzer following procedures outlined in Volumes 9 and 18 of the Initial Reports of the Deep Sea Drilling Project. Accuracy and precision of the results are as follows:

Total carbon	±0.3% (absolute)
Organic carbon	±0.06% (absolute)
$CaCO_3$	±3% (absolute)

X-ray Mineralogy

Semiquantitative determinations of the mineral composition in bulk samples, 2 to 20μ, and <2μ fractions is performed according to the methods described in the reports of Legs 1 and 2 and in Appendix III of Volume IV, Initial Reports of the Deep Sea Drilling Project. The mineral analyses of the 2 to 20μ and <2μ fractions are performed on $CaCO_3$-free residues.

The bulk sample analyses are reported and shown on the core forms using a ranked, semiqualitative scale as outlined below:

Trace - (TR)	(<5%); diffraction pattern is weak and identification is made on the basis of two major diagnostic peaks.

Present - (P)	(5-25%); a number of peaks of the mineral are visible in the diffraction pattern.
Abundant - (A)	(25-65%); diffraction peaks of the mineral are prominent in the total diffraction pattern, but the peaks of other minerals are of an equivalent intensity.
Major - (M)	(>65%); the diffraction peaks of the mineral dominate the diffraction pattern.

The mineral concentrations are reported as a percentage of the identified crystalline phases, but the percentage of amorphous material for each analysis is also given. The total mineral phases represent (100-amorphous) of the bulk sample. Consequently, a value of 50 percent quartz refers not to 50 percent of the bulk sample but rather to 50 percent of the identified mineral phases present in the bulk sample.

Grain Size

Sand-silt-clay distribution is determined on 10 cc sediment samples collected at the time the cores were split and described.

The sediment classification used here is that of Shepard (1954) with the sand, silt, and clay boundaries based on the Wentworth (1922) scale. Thus the sand, silt, and clay fractions are composed of particles whose diameters range from 2000 to 62.5 microns, 62.5 to 3.91 microns, and less than 3.91 microns, respectively.

Standard sieve and pipette methods were used to determine the

grain size distribution. The sand-size fraction was removed by wet sieving using 63-micron sieve, and the silt and clay fractions were analyzed by standard pipette analysis. Sampling depths and volumes were calculated using equations derived from Stokes setling velocity equation (Krumbein and Pettijohn, 1938, 95-96).

Sediment Classification

The sediment classification used on Leg 32 is outlined below following the DSDP Classification and Nomenclature Rules. The sediment was examined on a smear slide and placed in one of the catagories.

CLASSIFICATION AND NOMENCLATURE RULES

I. Rules for class limits and sequential listing of constituents in a sediment name.

A. Major constituents

1. Sediment assumes name of those constituents present in major amounts (major defined as >25%). See example in rule 1A3.
2. Where more than one major constituent is present, the one in greatest abundance is listed farthest to the right. In order of decreasing abundance, the remaining major constituents are listed progressively farther to the left.
3. Class limits when two or more major constituents are present in a sediment are based on percentage intervals, thusly: 0-5, 5-25, 25-75, 75-100.
   Example illustrating rules 1A and 1B and the resulting sediment names:

%Clay	%Nannos		
0- 25	75-100	=	Nanno ooze
25- 75	25- 75	=	Clay bearing nanno ooze
75- 95	5- 25	=	Nanno bearing clay
95-100	0- 5	=	Clay

B. Minor constituents

At the discretion of the geologist, constituents present in amounts of 5-25% may be prefixed on the sediment name by the term - bearing.
Example: 50% nannofossils, 30% radiolarians, 20% zeolites would be called a zeolite-bearing rad nanno ooze.

II. Specific rules for calcareous and siliceous tests.

A. Nannofossil is applied only to the calcareous tests of coccolithophorids, discoasters, etc.

B. The term calcareous or siliceous, depending on skeletal composition is applied where no attempt is made to distinguish fossils as to major subgroup. Thus, if no percent estimate is made, a mixture of radiolarians, daitoms, and silicoflagellates would be called siliceous ooze. Where this distinction is made, the appropriate fossil name is used.

C. Fossil tests are not qualified by a textural term unless very obviously redeposited.

D. Abbreviations, as nanno for nannofossil, rad for radiolarian, etc., may be used in the sediment name.

E. The term ooze follows a microfossil taxonomic group whenever it is the dominant sediment constituent.

F. Usage of the terms marl and chalk to designate amounts of microfossils, 30-60% and >60% respectively, as sued by Olausson (1960) and others, is dropped. The term chalk is retained to designate a compacted calcareous ooze.

III. Clastic sediments

A. Clastic constituents, whether detrital, volcanic, biogenous or authigenic, are given a textural designation. When detrital[1] grains are the sole clastic constituents of a sediment, a simple textural term suffices for its name. The textural term can be preceded by a mineralogical term when this seems warranted. Such mineralogical terms are applied as per rules 1A and B.

B. Clastic volcanics

Redeposited pyroclastics also become a clastic component. They are again recognized by the term volcanic and receive a textural term such as gravel, sand, silt, etc. It is particularly difficult at times to differentiate between volcanic sand (i.e., transported by tractive mechanisms) and crystal ash (i.e., direct outfall resulting from explosion of a volcano).

C. Clastic authigenic constituents

Where authigenic minerals are recognized as being a redeposited constituent, they are given a textural designation in addition to their mineral names.

IV. Volcanic and authigenic constituents

A. Volcanic constituents

Pyroclastics are given textural designations already established in the literature. Thus, volcanic breccia = >32 mm, volcanic lapilli = <32 mm to >4 mm, and volcanic ash = <4 mm. It is at times useful to further refine the textural designations by using such modifiers as coarse or fine. An ash wholly, or almost wholly, of glass shards is termed vitric ash.

---

[1] Detrital = all clastic grains derived from the erosion of preexisting rocks except for those of biogenous, authigenic, or volcanic origin.

B. Authigenic constituents
   1. Authigenic minerals enter the sediment name in a fashion similar to that outlined under rules 1A and B. Normally, as with a fossil biocoenosis, the authigenic minerals are not given a textural designation and texture.
   2. The terms ooze and chalk are applied to carbonate minerals of all types using the same rules that apply to biogenous constituents.

V. Color
   A. Color is not formally part of the sediment name. However, its employment for sediment description is important particularly as it provides one of the criteria used to distinguish pelagic and terrigenous sediments.
   B. Common usage dictates that it is no longer expedient to employ the term red for sediments (usually pelagic) which are various shades of red, yellow, and brown. The proper color designation should be used.

Additional descriptions were used following the criteria of:

Description	Percentage of Component
none	1- 5%
diatom - bearing nanno - bearing foram - bearing Rad - bearing	5-25%
diatom - ooze nanno - ooze foram - ooze Rad - ooze	25-75%
diatom ooze nannofossil ooze foram ooze Rad ooze	>75%

The lithologic symbols used in the core forms are shown in Figure 2.

Shipboard Mineralogic-Lithologic Determination

Smear Slides

Smear slides are the basic means of mineral identification on shipboard. The shipboard party tried to be as specific as possible with regard to mineral identifications.

Smear slide estimates of mineral abundances were based on area of the smear slide covered by each component. Quantification was assigned using the following criteria:

1- 5% Rare (R)

5-25% Common (C)

25-75% Abundant (A)

>75% Dominant (D)

Specific mineral identifcation and quantification was attempted for sands, but for silts and clays, only the textural categories were really quantified.

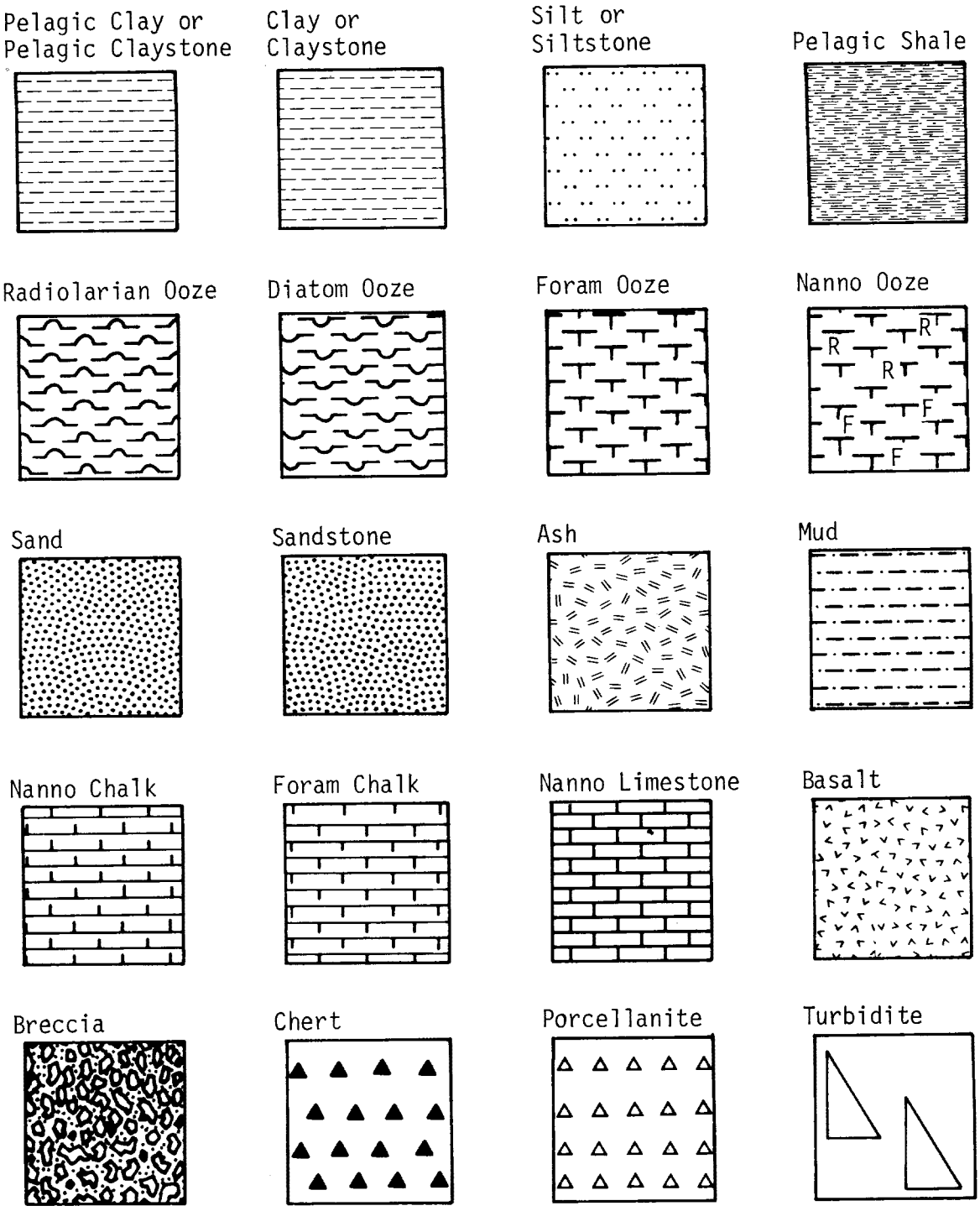
Core Forms

The basic lithologic data are contained on core summary forms in both symbolic (Fig. 2) and descriptive form. As far as possible the data are presented in the following order:

Sediment name

Color name and Munsell or GSA number

The reader is advised that colors recorded in core barrel summaries were determined during shipboard examination



R = Rads
D = Diatoms
F = Forams
Z = Zeolites
Fe = Ferruginous
V = Volcanic
C = Clay

FIGURE 2 LITHOLOGIC SYMBOLS

immediately after splitting core sections. Experience with carbonate sediments shows that many of the colors will fade or disappear with time after opening and storage. Colors particularly susceptible to rapid fading are purple, light and medium tints of blue, light bluish gray, dark greenish black, light tints of green, and pale tints of orange. These colors change to white or yellowish white or pale tan.

Composition

Structure(s)

X-ray, grain size, and carbon-carbonate data

Many cores contain important minor lithologies as well as a basic lithology. The description of the basic lithology is so indicated in most cases, however, descriptive information for minor lithologies is included wherever possible. X-ray data are those generated by the DSDP X-ray mineralogy laboratory at the University of California, Riverside. Grain size and carbon-carbonate results are from the DSDP laboratory at Scripps unless otherwise noted.

A sample core form precedes the site-by-site presentation of the cores (Fig. 3). This sample core form contains all legend and explanatory notes for understanding of the core forms.

Drilling Deformation

Four degrees of drilling deformation were recognized and are noted by symbols on the sample core form. Slightly deformed cores exhibit a slight bending of bedding contacts; extreme bending defines moderate deformation. In highly deformed cores, injected bedding planes may approach the vertical. In extreme cases, bedding may be

completely disrupted to produce a "drilling breccia." Watery intervals generally have lost any bedding characteristics originally available.

Downhole Contamination

Downhole contamination is a serious problem. Hared objects (manganese nodules, chert, lithic fragments, and pebbles) are often washed or dragged hundreds of meters downhole. They commonly are lodged in the top of cores or will become incorporated into the middle of cores at levels far below their proper stratigraphic position. Displaced manganese nodules can usually be recognized. However, displaced chert, lithic fragments, and pebbles are more difficult to recognize. This information is recorded on the core forms.

BIOSTRATIGRAPHY

The biostratigraphic studies of Leg 32 cores are still in progress so those included in this report are tentative. Ages and biostratigraphic boundaries have generally been assigned following the references below.

Calcareous Nannofossils: Bukry (1973) and Bukry (in press)

Radiolaria: Riedel and Sanfilippo (1971)

Foraminifera: Blow (1969)

sample-distribution policy

Distribution of Deep Sea Drilling samples will be undertaken in order to (1) provide supplementary data for inclusion in the appropriate Initial Report to support *Glomar Challenger* scientists in achieving the scientific objectives of their particular cruise, and (2) provide individual investigators with material to conduct detailed studies beyond the scope of the Initial Reports.

The National Science Foundation has established a Sample Distribution Panel to advise on distribution of core material. This panel is chosen in accordance with usual Foundation practices, in a manner that will assure advice in the various disciplines leading to a complete and adequate study of the core and related materials. Funding for the proposed research is handled separately by the investigator, not through the Deep Sea Drilling Project.

Distribution of samples for contributions to Initial Reports

Any investigator who wishes to contribute a paper to a given volume of the Initial Reports may write to the Curator, Deep Sea Drilling Project, Scripps Institution of Oceanography, University of California at San Diego, La Jolla, 92037, requesting samples from a forthcoming cruise. The request should include the nature of the study, and type, size, number of samples, particular sampling techniques or equipment that might be required, and an estimate of the time required to complete the study. The requests will be reviewed by shipboard scientists, and, if they are deemed suitable and pertinent to the objectives of the leg, and shipboard workload permits, the requested samples will be taken during the cruise (provided, of course, material suitable to the investigation is obtained during the drilling). In the case of multiple requests to perform the same investigation, selection of investigator will be made by the shipboard scientific party.

Proposals should be of a scope appropriate to complete the sampling and study in time for publication in the Initial Reports. Studies deemed acceptable will be referred to the Curator who will, with the consent of the NSF Sample Distribution Panel, authorize distribution of the samples. The Sample Distribution Panel and the Deep Sea Drilling Project will strive to ensure a reasonable degree of continuity in the investigations among the various cruises, that the studies are pertinent to goals of the cruise, and that they are consistent with the publication policy for the Initial Reports. Subject to these same provisions, the shipboard scientific party may elect to have special studies of selected core samples of its recently completed cruise made by other investigators.

Investigations not completed in time for inclusion in the Initial Report may not be published in other journals until publication of the Initial Report for which it was intended.

Distribution of samples for publication other than in Initial Reports

1. Researchers intending to request samples for studies beyond the scope of the Initial Reports should first obtain a sample request form from the Curator. Requests should specify the quantities and intervals of the core required, a statement of the proposed research, the possibility of returning residue to the Curator, the estimated time required to complete and publish the results, and the availability or need of funding and availability of equipment and space foreseen for the research.

In order to ensure that requests for highly desirable but limited samples can all be considered, approval of requests and distribution of samples will not be made prior to 12 months after date of completion of the cruise that collected the cores. Prior to publication of an Initial Report, requests for samples from a cruise can be based on the preliminary shipboard core logs. Copies of these logs will be kept on open file at Scripps and other designated institutions. The only exceptions will be for specific instances involving ephemeral properties.

Requests for samples from researchers in industrial laboratories will be handled in the same manner as those from academic organizations, and there will be the same obligation to publish results promptly. Requests from foreign scientists or organizations will also be considered.

2. The Curator has the responsibility for distributing samples, controlling quality of samples, and preserving core material. He also has the responsibility for maintaining a record of requests for samples that have been processed and filled indicating the investigator and subjects to be studied. This record will be available to investigators.

The distribution of samples will be made directly from the two repositories at Lamont-Doherty Geological Observatory and Scripps by the Curator or his designated representative.

3. (a) Samples up to 10 cc/m of core length can be automatically distributed by the Curator, Deep Sea Drilling Project or his authorized representative to any qualified investigator who requests them. The Curator will refrain from making automatic distribution of any parts of the cores which appear to be in particularly high demand, and any requests for these parts of the cores will be referred to the Sample Distribution Panel for review. Requests for samples from thin layers or important stratigraphic boundaries will generally require Panel review.

(b) All requests for samples in excess of 3(a) above will be referred to the Sample Distribution Panel.

(c) If, in the opinion of scientific investigators, certain properties they wish to study may deteriorate prior to the normal availability of the samples, such investigators may request that the normal waiting period not apply. All such requests must be approved by the Sample Distribution Panel.

4. 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 1). If a sample request is dependent, either wholly or in part, on proposed funding, the Curator will provide to the organization to whom the funding proposal has been submitted any information on the availability (or potential availability) of samples that it may request.

5. Investigators receiving samples are responsible for:

i) promptly publishing significant results.

ii) acknowledging, in publications, that samples were supplied through the assistance of the National Science Foundation.

iii) submitting 4 copies of all reprints of published results to the Curator.

iv) notifying the Curator of any work done on the samples that is additional to that stated in the original request for samples.

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

6. Cores will be made available at repositories for investigators to examine and specify exact samples in such instances as this may be necessary for the scientific purposes of the sampling, subject to the limitations of 3 (a), (b), (c), and 5, above, and with the specific permission of the Curator or his delegate.

7. Cores of igneous and metamorphic rocks will also remain at the repositories where they will be available for observation and description and where selected samples may be taken for thin-section preparation and other work.

8. The Deep Sea Drilling Project routinely processes by computer most of the quantitative data presented in the Initial Reports. Space limits in the Initial Reports preclude 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.

Magnetics, seismic-reflection and bathymetric data collected under way by the *Glomar Challenger* will also be available for distribution 12 months after completion of the cruise.

Requests for these data may be made to the Chief Scientific Editor of the Deep Sea Drilling Project, at Scripps.

A charge will be made to recover the expenses of responding to individual requests. Estimated charges can be furnished before the request is processed, if required.

9. This policy has the approval of the National Science Foundation and is designed to help ensure that the greatest possible scientific benefit is gained from the materials obtained, and that samples will be made widely available to interested geologists.

(Slightly condensed from the official sample distribution policy of the Deep Sea Drilling Project.)

REFERENCES

Blow, W. H., 1969. Late middle Eocene to Recent planktonic foraminiferal biostratigraphy: Int. Conf. Plankt. Microfossils, 1st, Proc. Brönnimann, P. and Renz, H. H. (Eds.), Leiden (Brill), v. 1, p. 199-422.

Bukry, D., 1973. Coccolith stratigraphy, eastern equatorial Pacific, Leg 16 DSDP, in van Andel, T. H., Heath, G. R., et al., Initial Reports DSDP v. 16, Washington (U. S. Government Printing Office) p. 653-711.

Bukry, D., in press. Cretaceous and Paleogene coccolith stratigraphy, DSDP Leg 26, in Davies, T. A., Luyendyk, B. P., et al., Initial Reports DSDP v. 26, Washington (U. S. Government Printing Office).

Krumbein, W. C. and Pettijohn, F. J., 1938. Manual of sedimentary petrology: Appleton-Century, New York.

Riedel, W. R. and Sanfilippo, A., 1971. Cenozoic Radiolaria from the western tropical Pacific, Leg 7, in Winterer, E. L., Ewing, J. I., et al., Initial Reports DSDP v. 7, pt. 2, Washington (U. S. Government Printing Office) p. 1529-1672.

Shepard, F. P., 1954. Nomenclature based on sand-silt-clay ratios: J. Sed. Petrol., v. 24, (3), p. 151-158.

Wentworth, C. K., 1922. A scale of grade and class terms of clastic sediments: J. Geol., v. 30, p. 377.

Site Hole Core Cored Interval:

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
	NANNOFOSSIL ZONES FORAMINIFERA ZONES RADIOLARIA ZONES	D=diatom, F=foraminifera, N=nannofossil, R=radiolaria, S=Silicoflagellate	A=abundant, C=common, F=rare, T=trace, O=omitted	G=good, M=moderate, P=poor	0 1 2 3 4 5 6 Core Catcher	0.5 1.0	The lithology symbols are only to indicate the sediment types present and do not indicate relative amounts of each type.	— — — moderate disturbance, ~~~~~~~ severe disturbance bx=drilling breccia, VOID=no material recovered	*Smear Slide depth in centimeters within the section C=chemistry, TS=thin section

LITHOLOGIC DESCRIPTION

GENERAL CODE FOR LITHOLOGIC DESCRIPTIONS

Description of major and minor (if any) lithologies, color, deformation, and characteristics.

SMEAR SLIDE - section, depth in section
Abundances are qualitative follow the general scheme:

D = >75%
A = 25-75%
C = 5-25%
R = 1- 5%

GRAIN SIZE
Section-depth in section (Sand-Silt-Clay) name

CARBON-CARBONATE
Section-depth in section (total carbon-organic carbon-$CaCO_3$)

X-RAY section-depth in section
Percentage of the crystalline phases represent percentage of (100-Amorphous) value. The amorphous value is the percentage of unidentified material in bulk sample.

TEXTURE
Qualitative estimate of (sand-silt-clay) derived from smear slide examination only.

Explanatory notes in Chapter 1

Figure 3. Sample Core Form and Legends.

DEEP SEA DRILLING PROJECT

LEG 32 SITE 303

SITE SUMMARY SHEET

POSITION: Latitude: 40°48.50'N Longitude: 154°27.07'E

Water depth: 5609 corrected meters (echo sounding)

Bottom felt at: 5625 meters (drill pipe) Penetration: 293 meters

Number of Holes: 2 Number of Cores: 16

Total length of cored section: 136.0 m Total core recovered: 31.7 m

Percentage of core recovery: 23.3%

OLDEST SEDIMENT CORED:

Depth below sea floor: 284.75 meters Nature: Chert and nanno ooze

Age: Aptian to Barremian/Hauterivian Measured Velocity: Recovery too fragmentary

BASEMENT:

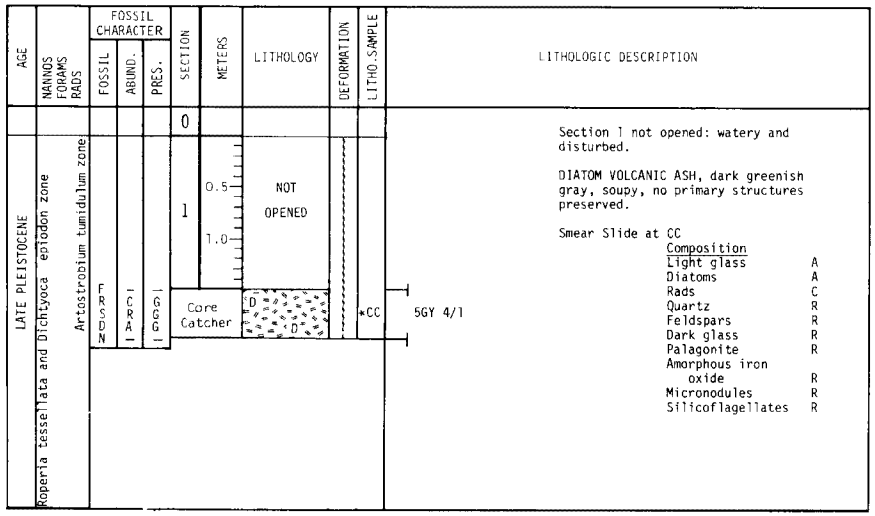
Depth below sea floor: 286 meters (drilled) Nature: Basalt

Velocity of basement: 4.5 km/sec

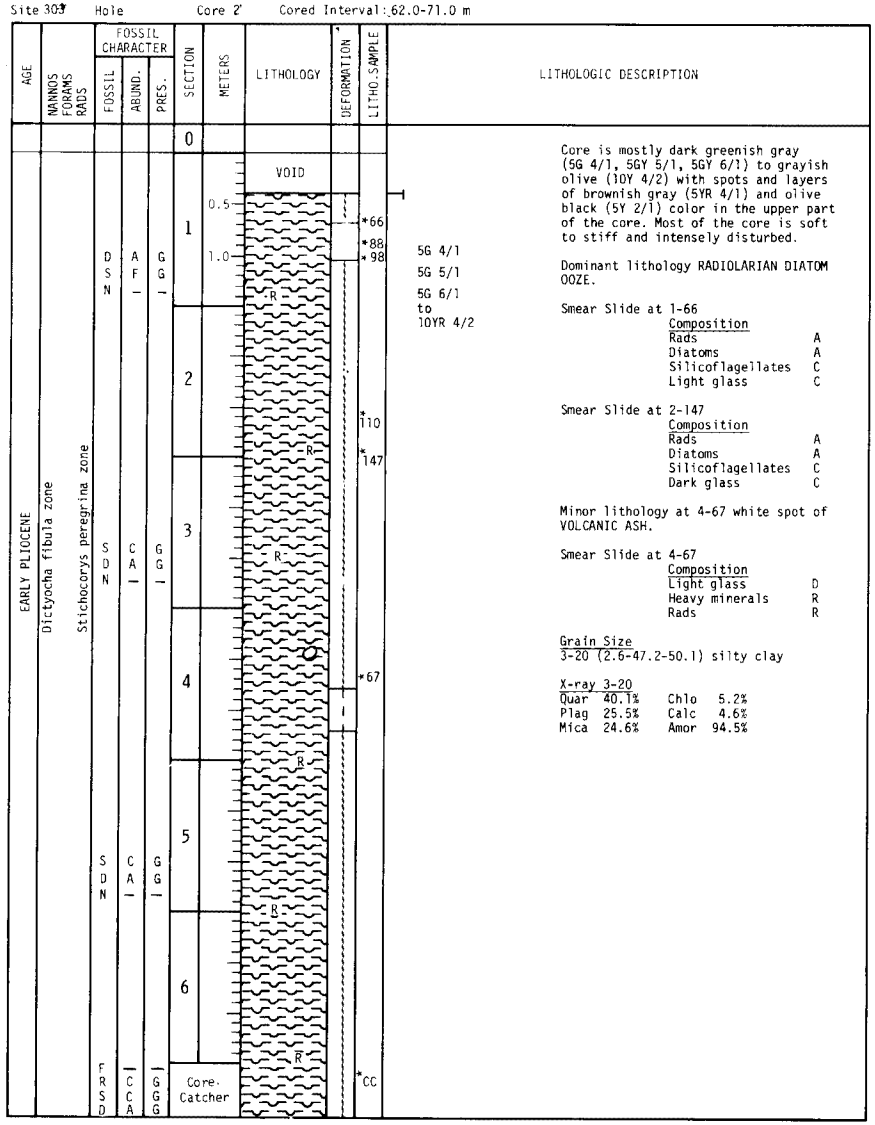
PRINCIPAL RESULTS:

Establishment of an Aptian to Barremian/Hauterivian age of anomaly M-4 confirmation of correlation between Japanese and Phoenix magnetic lineations. Compressed (less than 30 m), possibly absent, Paleogene-Upper Cretaceous section.

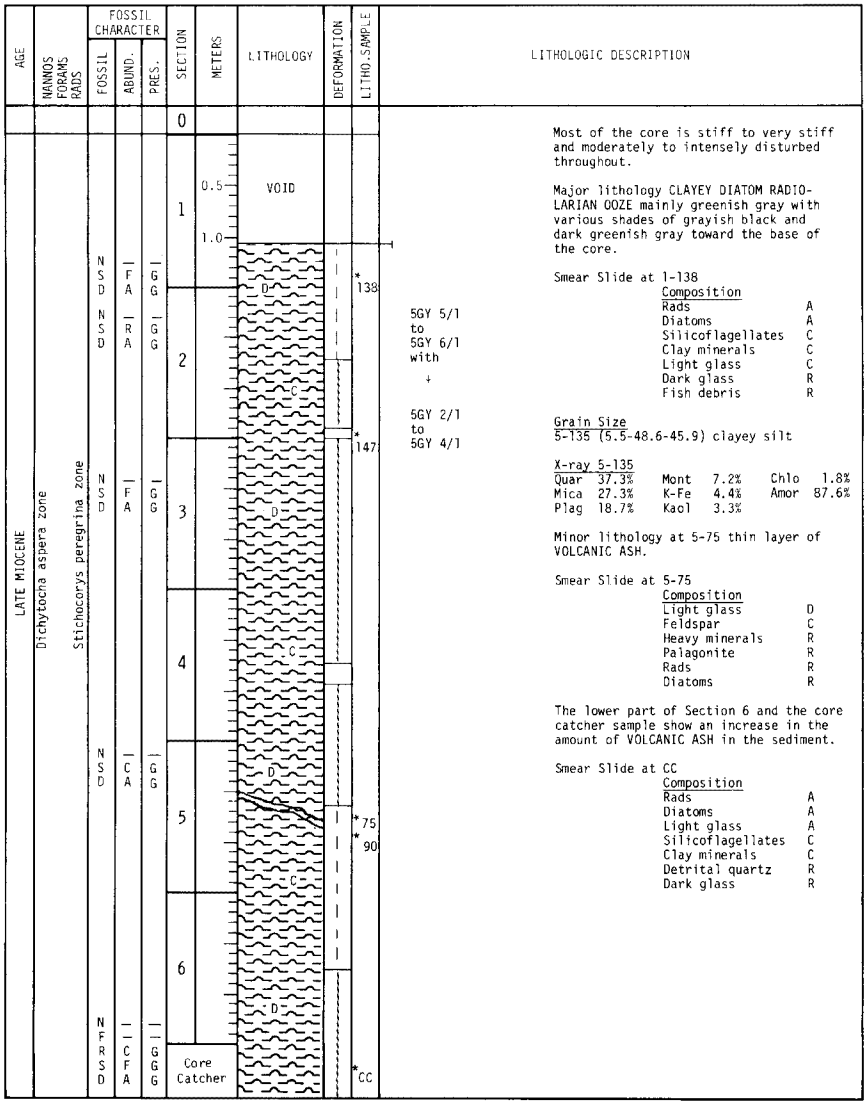
Site 303 Hole Core 1 Cored Interval: 0.0-12.0 m



Site 303 Hole Core 2 Cored Interval: 62.0-71.0 m



Site 303 Hole Core 3 Cored Interval: 117.0-126.0 m



Most of the core is stiff to very stiff and moderately to intensely disturbed throughout.

Major lithology CLAYEY DIATOM RADIOLARIAN OOZE mainly greenish gray with various shades of grayish black and dark greenish gray toward the base of the core.

Smear Slide at 1-138

Composition	
Rads	A
Diatoms	A
Silicoflagellates	C
Clay minerals	C
Light glass	C
Dark glass	R
Fish debris	R

Grain Size
5-135 (5.5-48.6-45.9) clayey silt

X-ray 5-135

Quar	37.3%	Mont	7.2%	Chlo	1.8%
Mica	27.3%	K-Fe	4.4%	Amor	87.6%
Plag	18.7%	Kaol	3.3%		

Minor lithology at 5-75 thin layer of VOLCANIC ASH.

Smear Slide at 5-75

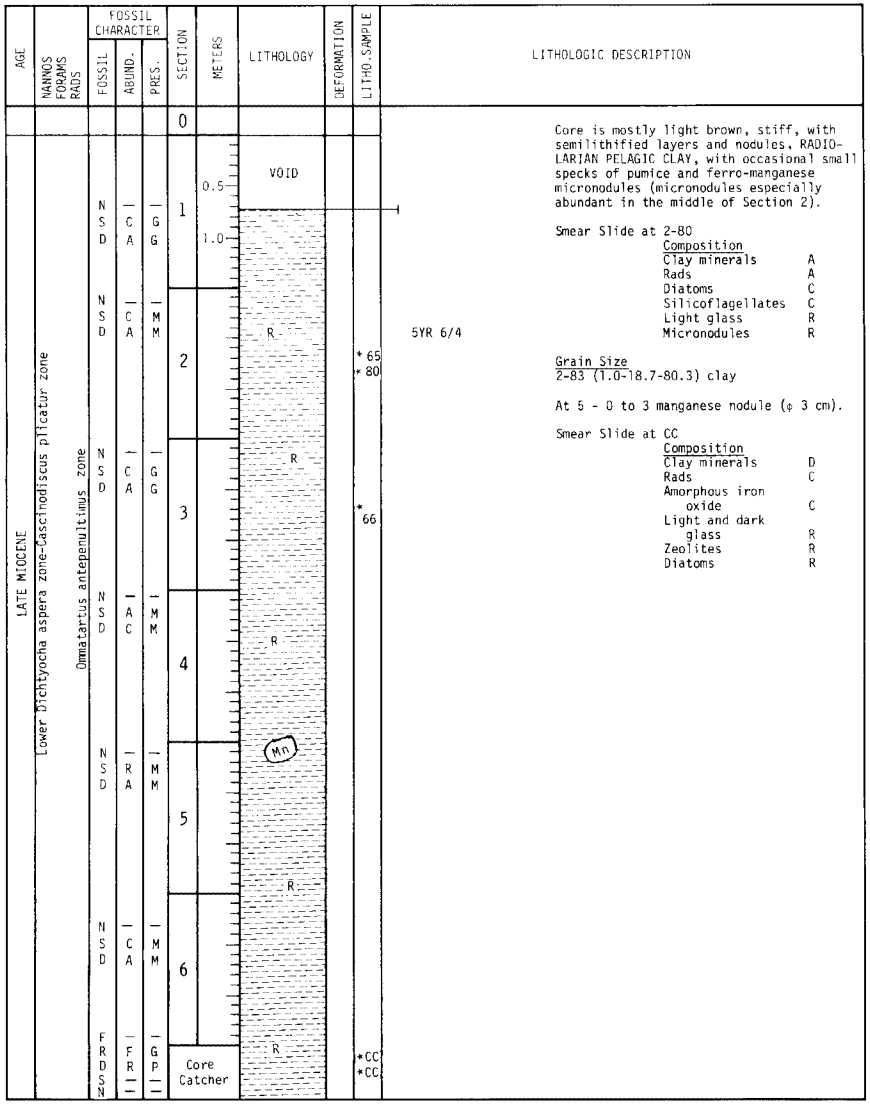
Composition	
Light glass	D
Feldspar	C
Heavy minerals	R
Palagonite	R
Rads	R
Diatoms	R

The lower part of Section 6 and the core catcher sample show an increase in the amount of VOLCANIC ASH in the sediment.

Smear Slide at CC

Composition	
Rads	A
Diatoms	A
Light glass	A
Silicoflagellates	C
Clay minerals	C
Detrital quartz	R
Dark glass	R

Site 303 Hole Core 4 Cored Interval: 174.0-183.0 m



Core is mostly light brown, stiff, with semilithified layers and nodules, RADIOLARIAN PELAGIC CLAY, with occasional small specks of pumice and ferro-manganese micronodules (micronodules especially abundant in the middle of Section 2).

Smear Slide at 2-80

Composition	
Clay minerals	A
Rads	A
Diatoms	C
Silicoflagellates	C
Light glass	R
Micronodules	R

Grain Size
2-83 (1.0-18.7-80.3) clay

At 5 - 0 to 3 manganese nodule (φ 3 cm).

Smear Slide at CC

Composition	
Clay minerals	D
Rads	C
Amorphous iron oxide	C
Light and dark glass	R
Zeolites	R
Diatoms	R

Site 303 Hole Core 5 Cored Interval: 211.0-220.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
TURONIAN TO CENOMANIAN	Dictyomitra somphedia	R F S D N	A	P	0	Core Catcher			* CC	10YR 2.5/2 ZEOLITIC PELAGIC CLAY and small chips of CHERT. Clay is dusky yellowish brown. Chert is brown to light tan. Smear Slide at CC Composition: Clay minerals D; Zeolites C; Amorphous iron oxide C; Micronodules C; Recrystallized silica R; Fish debris R

Site 303 Hole A Core 1 Cored Interval: 211.0-220.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
TURONIAN TO CENOMANIAN	Dictyomitra somphedia	R F S D N	R	P	0	Core Catcher			* CC * CC	10YR 2/2 ZEOLITIC PELAGIC CLAY, predominantly dusky yellowish brown with rare light tan spots and fragments of tan CHERT. Smear Slide at CC Composition: Clay minerals A; Zeolites A; Recrystallized silica C; Rads C; Light glass R; Diatoms R Radiolarian molds are filled with chalcedony.

Site 303 Hole A Core 2 Cored Interval: 220.0-229.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
ALBIAN	Dictyomitra somphedia	R F S D N	F	P	0	Core Catcher			* CC	10YR 2/2 (clay) and 10YR 4/2 to 5YR 5/6 (chert) Banded CHERT, dusky yellowish brown with discontinuous laminae of light brown color, showing microfaulting. Very small amount of brown ZEOLITIC PELAGIC CLAY mixed with the small chert fragments. Smear Slide at CC (in clay) Composition: Clay minerals A; Zeolites A; Recrystallized silica C; Rads C; Light glass R

Site 303 Hole A Core 3 Cored Interval: 229.0-238.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO BARREMIAN	Acaeniotyle umbilicata	R N D S	F	P	0	Core Catcher			* CC	10YR 2/2 to 10YR 4/2 CHERT, dusky yellowish brown and small amounts of brown ZEOLITIC PELAGIC CLAY. Smear Slide at CC (in clay) Composition: Clay minerals A; Zeolites A; Micronodules C; Light glass R; Hematite R

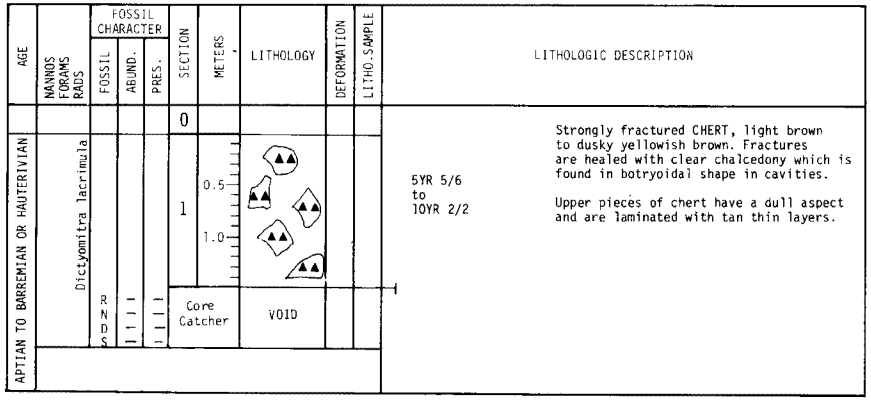
Site 303 Hole A Core 4 Cored Interval: 238.0-247.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO BARREMIAN	Acaeniotyle umbilicata	R N D S	F	P	0	Core Catcher			* CC	10YR 2/2 to 10YR 4/2 CHERT, dusky yellowish brown with small amounts of brown ZEOLITIC PELAGIC CLAY. Smear Slide at CC (in clay) Composition: Clay minerals A; Zeolites A; Amorphous iron oxide C; Micronodules C; Light glass R; Rads R; Fish debris R

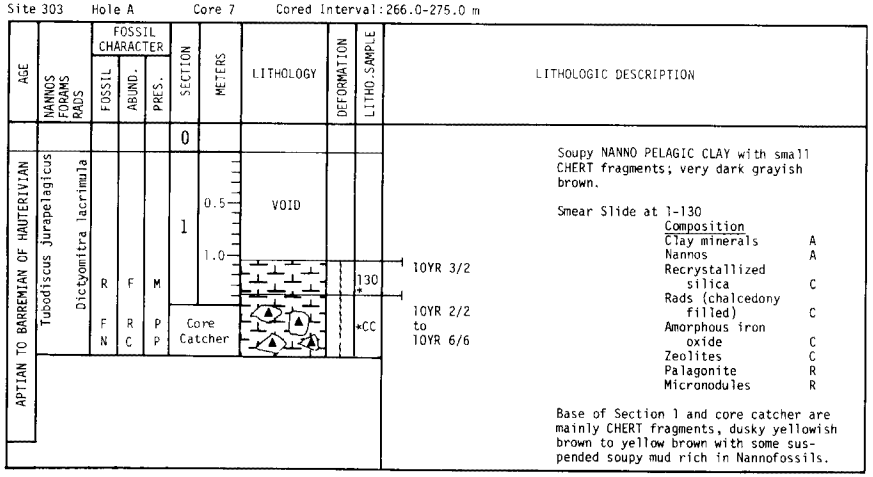
Site 303 Hole A Core 5 Cored Interval: 247.0-257.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO BARREMIAN OR HAUTERIVIAN	Dictyomitra lacrimula	R N D S	F	P	0					
					1	0.5 1.0	VOID		* 120	10YR 2/2 to 5Y 7/3 and 10YR 6/6 Large pieces and small chips of CHERT, dusky yellowish brown to yellowish gray and yellowish brown, sometimes laminated and showing microfaulting, and small amounts of ZEOLITIC PELAGIC CLAY of same colors. Smear Slide at 1-120 (in clay) Composition: Clay minerals A; Zeolites A; Light glass C; Amorphous iron oxide C; Palagonite R; Fish debris R
					2		VOID		* 110	5Y 5/2 and 10YR 6/6 Large pieces of light olive gray and yellowish brown CHERT with thin white layers, and small amounts of PELACIC CLAY of same colors.
					Core Catcher				* CC	Smear Slide at CC (in clay) Composition: Clay minerals A; Zeolites A; Recrystallized silica C; Rads C; Light glass R X-ray 2-118 Mont 31.9% Mica 10.5% Bari 4.4% Clin 26.9% Plag 6.3% Calc 1.7% Quar 13.5% K-Fe 4.8% Amor 77.1%

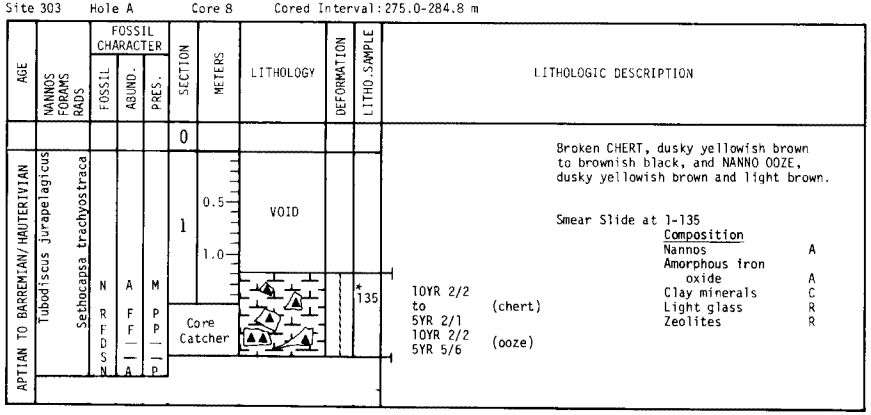
Site 303 Hole A Core 6 Cored Interval: 257.0-266.0 m



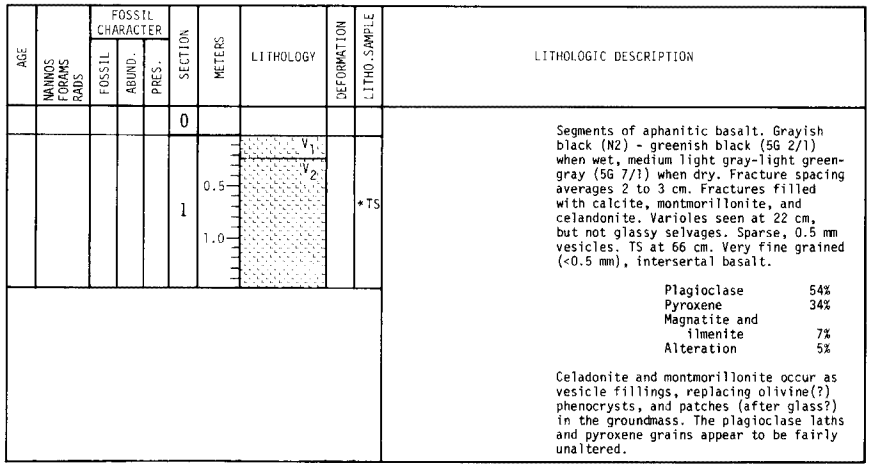
Site 303 Hole A Core 7 Cored Interval: 266.0-275.0 m



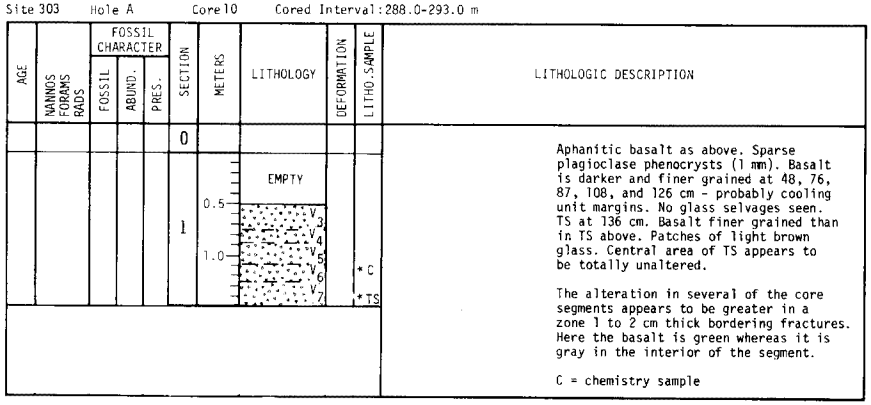
Site 303 Hole A Core 8 Cored Interval: 275.0-284.8 m



Site 303 Hole A Core 9 Cored Interval: 284.8-288.0 m



Site 303 Hole A Core 10 Cored Interval: 288.0-293.0 m



DEEP SEA DRILLING PROJECT

LEG 32 SITE 304

SITE SUMMARY SHEET

POSITION: Latitude: 39°20.27'N Longitude: 155°04.19'E

Water depth: 5630 corrected meters (echo sounding)

Bottom felt at: 5640 meters (drill pipe) Penetration: 347 meters

Number of Holes: 1 Number of Cores: 17

Total length of cored section: 131.0 m Total core recovered: 30.1 m

Percentage of core recovery: 23.0%

OLDEST SEDIMENT CORED:

Depth below sea floor: 333 meters Nature: Nanno ooze and chert

Age: Aptian to Barremian/Valanginian Measured Velocity: Fragmentary recovery

BASEMENT:

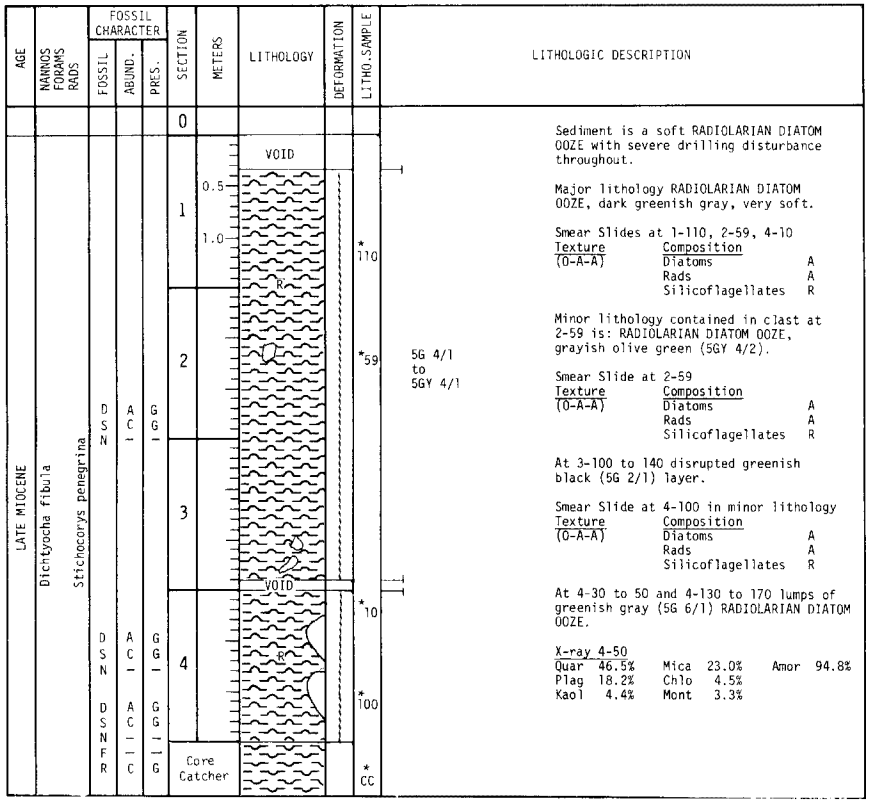
Depth below sea floor: 335 meters (drilled) Nature: Basalt

Velocity of basement: Average 5.6 km/sec

PRINCIPAL RESULTS:

Recovered section generally like Site 303. Aptian to Barremian/Valanginian age of basement, at magnetic anomaly M-9. Further confirmation of correlation between Japanese and Phoenix lineations. There is a suggestion that the basement age at Site 304 is older than at Site 303.

Site 304 Hole Core 1 Cored Interval: 105.5-115.0 m



Sediment is a soft RADIOLARIAN DIATOM OOZE with severe drilling disturbance throughout.

Major lithology RADIOLARIAN DIATOM OOZE, dark greenish gray, very soft.

Smear Slides at 1-110, 2-59, 4-10

Texture	Composition	
(0-A-A)	Diatoms	A
	Rads	A
	Silicoflagellates	R

Minor lithology contained in clast at 2-59 is: RADIOLARIAN DIATOM OOZE, grayish olive green (5GY 4/2).

Smear Slide at 2-59

Texture	Composition	
(0-A-A)	Diatoms	A
	Rads	A
	Silicoflagellates	R

At 3-100 to 140 disrupted greenish black (5G 2/1) layer.

Smear Slide at 4-100 in minor lithology

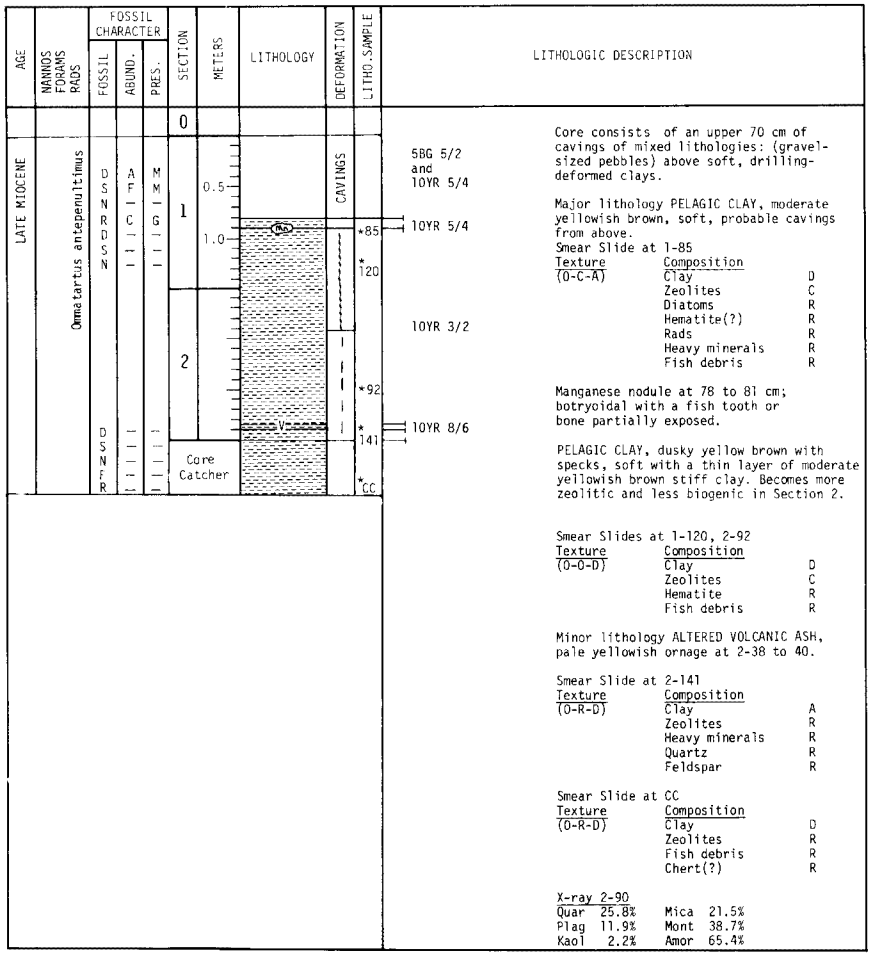
Texture	Composition	
(0-A-A)	Diatoms	A
	Rads	A
	Silicoflagellates	R

At 4-30 to 50 and 4-130 to 170 lumps of greenish gray (5G 6/1) RADIOLARIAN DIATOM OOZE.

X-ray 4-50

Quar	46.5%	Mica	23.0%	Amor	94.8%
Plag	18.2%	Chlo	4.5%		
Kaol	4.4%	Mont	3.3%		

Site 304 Hole Core 2 Cored Interval: 216.0-225.5 m



Core consists of an upper 70 cm of cavings of mixed lithologies: (gravel-sized pebbles) above soft, drilling-deformed clays.

Major lithology PELAGIC CLAY, moderate yellowish brown, soft, probable cavings from above.

Smear Slide at 1-85

Texture	Composition	
(0-C-A)	Clay	D
	Zeolites	C
	Diatoms	R
	Hematite(?)	R
	Rads	R
	Heavy minerals	R
	Fish debris	R

Manganese nodule at 78 to 81 cm; botryoidal with a fish tooth or bone partially exposed.

PELAGIC CLAY, dusky yellow brown with specks, soft with a thin layer of moderate yellowish brown stiff clay. Becomes more zeolitic and less biogenic in Section 2.

Smear Slides at 1-120, 2-92

Texture	Composition	
(0-0-D)	Clay	D
	Zeolites	C
	Hematite	R
	Fish debris	R

Minor lithology ALTERED VOLCANIC ASH, pale yellowish ornage at 2-38 to 40.

Smear Slide at 2-141

Texture	Composition	
(0-R-D)	Clay	A
	Zeolites	R
	Heavy minerals	R
	Quartz	R
	Feldspar	R

Smear Slide at CC

Texture	Composition	
(0-R-D)	Clay	D
	Zeolites	R
	Fish debris	R
	Chert(?)	R

X-ray 2-90

Quar	25.8%	Mica	21.5%
Plag	11.9%	Mont	38.7%
Kaol	2.2%	Amor	65.4%

Site 304 Hole Core 3 Cored Interval: 235.0-244.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
CENOMANIAN TO ALBIAN	Dictyomitra somphedia		D S N R	— — — C	0				
					1	0.5 1.0		bx	
					2		VOID		
								bx	
					3		VOID		
								bx	
					4		VOID		
								bx	
					5		VOID		
								bx	
					6		VOID		
								bx	
					Core Catcher		VOID		* CC

LITHOLOGIC DESCRIPTION

The whole core (except core catcher) consists of drilling breccia with large void spaces.

The drilling breccia is a mixture of soupy lumps of ZEOLITIC PELAGIC CLAY, dark yellowish brown (10YR 4/2) and small amounts of PELAGIC CLAY, moderate yellowish brown (10YR 5/4), soupy.

Core catcher sample is a mixture of the above ZEOLITIC PELAGIC CLAY with CHERT (5YR 2/2) with small layer and streaks of moderate brown (5YR 4/4).

Smear Slide at CC

Texture (O-A-A)	Composition	
	Zeolites	A
	Clay	A
	Fish debris	R
	Hematite(?)	R

Zeolite is clinoptilolite.

Site 304 Hole Core 4 Cored Interval: 244.0-253.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
CENOMANIAN TO ALBIAN	Acaeniotyle umbilicata	R	C	M	0				
					Core Catcher				

LITHOLOGIC DESCRIPTION

CHERT, dominantly grayish brown (5YR 3/2). One piece is dark yellowish orange (10YR 6/6), brecciated, with clear quartz or chalcedony void-fillings, and a white coating.

Site 304 Hole Core 5 Cored Interval: 253.0-262.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
APTIAN TO BARREMIAN	Acaeniotyle umbilicata	R	F	P	0				
		R	C	P	1	0.5 1.0			

LITHOLOGIC DESCRIPTION

CHERT (8 pieces)

7 pieces dusky brown (5YR 2/2) with thin layers of moderate brown (5YR 4/4) to light brown (5YR 5/6).

1 piece light brown (5YR 5/6) to moderate brown (5YR 4/4).

Site 304 Hole Core 6 Cored Interval: 262.5-271.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
APTIAN TO BARREMIAN	Acaeniotyle umbilicata	D S N R	F	P	0				
					Core Catcher				

LITHOLOGIC DESCRIPTION

1 piece CHERT, dusky brown (5YR 2/2).

Site 304 Hole Core 7 Cored Interval: 271.5-281.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO BARREMIAN	Dictyomitra (?) lacrimula				0					10 pieces of CHERT CHERT, predominately grayish brown (5YR 3/2) to dusky brown (5YR 2/2) with a few thin layers of grayish orange (10YR 7/4) to moderate yellowish brown (10YR 5/4).
					1	0.5 1.0				

Site 304 Hole Core 8 Cored Interval: 281.0-290.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO VALANGINIAN	Dictyomitra (?) lacrimula	R D S N F R	C — — — — C	M — — — — P	0					Major lithology CHERT, light brown (5YR 5/6) with spots of moderate reddish brown (10R 4/6) - 2 pieces. Other chert pieces are moderate brown (5YR 4/4 to 5YR 3/4) with some pieces moderate reddish brown (10YR 4/6) with white inclusions having silicified rim. CHERT piece at 1-120 to 135 interval has coating of ZEOLITIC PELAGIC CLAY, moderate brown (5YR 5/4). Minor lithology at 1-120 to 132 ZEOLITIC PELAGIC CLAYSTONE, moderate brown (5YR 5/4), very thinly laminated, partly silicified, indications of manganese on bedding planes.
					1	0.5 1.0	VOID		* 125	5YR 5/4
					Core Catcher				* CC	

Smear Slide at 1-125

Texture (0-C-D)	Composition	
	Zeolites	C
	Chert fragments	C
	Clay	C
	Rad fragments	C
	Volcanic glass	R
	Fish debris	R

Smear Slide at CC

Texture (R-A-D)	Composition	
	Chert fragments	A
	Clay	C
	Recrystallized Rads	R

Explanatory notes in Chapter 1

Site 304 Hole Core 9 Cored Interval: 290.0-299.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO VALANGINIAN	Dictyomitra (?) lacrimula				0					10 YR 5/4 10 YR 3/2
		R	C	G	1	0.5 1.0			* 115	
		R	C	M	Core Catcher					

General lithology is a mixture of pelagic claystone/pelagic clay and chert fragments.

PELAGIC CLAYSTONE/PELAGIC CLAY, moderate yellowish brown (10YR 5/4) to dusky yellowish brown (10YR 3/2), slightly lithified, porous, dendritic manganese on broken surface at 140 cm.

Smear Slide at 1-115

Texture (0-0-D)	Composition	
	Clay	D
	Rads	R
	Fish debris	R

CHERT, light brown (5YR 5/6) with very pale orange (10YR 8/2) partly silicified rim and also dusky brown (5YR 2/2) and moderate brown (5YR 3/4).

Site 304 Hole Core 10 Cored Interval: 299.5-308.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO VALANGINIAN					0					Four pieces of chert. CHERT, dusky brown (5YR 2/2) to grayish brown (5YR 3/2) with rare inclusions of moderate brown (5YR 4/4) to light brown (5YR 5/6) and rare rims and inclusions of very pale orange (10YR 8/2) material.
		R	F	P	1	0.5 1.0				

Site 304 Hole Core 11 Cored Interval: 308.5-318.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO VALANGINIAN					0					12 pieces of chert CHERT, moderate brown (5YR 4/4) and dusky brown (5YR 2/2). One piece has an inclusion of semi-lithified clay of light brown (5YR 5/6) color.
		R	F	P	1	0.5 1.0				

Explanatory notes in Chapter 1

Site 304 Hole Core 12 Cored Interval: 318.0-327.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					Nine pieces of chert with smears of nanno ooze on surfaces.
		R N N	R A C	P M P	1	0.5 1.0	▲▲▲ ▲▲▲▲▲▲		* 123	CHERT, dusky brown (5YR 2/2) to dusky yellowish brown (10YR 2/2) with rare small inclusions of moderate brown (5YR 4/4). Smear of nanno ooze scraped off of chert fragment. Texture (O-R-D): Nannos D; Hematite R

Site 304 Hole Core 13 Cored Interval: 327.0-331.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					Scrapings off core catcher was only material recovered.
VALANGINIAN TO HAUTERIVIAN	Tubodiscus jurapelagicus	N F R	A R	M G	Core Catcher				* CC	NANNO OOZE, ferrugenous. Smear Slide at CC Texture (O-R-D): Nannos D; Hematite(?) R; Chert fragments R

Site 304 Hole Core 14 Cored Interval: 331.0-334.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					NANNO OOZE AND CHERT FRAGMENTS
Valanginian to Hauterivian	Tubodiscus jurapelagicus	F N R	F A R	G M P	1	0.5 1.0			5YR 5/4	NANNO OOZE, moderate brown (5YR 5/4), soupy. Smear Slide at CC Texture (O-R-D): Nannos D; Hematite R; Chert fragments R; Fish debris R
					Core Catcher				* CC	CHERT, moderate brown (5YR 4/4), glassy, chalcedony filled veins and lenses.

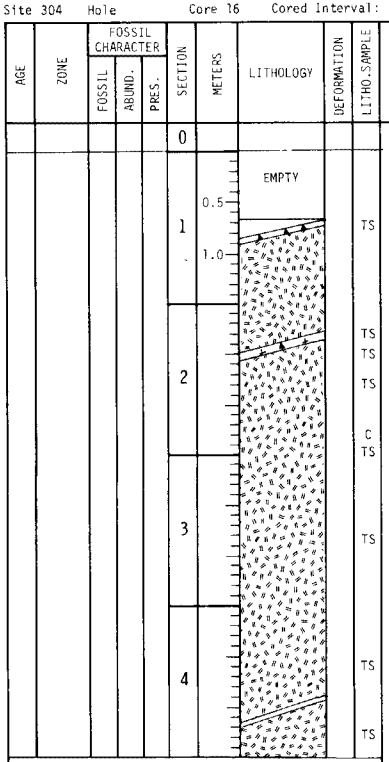
Site 304 Hole Core 15 Cored Interval: 334.5-337.5 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					CHERT, moderate yellowish brown (10YR 5/4), glassy, chalcedony filled veins.
					1	0.5 1.0	EMPTY		TS TS	BASALT: Dry-medium dark gray (N4), wet-greenish black (5G 2/1) to gray black (N2). Aphyric. No glassy crust preserved. At top, very fine, feathery plagioclase (30 x 100μ) in a matrix of montmorillonite. Rest of core has intergranular-intersertal texture of plagioclase laths (80 x 450μ) and pyroxene grains (~100μ). Except for middle of Section 2, pyroxene is more or less severely altered to olive-brown montmorillonite. Texture at this depth is occasionally coarsely feathery with sheaves of intergrown plagioclase and pyroxene. Scattered vesicles (<1 mm) filled with calcite or celadonite/montmorillonite. One cm to one mm thick veins of calcite, celadonite, montmorillonite, and pyrite. Fracture spacing ~5 cm.
					2				TS C TS TS	

	1-117 cm	2-10 cm
Plagioclase	41%	32%
Pyroxene	17%	21%
Opaque	8%	12%
Alteration	34%	35%

C = chemistry sample

Site 304 Hole Core 16 Cored Interval: 337.5-343.0 m



LITHOLOGIC DESCRIPTION

BASALT: Dry-gray black (N2); wet-black (N1). Aphyric. At Section 2, 50 cm and Section 3, 75 cm most of the plagioclase and pyroxene occurs as intergrown laths in sheaves or bundles (300 x 800μ). In most of the rest of the core, texture varies between intergranular (or intersertal) and this coarsely feathery texture within the same TS. The rock is fine-grained throughout, the plagioclase laths being ~70 x 600μ and the pyroxene grains ~120μ. The fairly sparse vesicles are filled with calcite or montmorillonite. The veins are mostly <0.5 mm thick and are calcite, celadonite montmorillonite, and a dusting of pyrite. The pyroxene is much more altered (to olive brown montmorillonite) than the plagioclase and the degree of alteration varies from TS to TS.

	1-65 cm	3-75 cm	4-115 cm
Plagioclase	34%	44%	28%
Pyroxene	8%	38%	39%
Opaque	18%	8%	17%
Alteration	40%	6%	16%
Glass(?)	0%	4%	0%

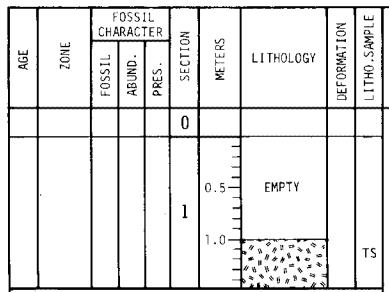
Veins: At 1-68 to 78: 2.5 cm thick, composed of calcite, celadonite, chalcedony, and some montmorillonite. At 2-40 to 60 cm: 2 m thick, calcite with fecal pellets.

Favreina: At 4-108 to 125 cm: celadonite, chalcedony, and pyrite.

Preliminary Michel-Levi analysis of plagioclase laths in Section 1 show them to be normally zoned with an average composition of An 46 - calcic andesine.

C = chemistry sample

Site 304 Hole Core 17 Cored Interval: 343.0-347.0 m



LITHOLOGIC DESCRIPTION

BASALT: Dry-dark gray (N3), wet-gray black (N2). Aphyric. Texture is intergranular-intersertal, coarsely feathery in places. Fine grained (plagioclase laths 100 x 700μ, pyroxene grains 140μ). Pyroxene is fairly much altered to olive brown montmorillonite. Sparse vesicles (~ 1 mm) filled with calcite and montmorillonite. Veins (<0.5 mm) of calcite and montmorillonite(?).

	113 cm
Plagioclase	36%
Pyroxene	35%
Opaques	12%
Alteration	17%

The topmost piece is yellow, red, and brown chert that most likely fell to the bottom from the overlying chert layers.

DEEP SEA DRILLING PROJECT

LEG 32 SITE 305

SITE SUMMARY SHEET

POSITION: Latitude: 32°00.13'N Longitude: 157°51.00'E

Water depth: 2903 corrected meters (echo sounding)

Bottom felt at: 2921 meters (drill pipe) Penetration: 640.5 meters

Number of Holes: 1 Number of Cores: 68

Total length of cored section: 631.0 m Total core recovered: 210.6 m

Percentage of core recovery: 33.4%

OLDEST SEDIMENT CORED:

Depth below sea floor: 640.5 meters Nature: Siliceous limestone, chert, and calcareous shale

Age: Hauterivian to Valanginian Measured Velocity: Too fragmentary

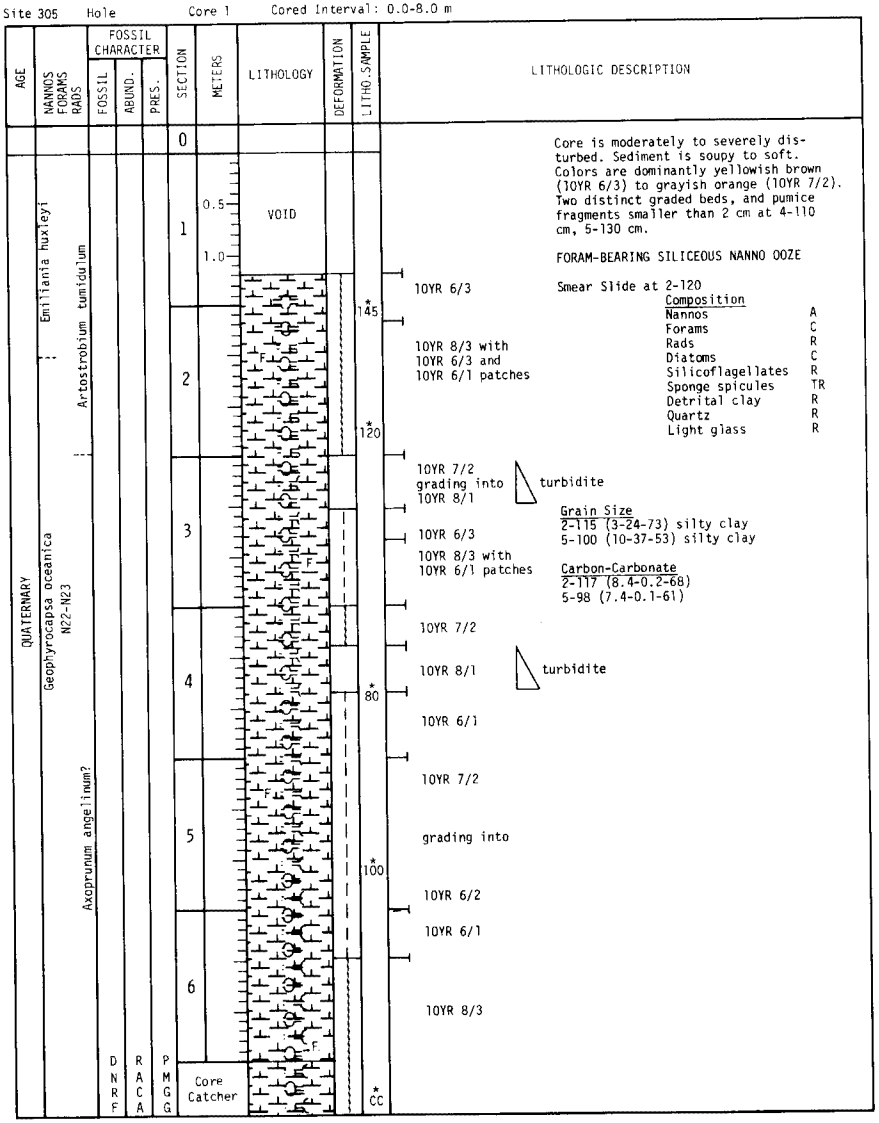
BASEMENT:

Depth below sea floor: Not reached

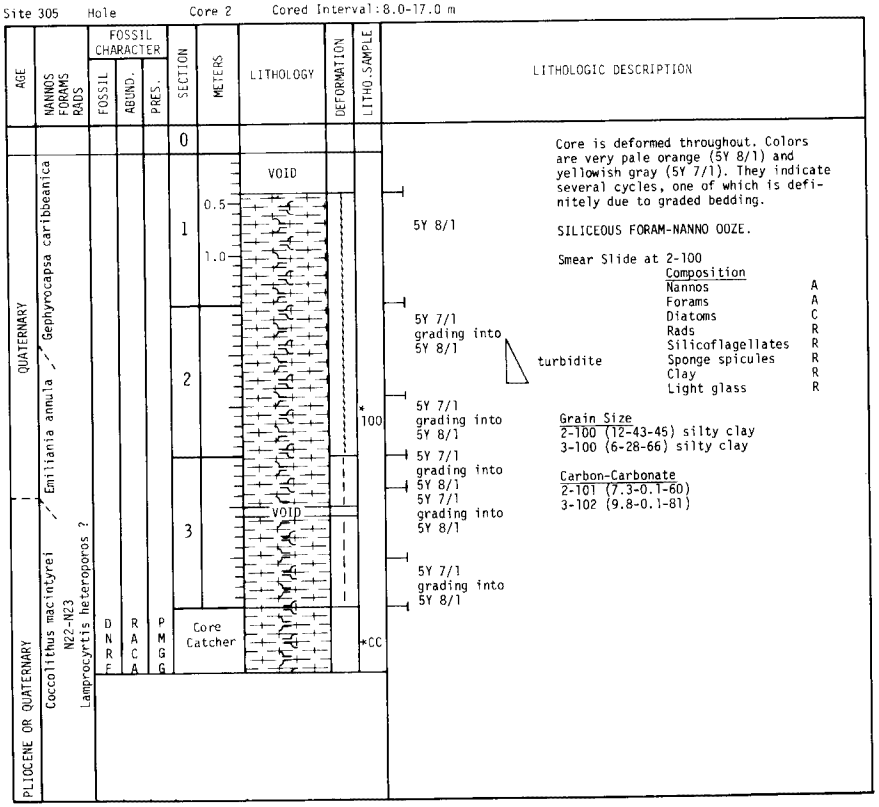
PRINCIPAL RESULTS:

Section on Shatsky Rise is composed of about 45 meters of Neogene siliceous foraminiferal nanno ooze over a late Miocene-late Oligocene unconformity, lying on about 100 meters of Paleogene-Campanian foraminiferal nanno ooze with Paleocene-Cretaceous boundary at 130 meters depth. Beneath this is about 400 meters of Santonian-Aptian ooze, chalk, and chert, overlying about 100 meters of Lower Cretaceous siliceous limestone and chert.

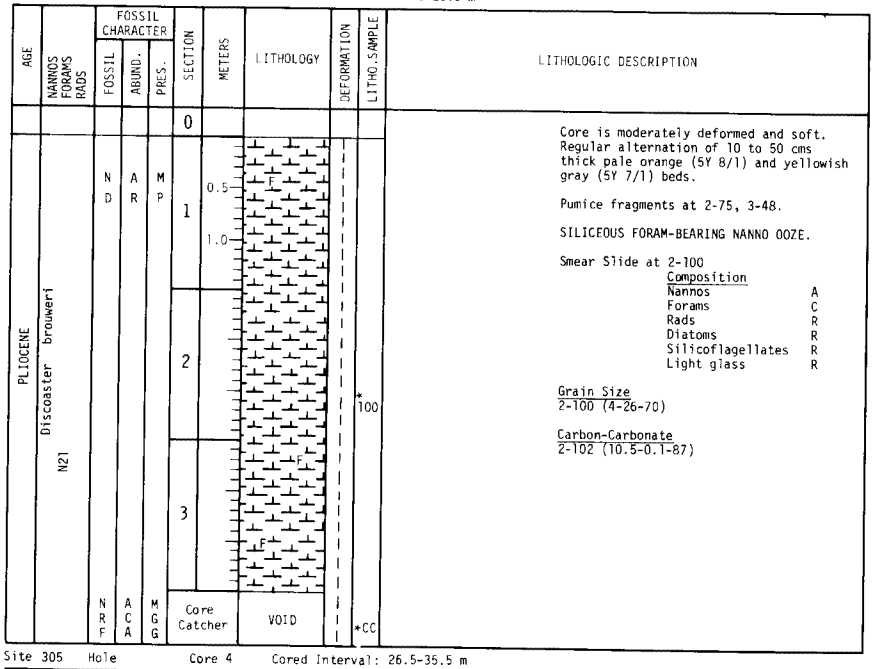
Site 305 Hole Core 1 Cored Interval: 0.0-8.0 m



Site 305 Hole Core 2 Cored Interval: 8.0-17.0 m



Site 305 Hole Core 3 Cored Interval: 17.0-26.5 m



Core is moderately deformed and soft. Regular alternation of 10 to 50 cms thick pale orange (5Y 8/1) and yellowish gray (5Y 7/1) beds.

Pumice fragments at 2-75, 3-48.

SILICEOUS FORAM-BEARING NANNO OOZE.

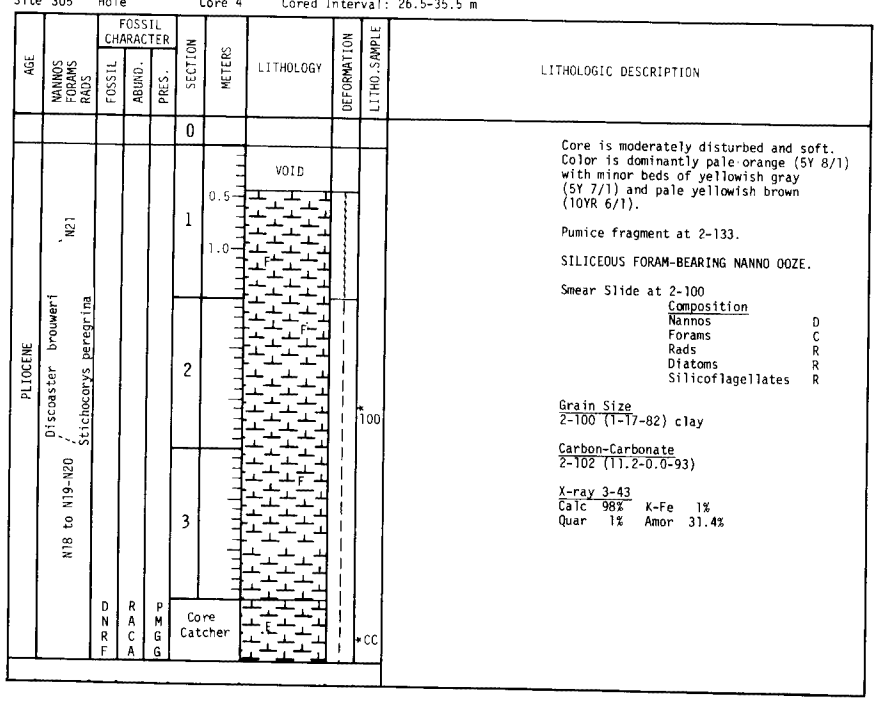
Smear Slide at 2-100

Composition	
Nannos	A
Forams	C
Rads	R
Diatoms	R
Silicoflagellates	R
Light glass	R

Grain Size
2-100 (4-26-70)

Carbon-Carbonate
2-102 (10.5-0.1-87)

Site 305 Hole Core 4 Cored Interval: 26.5-35.5 m



Core is moderately disturbed and soft. Color is dominantly pale orange (5Y 8/1) with minor beds of yellowish gray (5Y 7/1) and pale yellowish brown (10YR 6/1).

Pumice fragment at 2-133.

SILICEOUS FORAM-BEARING NANNO OOZE.

Smear Slide at 2-100

Composition	
Nannos	D
Forams	C
Rads	R
Diatoms	R
Silicoflagellates	R

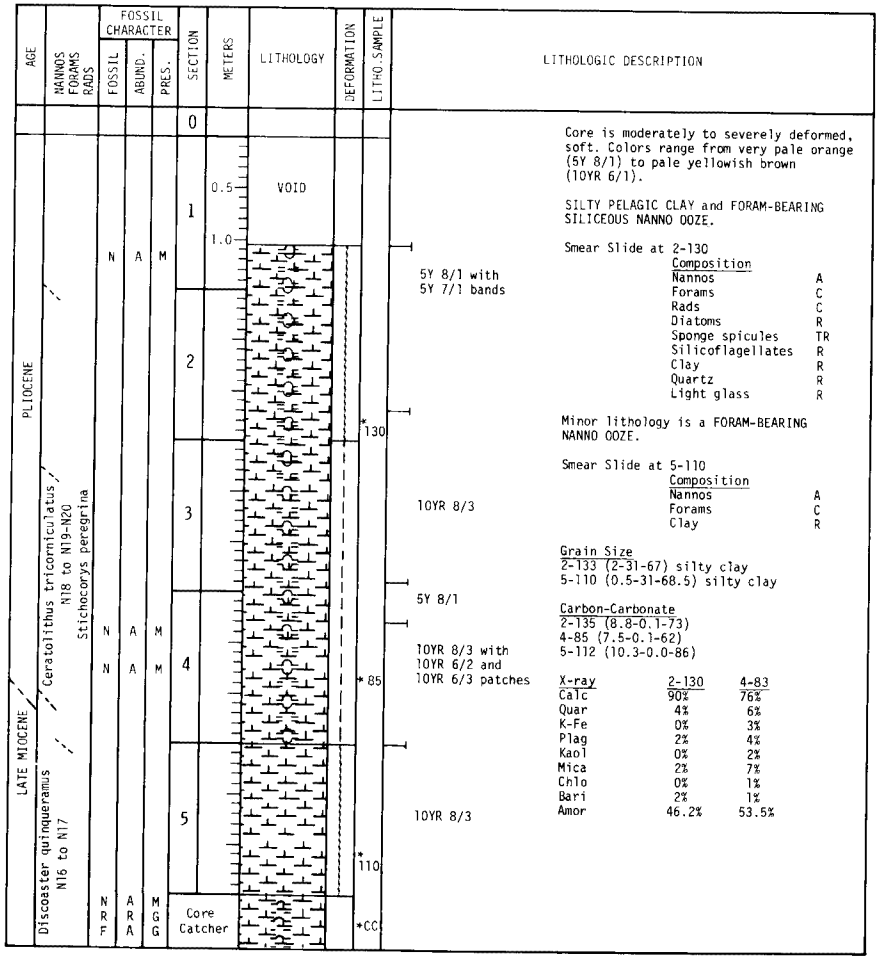
Grain Size
2-100 (1-17-82) clay

Carbon-Carbonate
2-102 (11.2-0.0-93)

X-ray 3-43

Calc	98%	K-Fe	1%
Quar	1%	Amor	31.4%

Site 305 Hole Core 5 Cored Interval: 35.5-45.0 m



Core is moderately to severely deformed, soft. Colors range from very pale orange (5Y 8/1) to pale yellowish brown (10YR 6/1).

SILTY PELAGIC CLAY and FORAM-BEARING SILICEOUS NANNO OOZE.

Smear Slide at 2-130

Composition	
Nannos	A
Forams	C
Rads	C
Diatoms	R
Sponge spicules	TR
Silicoflagellates	R
Clay	R
Quartz	R
Light glass	R

Minor lithology is a FORAM-BEARING NANNO OOZE.

Smear Slide at 5-110

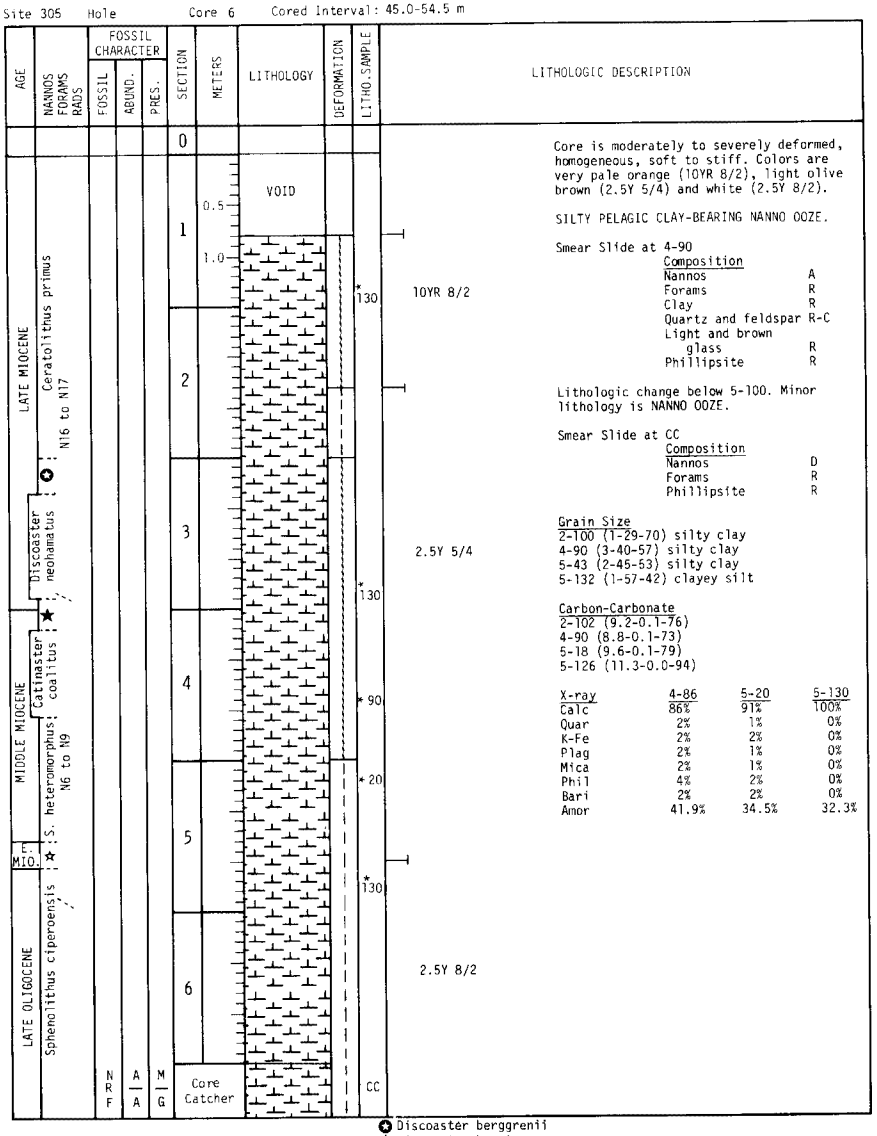
Composition	
Nannos	A
Forams	C
Clay	R

Grain Size
2-133 (2-31-67) silty clay
5-110 (0.5-31-68.5) silty clay

Carbon-Carbonate
2-135 (8.8-0.1-73)
4-85 (7.5-0.1-62)
5-112 (10.3-0.0-86)

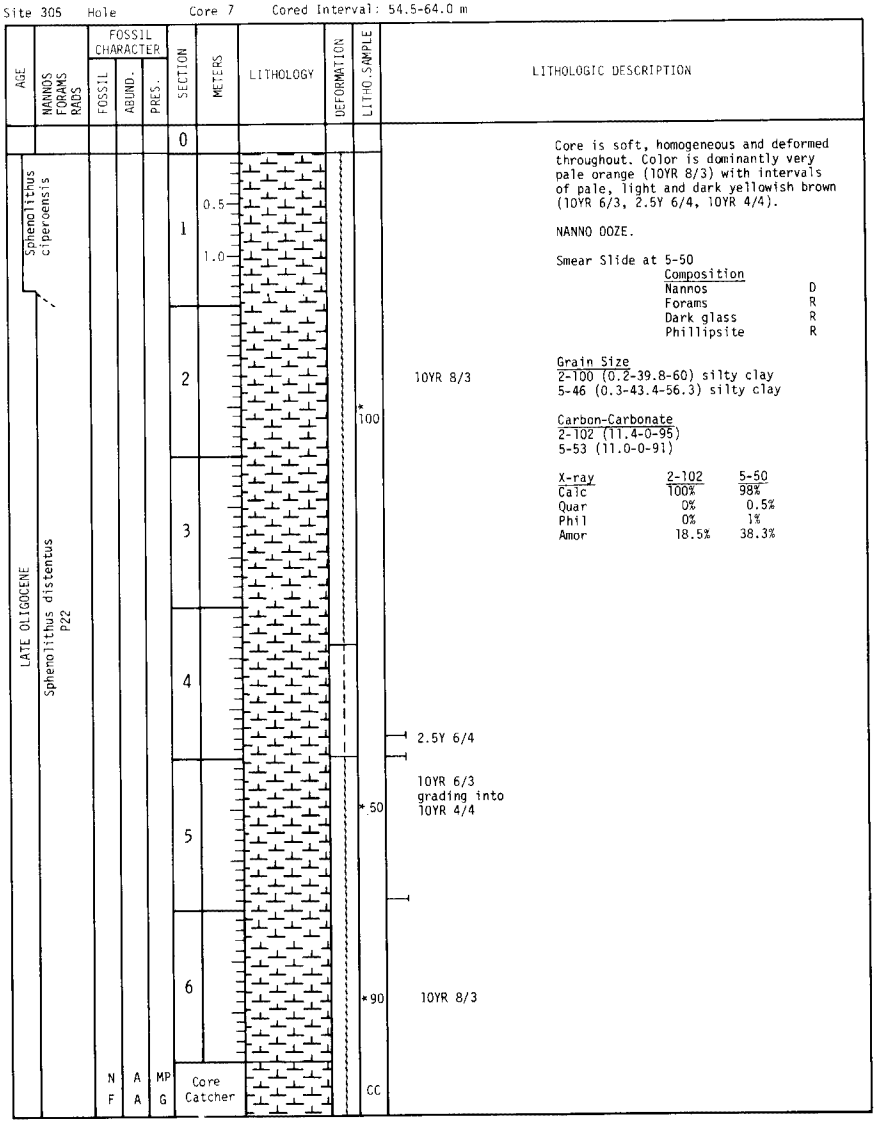
X-ray	2-130	4-83
Calc	90%	76%
Quar	4%	6%
K-Fe	0%	3%
Plag	2%	4%
Kaol	0%	2%
Mica	2%	7%
Chlo	0%	1%
Bari	2%	1%
Amor	46.2%	53.5%

Site 305 Hole Core 6 Cored Interval: 45.0-54.5 m

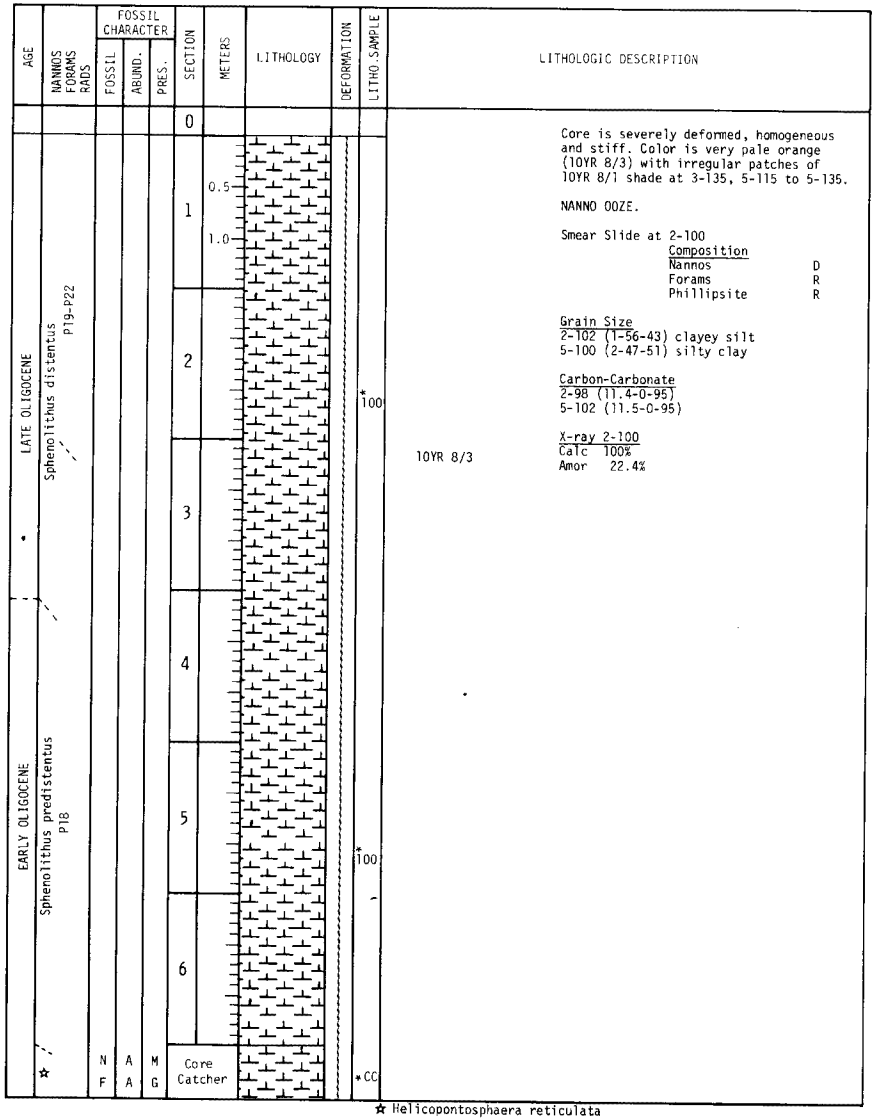


Discoaster berggrenii
Discoaster hamatus
Helicopontosphaera ampliaperta

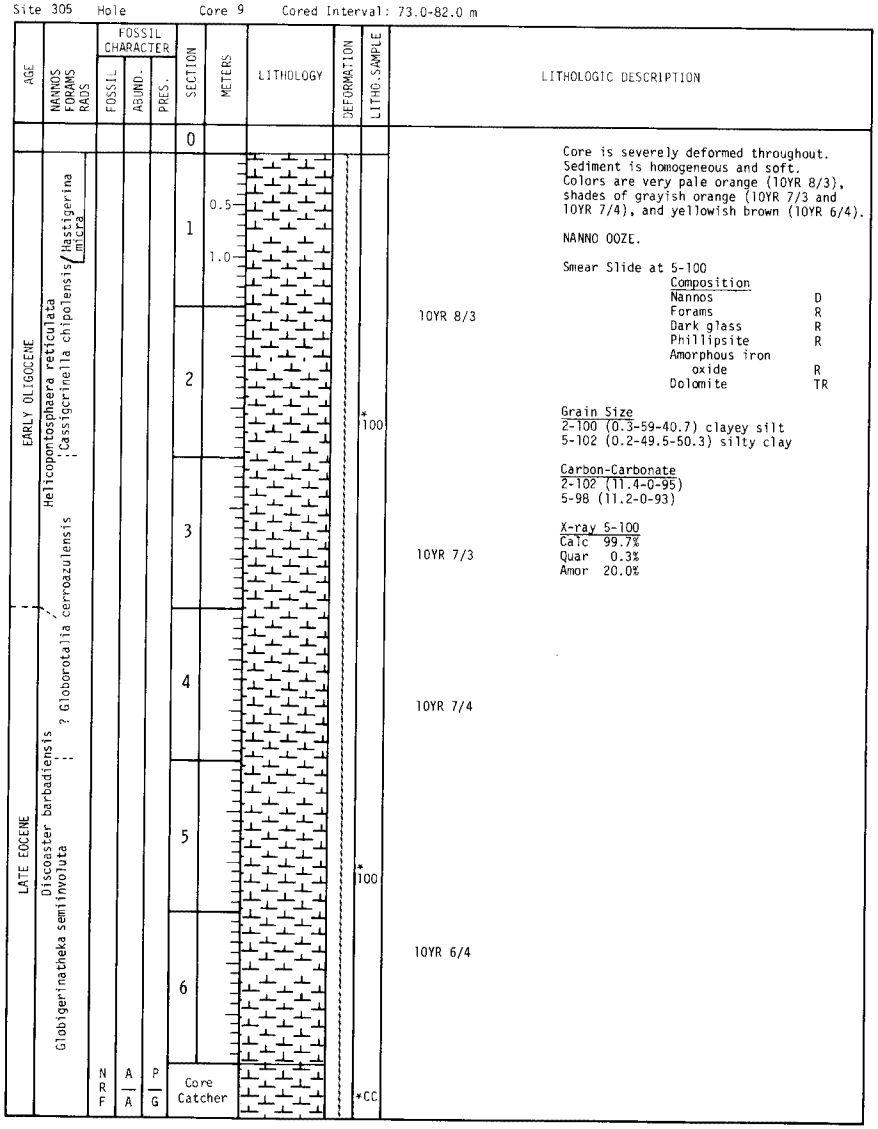
Site 305 Hole Core 7 Cored Interval: 54.5-64.0 m



Site 305 Hole Core 8 Cored Interval: 64.0-73.0 m



Site 305 Hole Core 9 Cored Interval: 73.0-82.0 m



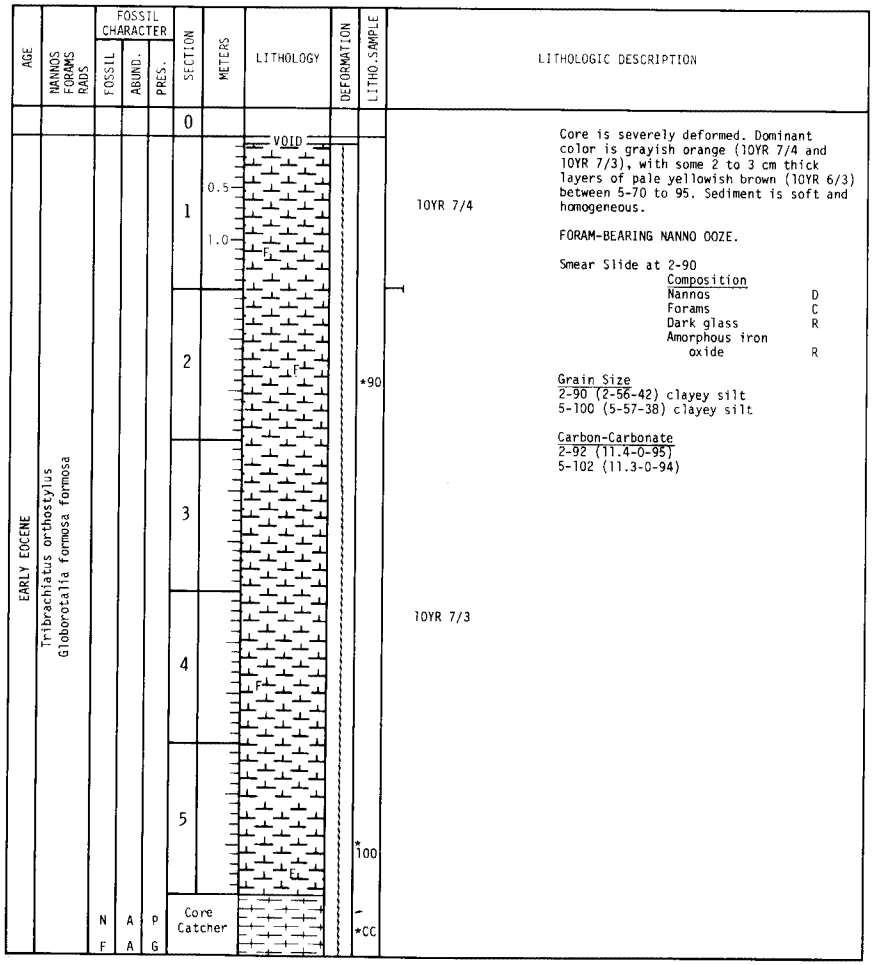
Site 305 Hole Core 10 Cored Interval: 82.0-91.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE EOCENE / MIDDLE EOCENE	Globigerinatheka semiinvoluta / Globorotalia lehneri / Globorotalia truncatulinoides tosaensis / Reticulofenestra umbilica	N F	A A	M G	0					
					1	0.5	VOID			Core is severely disturbed. Sediment is homogeneous and soft. Colors are grayish orange (10YR 7/4) and very pale orange (10YR 8/3) with gradational contact.
					2	1.0			*100	10YR 7/4
					3					NANNO OOZE.
					4					10YR 8/3
					5				*100	Smear Slide at 5-100 Composition Nannos D Forams R Dark glass R Phillipsite R Amorphous iron oxide R
					Core Catcher				*CC	Grain Size 2-98 (11.1 0-92) 4-130 (11.4-0-95) 5-98 (11.5-0-96) X-ray 5-100 Calc 100% Amor 15.5%

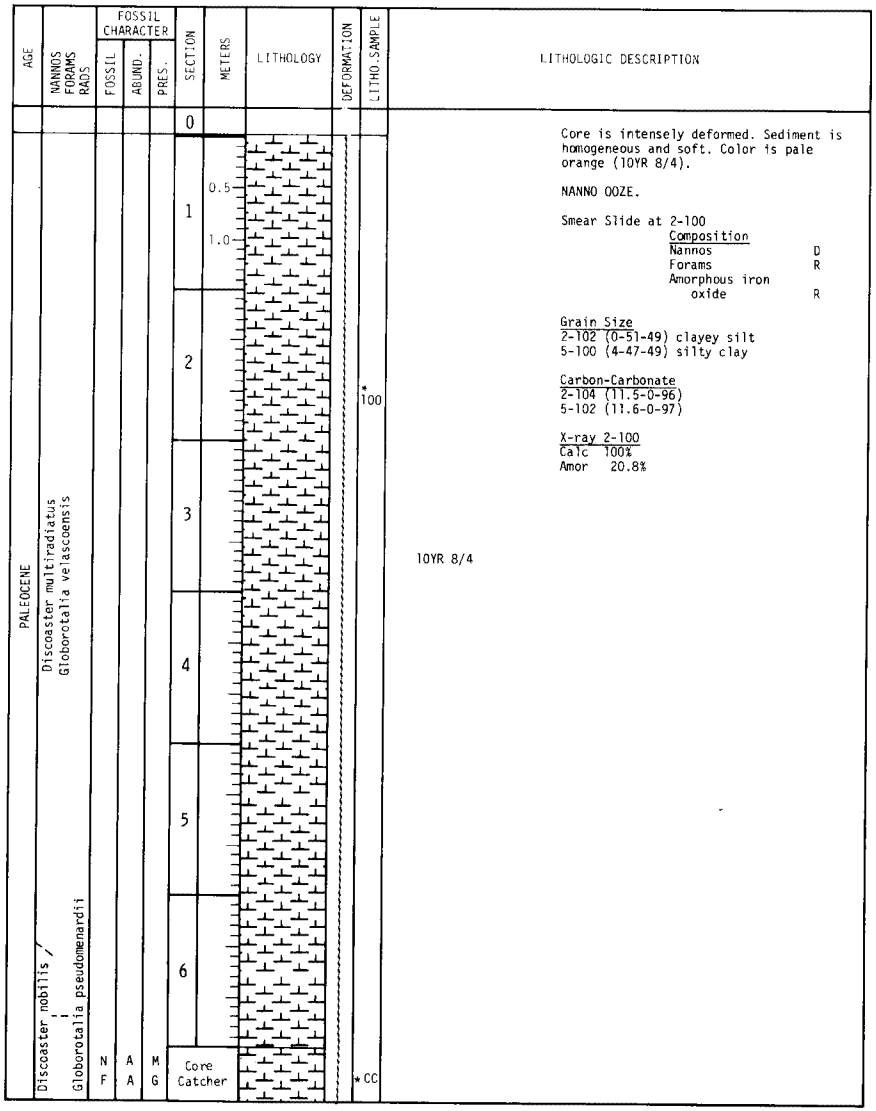
Site 305 Hole Core 11 Cored Interval: 91.5-101.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
EARLY EOCENE	Discoaster lodoensis / Globorotalia pentacamerata / Globorotalia aragonensis				0					
					1	0.5	VOID			Core is intensely deformed. Sediment is soft and its color is grayish orange (10YR 7/4) to pale orange (10YR 8/4). Below Section 3 interbeds (5 to 10 cm thick) of yellowish brown (10YR 6/4) and very pale orange (10YR 8/1) alternate with pale orange beds.
					2	1.0			*70	10YR 7/4
					3					FORAM-BEARING NANNO OOZE.
					4					Alternating beds of 10YR 8/4, 10YR 6/4 & 10YR 8/1
					5					Smear Slide at 2-70 Composition Nannos D Forams C Dark glass R Amorphous iron oxide R
					6				*70	Grain Size 2-70 (2-70-28) clayey silt 5-100 (3-69-28) clayey silt
		N F	A A	P G	Core Catcher				*CC	Carbon-Carbonate 2-72 (11.6-0-96) 5-98 (11.4-0-94) X-ray 2-66 Calc 100% Amor 17.7%

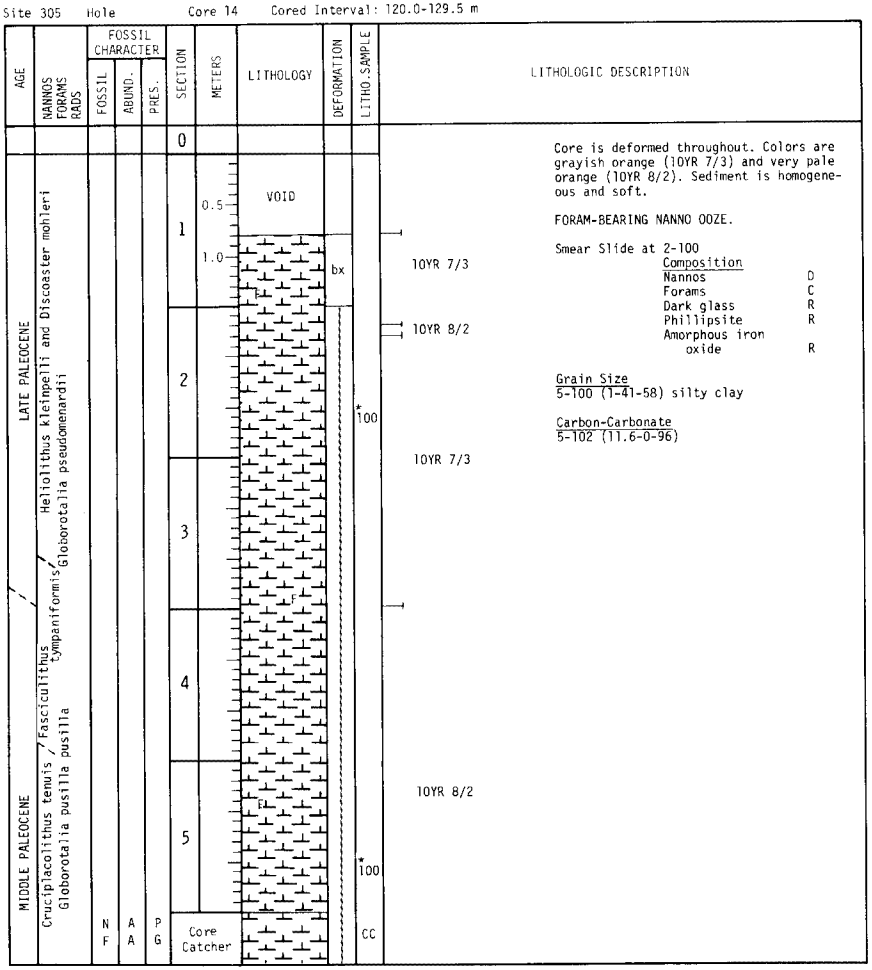
Site 305 Hole Core 12 Cored Interval: 101.0-110.5 m



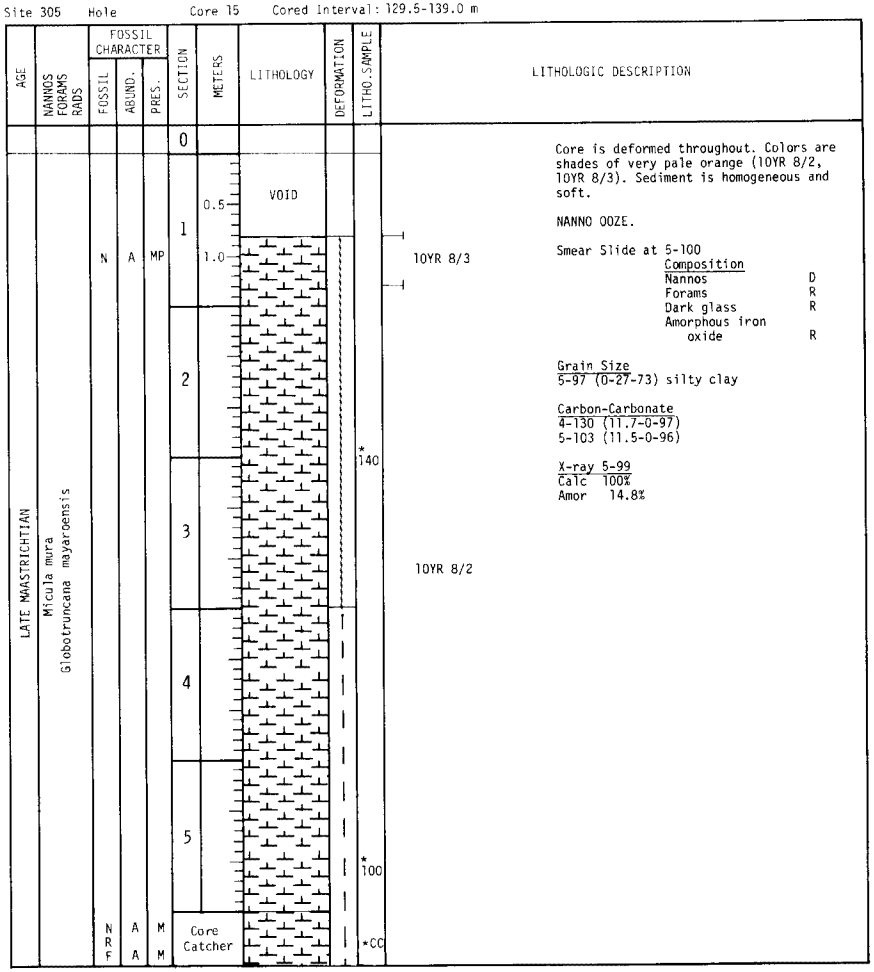
Site 305 Hole Core 13 Cored Interval: 110.5-120.0 m



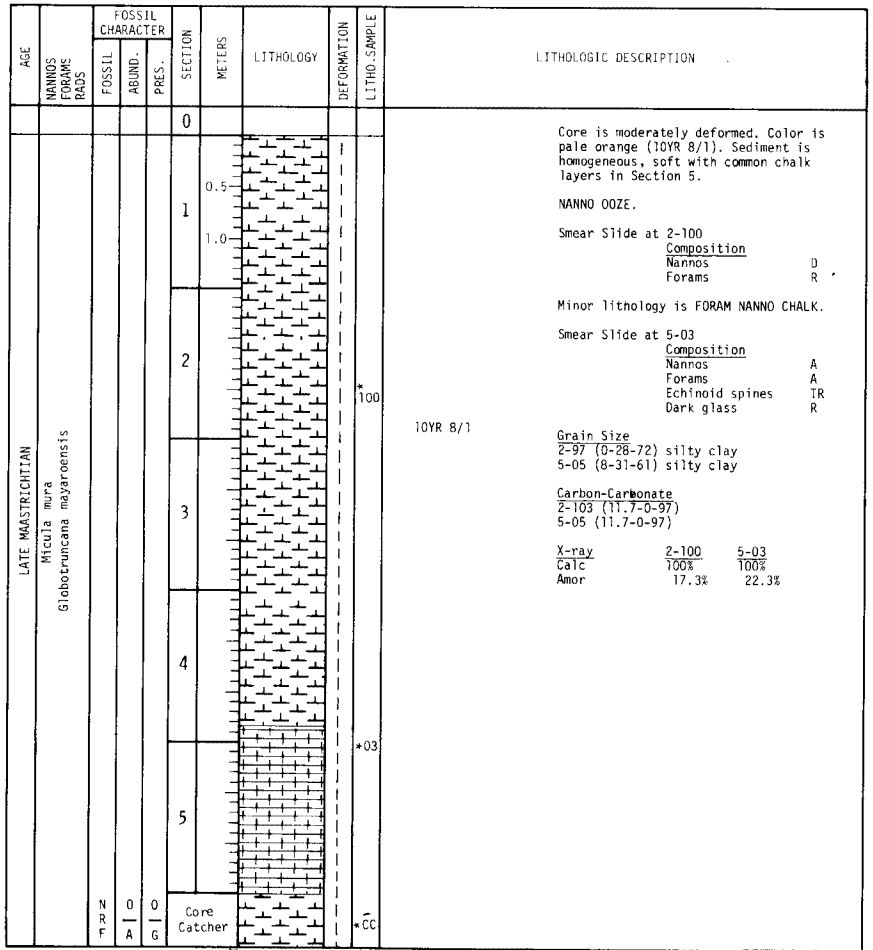
Site 305 Hole Core 14 Cored Interval: 120.0-129.5 m



Site 305 Hole Core 15 Cored Interval: 129.5-139.0 m



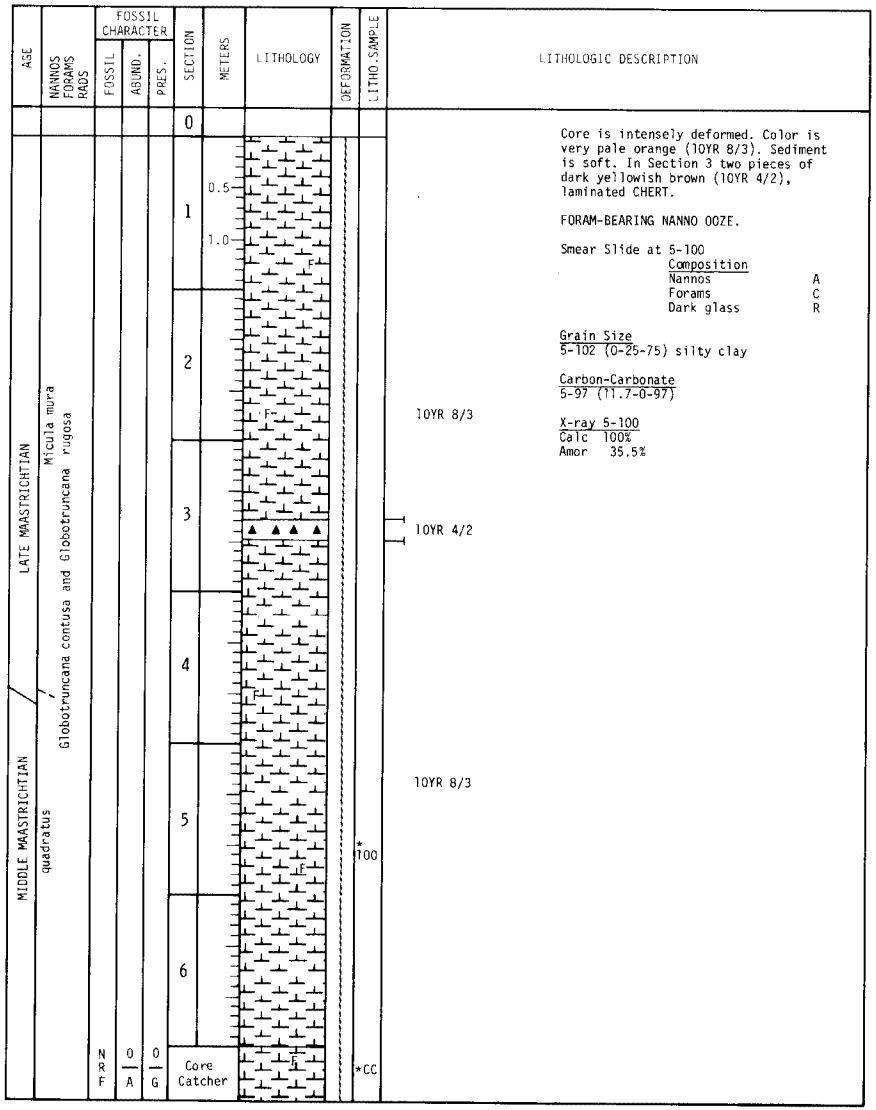
Site 305 Hole Core 16 Cored Interval: 139.0-148.5 m



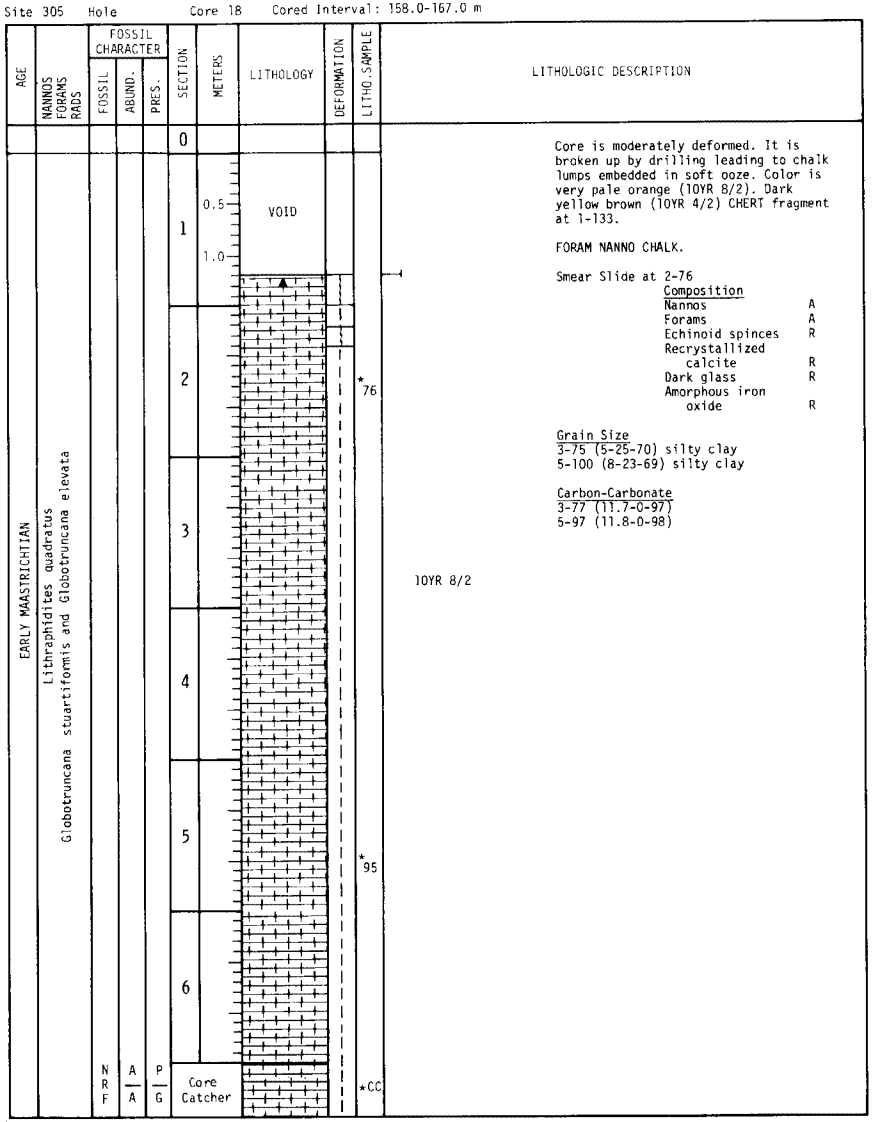
--- = examined, nothing present
0 = examined, not recorded

Site 305

Site 305 Hole Core 17 Cored Interval: 148.5-158.0 m



Site 305 Hole Core 18 Cored Interval: 158.0-167.0 m



Core is moderately deformed. It is broken up by drilling leading to chalk lumps embedded in soft ooze. Color is very pale orange (10YR 8/2). Dark yellow brown (10YR 4/2) CHERT fragment at 1-133.

FORAM NANNO CHALK.

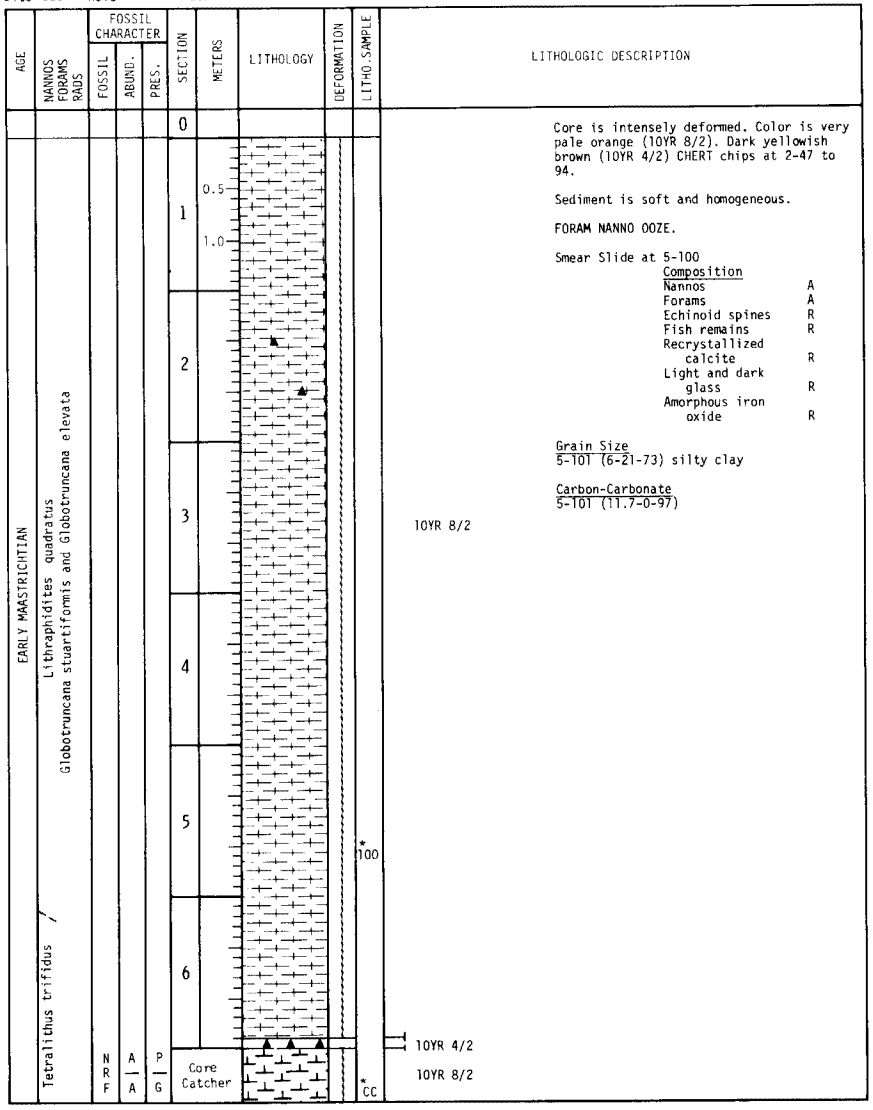
Smear Slide at 2-76

Composition	
Nannos	A
Forams	A
Echinoid spinces	R
Recrystallized calcite	R
Dark glass	R
Amorphous iron oxide	R

Grain Size
3-75 (5-25-70) silty clay
5-100 (8-23-69) silty clay

Carbon-Carbonate
3-77 (11.7-0-97)
5-97 (11.8-0-98)

Site 305 Hole Core 19 Cored Interval: 167.0-176.5 m



Core is intensely deformed. Color is very pale orange (10YR 8/2). Dark yellowish brown (10YR 4/2) CHERT chips at 2-47 to 94.

Sediment is soft and homogeneous.

FORAM NANNO OOZE.

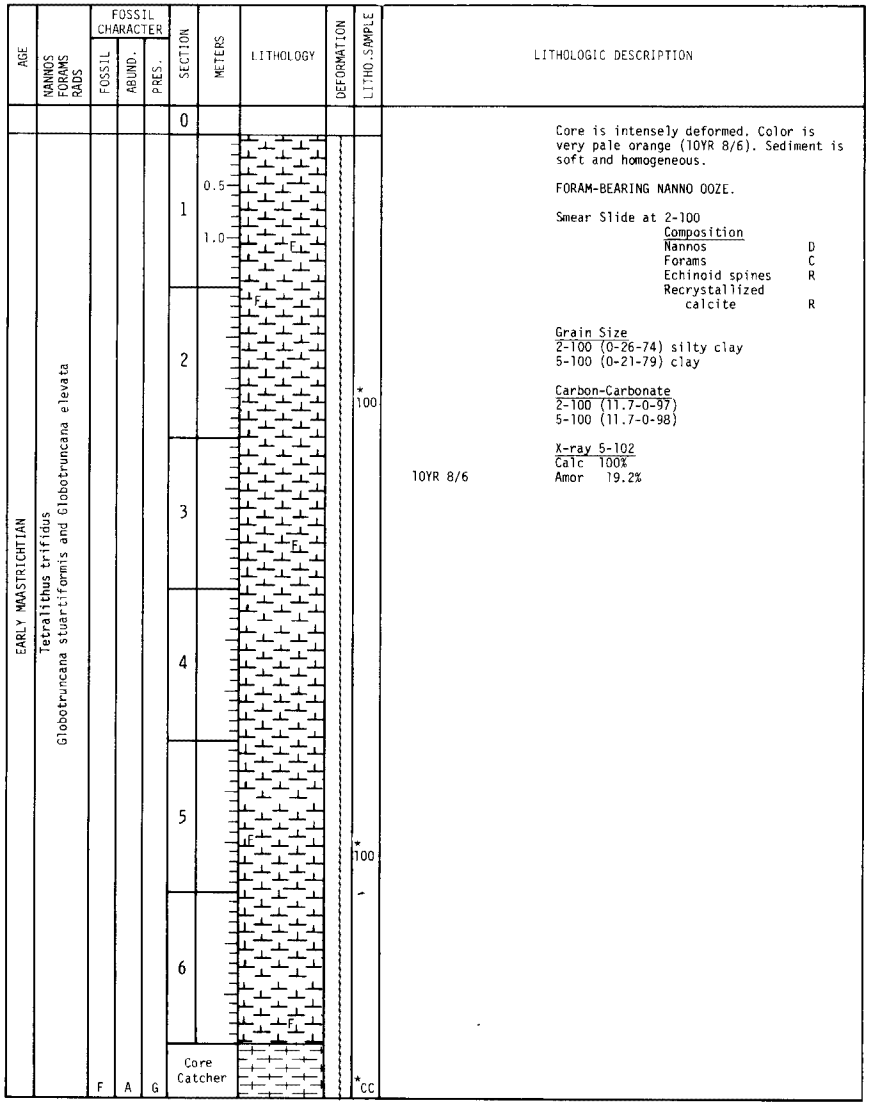
Smear Slide at 5-100

Composition	
Nannos	A
Forams	A
Echinoid spines	R
Fish remains	R
Recrystallized calcite	R
Light and dark glass	R
Amorphous iron oxide	R

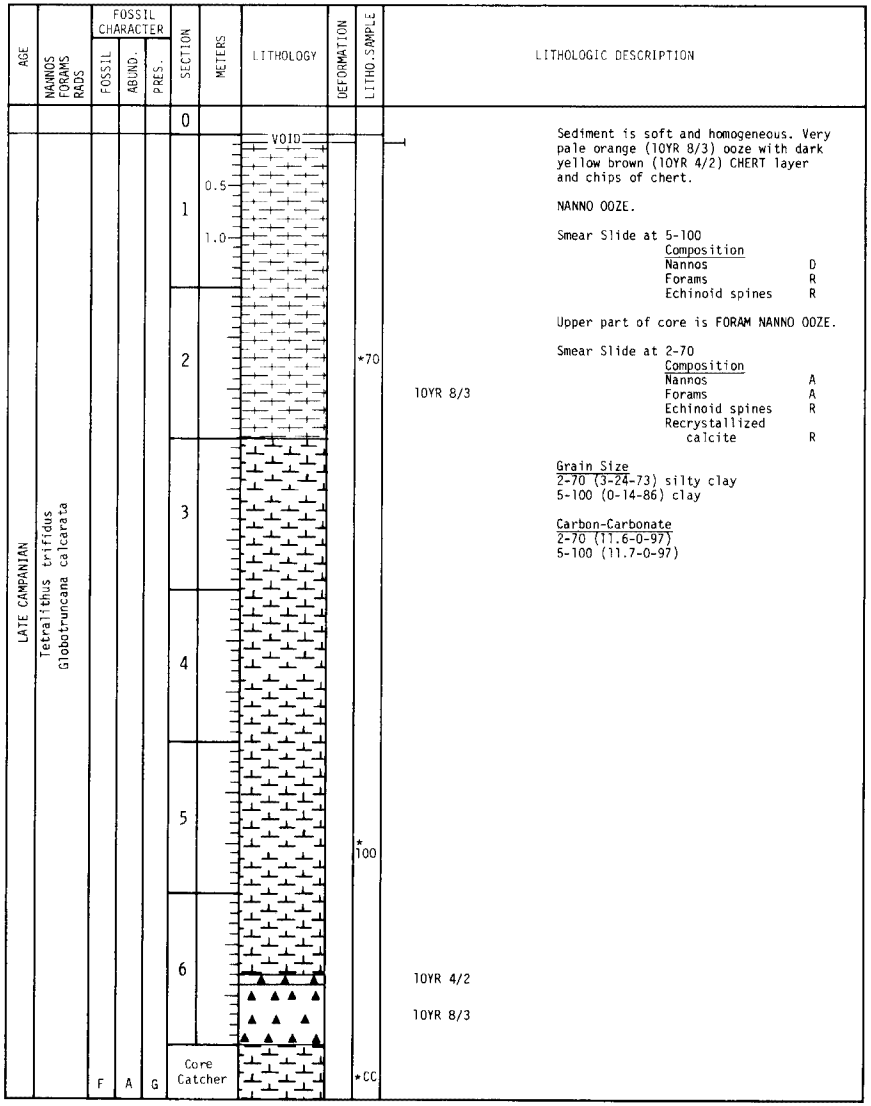
Grain Size
5-101 (6-21-73) silty clay

Carbon-Carbonate
5-101 (11.7-0-97)

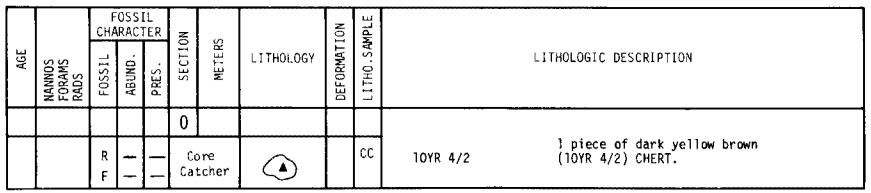
Site 305 Hole Core 20 Cored Interval: 176.5-186.0 m



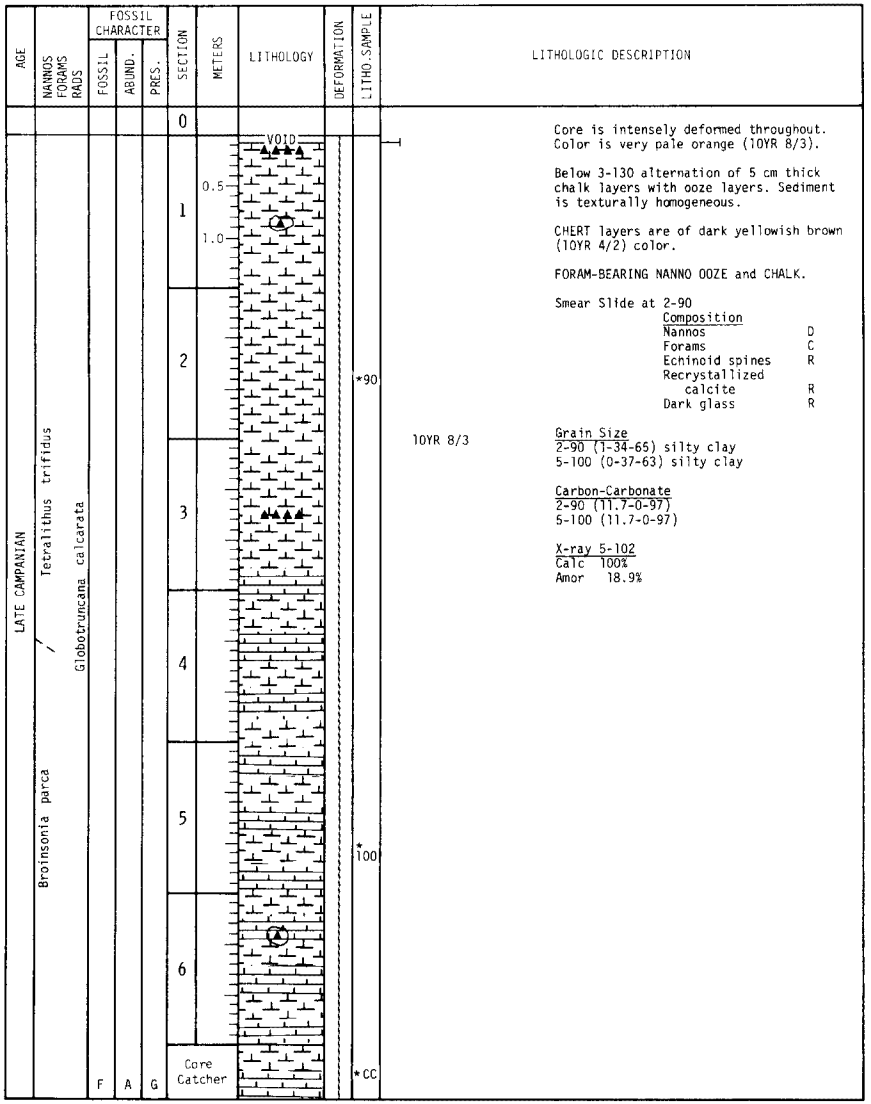
Site 305 Hole Core 21 Cored Interval: 186.0-195.5 m



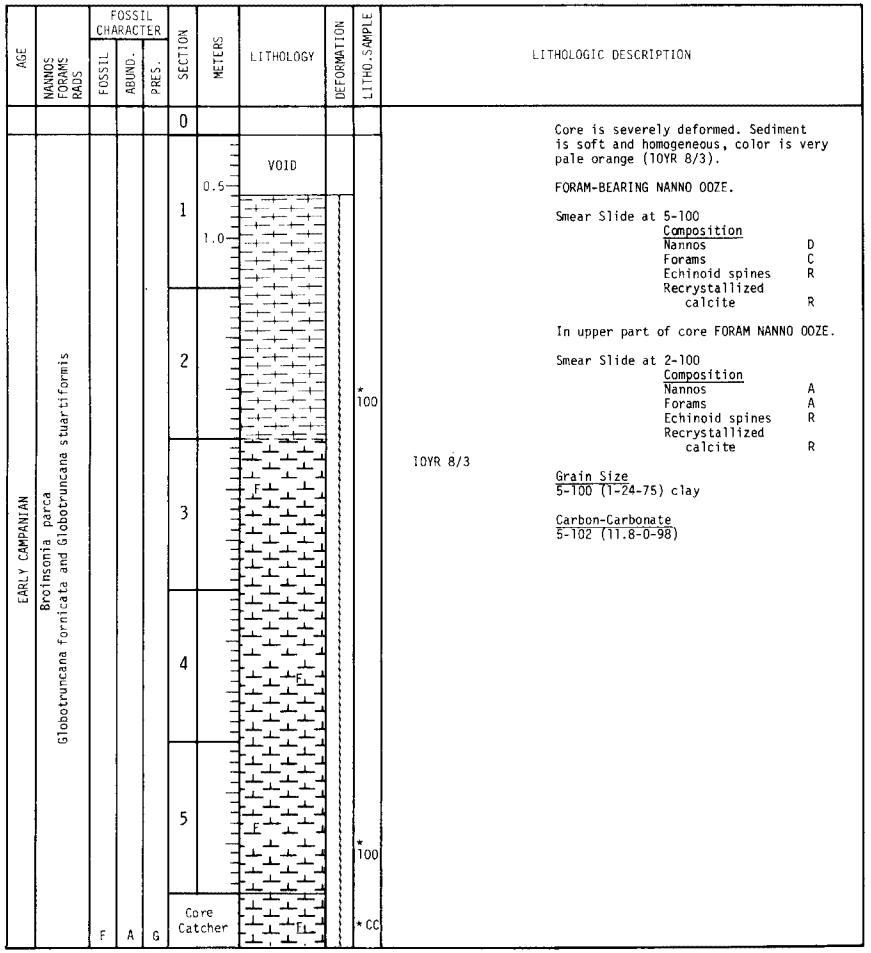
Site 305 Hole Core 22 Cored Interval: 195.5-205.0 m



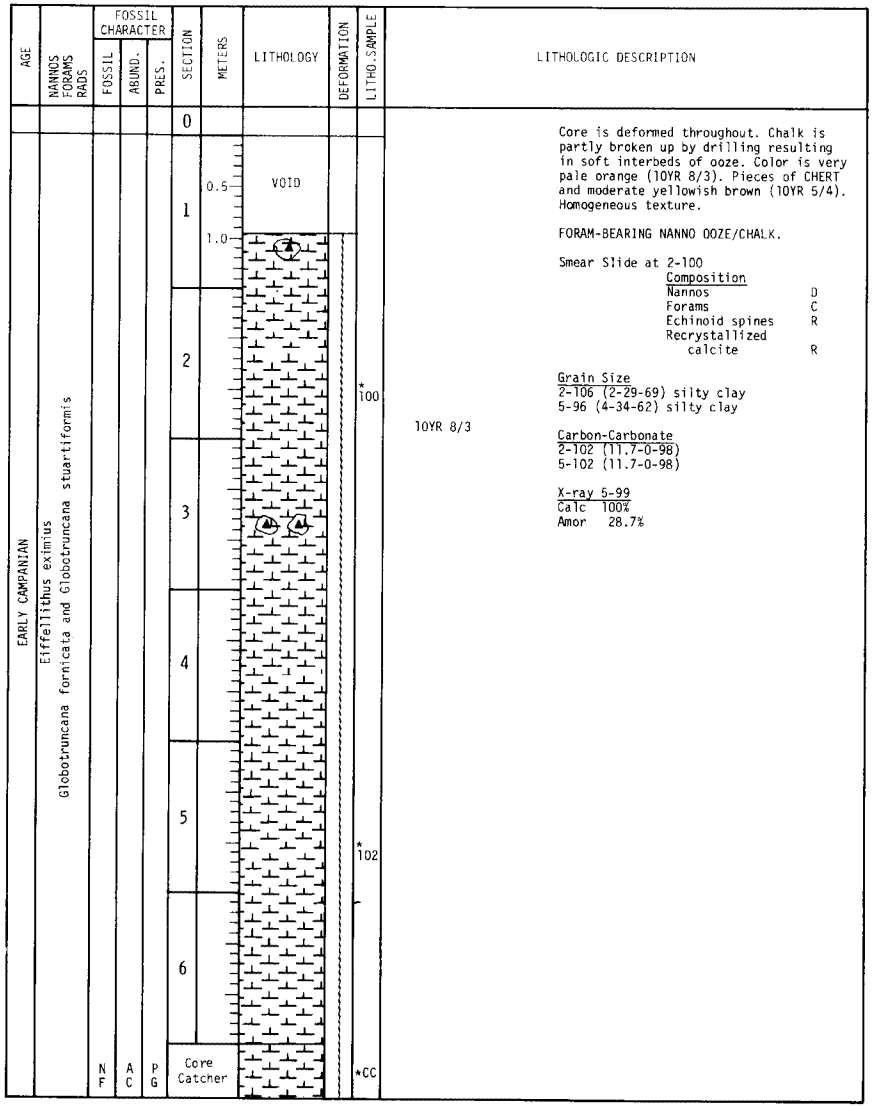
Site 305 Hole Core 23 Cored Interval: 205.0-214.0 m



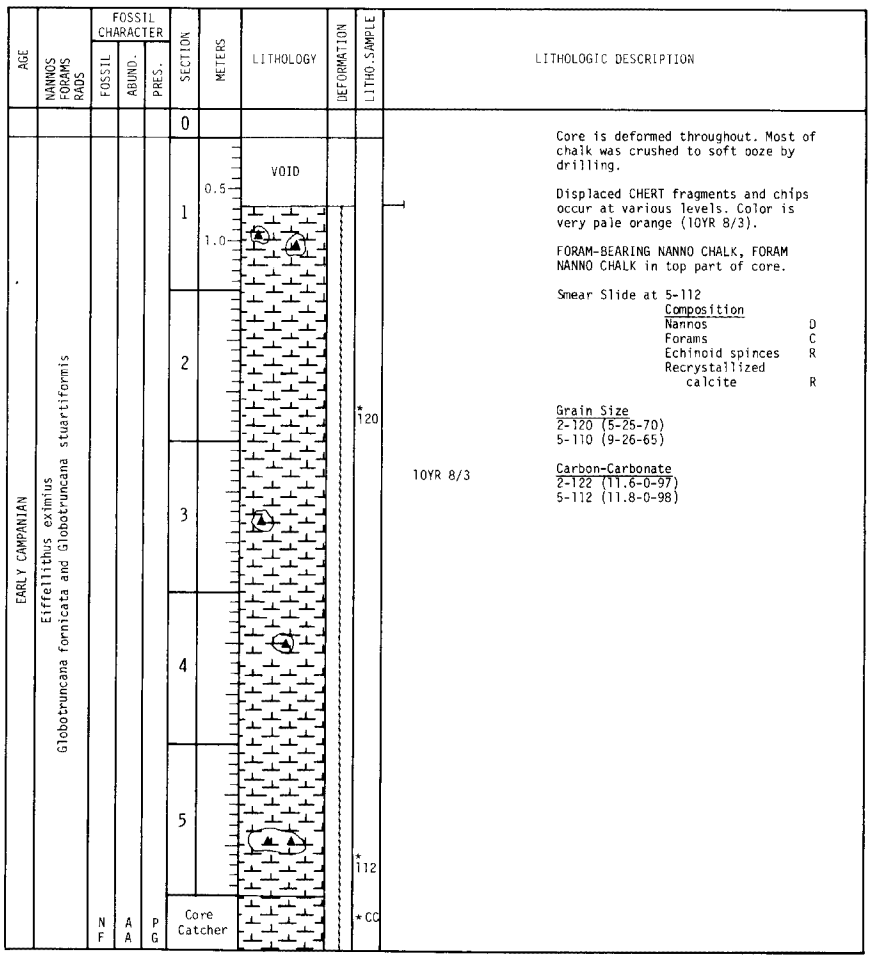
Site 305 Hole Core 24 Cored Interval: 214.0-223.5 m



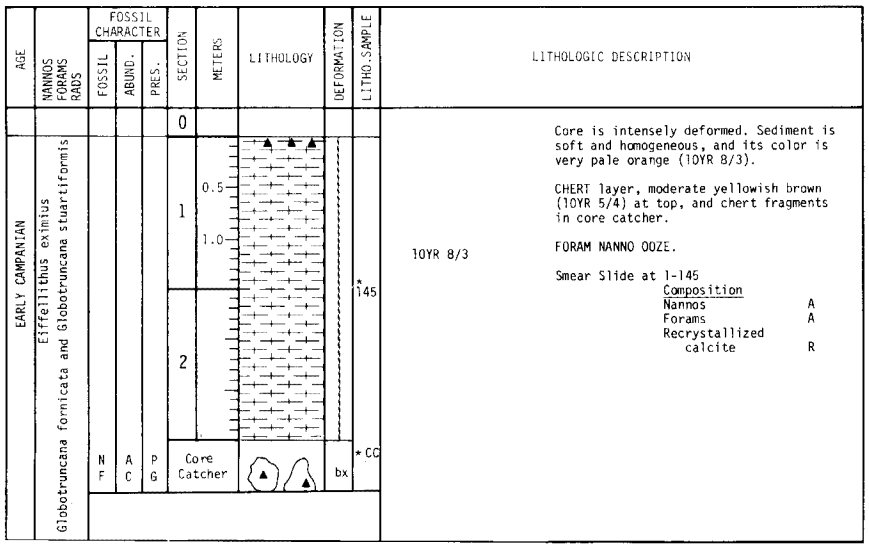
Site 305 Hole Core 25 Cored Interval: 223.5-233.0 m



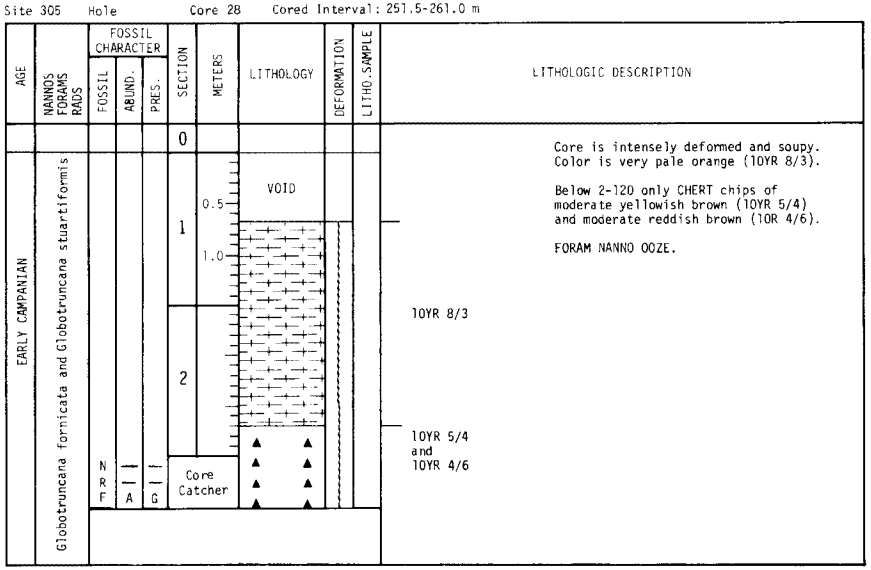
Site 305 Hole Core 26 Cored Interval: 233.0-242.0 m



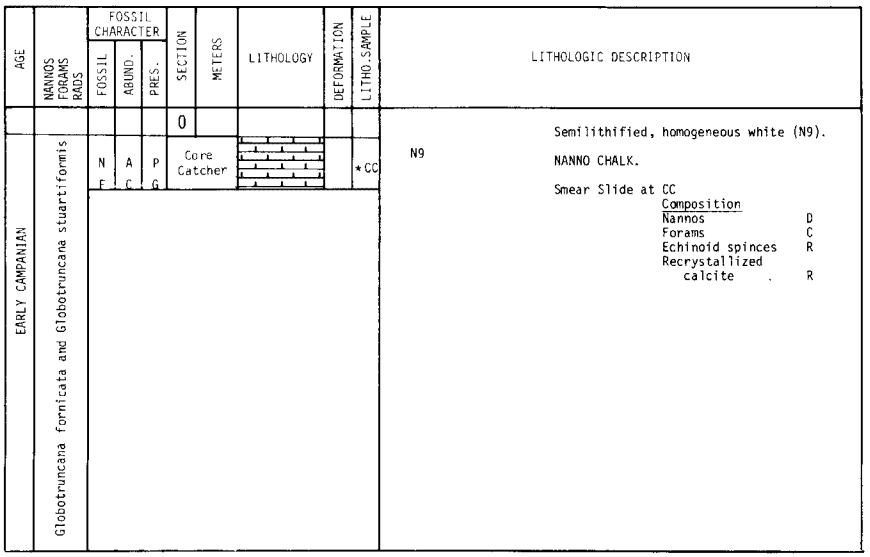
Site 305 Hole Core 27 Cored Interval: 242.0-251.5 m



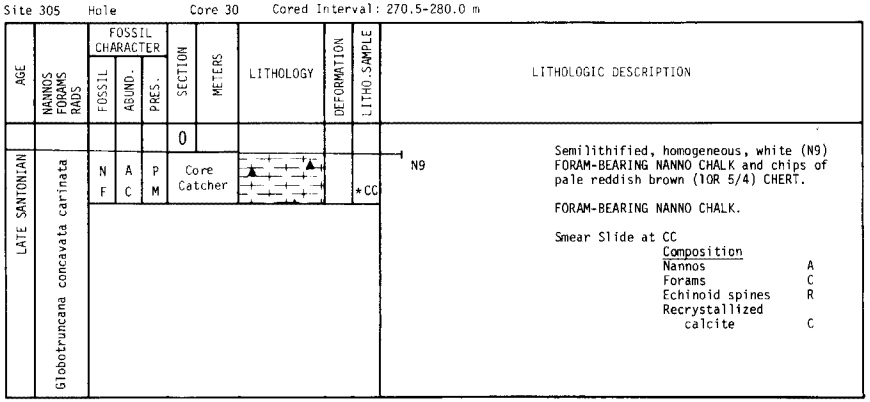
Site 305 Hole Core 28 Cored Interval: 251.5-261.0 m



Site 305 Hole Core 29 Cored Interval: 261.0-270.5 m



Site 305 Hole Core 30 Cored Interval: 270.5-280.0 m



Site 305 Hole Core 31 Cored Interval: 280.0-289.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE SANTONIAN	Globotruncana concavata carinata	N R F	A R A	P P G	0 Core Catcher				* CC	N9

Semilithified, white (N9) FORAM NANNO CHALK with chips and fragments of moderate yellowish brown (10YR 4/6) CHERT.

Smear Slide at CC

Composition	
Nannos	A
Forams	A
Echinoid spines	R
Recrystallized calcite	C

Site 305 Hole Core 32 Cored Interval: 289.5-298.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
EARLY AND MIDDLE SANTONIAN	LATE TURONIAN TO SANTONIAN Globotruncana fornicata and Globotruncana concavata carinata and Globotruncana angusti carinata ? Artostrobium urna	N R F	A R A	P P G	0 Core Catcher			bx	* CC	N9

Chalk is completely broken up, and contains 2 large CHERT pieces and many small chips.

Chalk is white (N9) and chert is moderate reddish brown (10R 4/6) and medium light gray (2.5Y 6/0).

FORAM NANNO CHALK.

Smear Slide at CC

Composition	
Nannos	A
Forams	A
Echinoid spines	R
Recrystallized calcite	C
Dark glass	R

Site 305 Hole Core 33 Cored Interval: 298.5-308.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
TURONIAN TO SANTONIAN		N R F	A R —	P P —	0 Core Catcher			bx		

Fragmented by drilling. Pieces of CHERT of various shades: pale yellowish brown (10YR 6/1, 10YR 6/2), moderate reddish brown (10R 4/6).

Some fragments show thin layers and pockets of weakly silicified nanno chalk.

Site 305 Hole Core 34 Cored Interval: 308.0-317.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
TURONIAN TO SANTONIAN		N R F	A R —	P P —	0 Core Catcher			bx		

Fragmented by drilling. Pieces of CHERT of various shades: pale yellowish brown (10YR 6/1) with laminae of pale yellowish brown (10YR 6/3), light brown (5YR 5/6) with laminae of moderate reddish brown (10R 4/6). It shows vitreous luster and conchoidal fractures. White carbonate occurs attached to surface of some fragments and within small voids.

Composition (X-ray, thin-section).

Chert consists of microcrystalline quartz, common tiny calcite inclusions and iron-oxide particles. These are concentrated in irregular laminae and patches showing diffuse boundaries. The ferrugineous stain causes the red-brown color of the chert. Radiolaria are present as "ghosts" only.

Site 305 Hole Core 35 Cored Interval: 317.5-326.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					CHERT (vitreous). Fragments of various sizes up to 5 cm (broken up by drilling). Mottled with inclusions of less silicified areas and many open vugs lined with NANNO CHALK. Colors: (1) Light brown (5YR 5/6) mottled with moderate reddish brown (10R 4/6). (2) Moderate reddish brown (10R 4/6) mottled with pale reddish brown (10R 5/4).
TURONIAN TO SANTONIAN	Globotruncana fornicata and Globotruncana concavata carinata and Globotruncana imbricata	R F	— A	— M	Core Catcher			bx		

Site 305 Hole Core 36 Cored Interval: 326.5-336.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					CHERT (vitreous). Eleven fragments. Upper 8 pieces are mottled medium dark gray (N4) and light gray (N7). Light patches show often pyrite crystals. Elongate, horizontal flattened cavities are common and are lined with white nanno chalk crust. They also contain euhedral pyrite crystals up to 5 mm. All fragments from core catcher placed in Section 1.
					1	0.5	VOID			
TURONIAN TO SANTONIAN		N R F	C — —	P — —	Core Catcher			bx		

Site 305 Hole Core 37 Cored Interval: 336.0-345.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					N3 CHERT with vitreous luster and conchoidal fractures. Ten fragments (broken up by drilling). Several pieces have a nanno chalk crust as well as vugs which are lined with white (N9), partly silicified nanno chalk, and occasionally also with euhedral quartz crystals. Color of chert is dark gray (N3) with slight mottling of light gray. At 135 to 138 black (5Y 2.5/1), semi-lithified, fissile and slightly fluorescent layer of CARBONACEOUS ZEOLITIC PELAGIC SHALE. Smear Slide at 1-135 Composition Nannos R Forams R Clay minerals A Zeolites A Dark glass R Pyrite C
EARLY CENOMANIAN	Lithraphidites alatus Rotalipora brotzeni, Rotalipora greenhornensis				1	0.5 1.0	VOID			
		N R F	F C R	M P G	Core Catcher			bx	*CC	

Site 305 Hole Core 38 Cored Interval: 335.5-354.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					N3 with mottling of N7 CHERT which is broken up by drilling. Color is dark gray (N3) with mottling of light gray (N7). White FORAM-BEARING NANNO CHALK forms a thin (<5 mm) crust on several chert fragments. Chalk-lined vugs are common. Composition of chalk crust Nannos A Forams C Recrystallized calcite C Recrystallized silica R
EARLY CENOMANIAN	Lithraphidites alatus	R F	— F	— M	Core Catcher			bx	*CC	

Site 305 Hole Core 39 Cored Interval: 354.5-364.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					Fragments of CHERT up to 6 cm in size. Dark gray (N3) with moderate mottling of light gray (N7). NANNO FORAM CHALK as crust on chert pieces and as vug linings. Vugs are irregular in shape and up to 2 mm large. NANNO FORAM CHALK very pale orange (10YR 8/2). Only few lumps recovered. Semilithified, homogeneous. Smear Slide at CC Composition Nannos A Forams A Echinoid spines R Rads R Recrystallized calcite C
EARLY CENOMANIAN	Lithrapidites alatus Rotalipora brotzeni, Rotalipora greenhornensis	R F	C C	P G	Core Catcher			bx	*CC	

Site 305 Hole Core 40 Cored Interval: 364.0-373.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY CENOMANIAN	Rotalipora brotzeni, Rotalipora greenhornensis / Lithrapidites alatus	N R F	A A R	P M M	0	Core Catcher		bx	*CC	

Sediment brecciated by drilling.

CHERT. One piece (~6 cm). Black (N2) with one vug (~2 cm) filled with yellowish gray (5Y 8/1). Foram nanno chalk.

FORAM NANNO CHALK. Laminated, alternating yellowish gray (5Y 3/2) and light gray (N7).

Smear Slide at CC

Composition	
Nannos	A
Forams	A
Echinoid spines	R
Recrystallized calcite	C

Site 305 Hole Core 41 Cored Interval: 373.5-382.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
EARLY CENOMANIAN	Rotalipora brotzeni, Rotalipora greenhornensis / Eiffellithus turriseiffeli	N R F	A R R	P P M	0	Core Catcher		bx	*CC	

CHERT.
Several fragments up to 6 cm large. Dark gray (N3) with moderate to intense mottling of light gray (N7). Vugs common and range up to 2 cm in size.

FORAM-BEARING NANNO CHALK forms a crust on chert pieces and also lines the vug.

Smear Slide at CC

Composition	
Nannos	D
Forams	C
Recrystallized calcite	C
Dark glass	R

Site 305 Hole Core 42 Cored Interval: 382.5-391.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffellithus turriseiffeli / Rotalipora apenninica	N R F	A F C	P P G	0					
					1	0.5	VOID	bx		
						1.0				
					Core Catcher				*CC	
	N8									

FORAM NANNO OOZE with CHERT chips, soupy, completely disturbed by drilling. Unopened.

In core catcher FORAM NANNO CHALK very light gray (N8) mixed by drilling with several small (<3 cm) pieces of CHERT, grayish black (N2).

Smear Slide at CC

Composition	
Nannos	A
Forams	A
Echinoid spines	R
Recrystallized calcite	C

Site 305 Hole Core 43 Cored Interval: 391.5-400.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffellithus turriseiffeli				0					
					1	0.5	VOID	bx		
						1.0				
					2					
					3					
		N F	A A	M G	Core Catcher					

CHERT chips and NANNO OOZE, homogenized by drilling and very soupy ooze to very light gray (N8), chert chips are light gray (N7), dark gray (N3) and moderate reddish brown (10R 4/6).

Unopened.

Site 305 Hole Core 44 Cored Interval: 410.0-419.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffellithus turriseiffeli Rotalipora apenninica	N R F	A P C	M P G	0	Core Catcher		bx	* CC	CHERT. Six fragments up to 6 cm in size. Dark gray (N3) with moderate to intense mottling of light gray (N7). Irregular flattish vugs common. White FORAM NANNO CHALK forms a few mm thick crust on chert and lines vugs.

Smear Slide at CC

Composition	
Nannos	A
Forams	A
Echinoid spines	R
Rads	R
Recrystallized calcite	C
Recrystallized silica	R
Pyrite	R
Light glass	R

Site 305 Hole Core 45 Cored Interval: 319.0-428.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffellithus turriseiffeli Rotalipora apenninica	N R F	A R F	M P M	0	Core Catcher		bx	* CC	Sediment brecciated by drilling. Pieces of CHERT, dark gray (N3) with slight mottling of medium gray (N5) and FORAM-BEARING NANNO CHALK very pale orange (10YR 8/1).

Smear Slide at CC

Composition	
Nannos	D
Forams	C
Echinoid spines	R
Recrystallized calcite	C

Site 305 Hole Core 46 Cored Interval: 428.5-438.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE ALBIAN	Eiffellithus turriseiffeli Rotalipora apenninica Dictyomitra samphedia	N R F	C C C	P P G	0	Core Catcher		bx	* CC	10YR 8/1 N3 Sediment was fragmented by drilling. Pieces of CHERT dark gray (N3) with slight mottling of medium gray (N5). Covered with thin layer of white chalk. FORAM-BEARING NANNO CHALK very pale orange (10YR 8/1).

Smear Slide at CC

Composition	
Nannos	A
Forams	C
Echinoid spines	R
Recrystallized calcite	R
Rads	R

Site 305 Hole Core 47 Cored Interval: 438.0-447.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
ALBIAN	Eiffellithus turriseiffeli Ticinella primula	N R F	A F F	M P P	0					Sediment brecciated by drilling. FORAM-RADIOLARIAN-BEARING NANNO LIMESTONE. Color is light gray (N8) with moderate mottling in darker shade due to bioturbation. Vertical and horizontal burrows, some with infill structures. CHERT generally brecciated. At 1-116 it occurs as less than 4 mm thick irregular layer in the limestone. Chert has a vitreous luster and conchoidal fractures.
					1	0.5	VOID			
						1.0	R F R F R	bx	* 138	N8
						Core Catcher			CC	

Smear Slide at 1-138

Composition	
Nannos	A
Forams	C
Recrystallized calcite	C
Light glass	R

Carbon-Carbonate
1-110 (11.2-0-93)

In thin-section (1-103, 1-128) common Radiolaria are observed in addition to fossils listed above. Molds of rads and forams are filled with chalcedony. X-ray analysis reveals calcite, quartz and opal-CT.

Site 305 Hole Core 48 Cored Interval: 447.5-456.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
		N F	C —	P —	0	Core Catcher		bx	* CC	N9 N2 Sediment fragmented by drilling. CHERT grayish black (N2) with intense mottling of medium dark gray (N4). Irregular surfaces covered with thin crust of white NANNO CHALK.

Smear Slide at CC

Composition	
Nannos	A
Forams	R
Rads	R
Recrystallized calcite	C
Recrystallized silica	R
Hematite	R
Phillipsite	R

Site 305 Hole Core 49 Cored Interval: 456.5-466.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
ALBIAN	Eiffellithus turriseiffeli Ticinella primula	R F	C C	M M	Core Catcher			bx	CC	

Sediment brecciated by drilling. CHERT, one fragment light gray (N7) intensely mottled with grayish black (N2). Other fragments grayish black (N2) with white crust of FORAM NANNO CHALK.

Smear Slide at CC

Composition	
Nannos	A
Forams	A
Rads	R
Recrystallized calcite	C
Recrystallized silica	R

Site 305 Hole Core 50 Cored Interval: 466.0-475.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
ALBIAN	Eiffellithus turriseiffeli Ticinella primula Acaeniotyle umbilicata	N R F	C C F	P M M	Core Catcher			bx	* CC	N9 N2

Sediment brecciated by drilling. CHERT, black (N2) with intense light gray (N7) mottling and FORAM-BEARING NANNO CHALK, white (N9).

Smear Slide at CC

Composition	
Nannos	A
Forams	C
Rads	R
Recrystallized calcite	C
Recrystallized silica	R

Site 305 Hole Core 51 Cored Interval: 475.5-484.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
ALBIAN	Eiffellithus turriseiffeli Ticinella primula Acaeniotyle umbilicata	N R F	A C R	P M M	Core Catcher			bx	* CC	N7

Fragmented by drilling. CHERT, light gray (N7) with intense mottling of grayish black (N2). This crust of white (N9) FORAM-BEARING NANNO CHALK on irregular chert surfaces.

Site 305 Hole Core 52 Cored Interval: 484.5-494.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
ALBIAN	Ticinella primula Acaeniotyle umbilicata	N R F	A A C	P M M	Core Catcher			bx	* CC	N8 N2

Sediment brecciated by drilling. CHERT, grayish black (N2) with moderate mottling of light gray (N7). Irregular chert surfaces covered with white (N7) chalk and FORAM-RADIOLARIAN-BEARING NANNO CHALK, homogeneous very light gray (N8).

Smear Slide at CC

Composition	
Nannos	A
Forams	C
Rads	C
Recrystallized calcite	C
Recrystallized silica	R

Site 305 Hole Core 53 Cored Interval: 494.0-503.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
ALBIAN?		N R F	F R C	P P M	Core Catcher			bx	* CC	

Brecciated by drilling. CHERT with alternating layers and mottling of light gray (N7) and grayish black (N2), and with few, partly silicified FORAM-BEARING NANNO CHALK layers.

Composition of chalk layers in chert

Nannos	A
Forams	C
Rads	R
Recrystallized calcite	A
Recrystallized silica	R

Site 305 Hole Core 54 Cored Interval: 503.5-513.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
ALBIAN	Prediscosphaera cretacea Ticinella primula ?	N R F	O R R	O P P	Core Catcher			bx	* CC	N9

Both lithologies broken up by drilling.
CHERT (vitreous).
Intensely mottled light gray (N7), medium light gray (N6) and grayish black (N2). White chalk crusts on irregular chert surfaces and in vugs.

NANNO CHALK, white, homogeneous.

Composition of chalk

Nannos	A
Forams	R
Rads	R
Recrystallized calcite	C
Recrystallized silica	R

Site 305 Hole Core 55 Cored Interval: 513.0-522.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO ALBIAN	Parhabdolithus angustus	N R F	C R	P P	0	Core Catcher		bx	CC	N7

CHERT (vitreous), broken up by drilling. Dominantly light gray (N7), showing resilicified fractures.

Site 305 Hole Core 56 Cored Interval: 522.0-531.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN	Parhabdolithus angustus	N R F	F R	P P	0					
					1	0.5	VOID		135	10R 4/2
						1.0		bx	CC	
						Core Catcher				

Broken up by drilling.
CHERT (vitreous), dominantly grayish red (10R 4/2) with layers and patches of white (N9) weakly silicified Nanno chalk, which also covers the chert surfaces and partly fills vugs.

Composition of chalk layer from chert 1-135

Nannos	A
Forams	C
Recrystallized calcite	C
Recrystallized silica	R

Site 305 Hole Core 57 Cored Interval: 531.5-541.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN	Parhabdolithus angustus Globigerinelloides ferreolensis	N R F	C R F	P P M	0	Core Catcher		bx	*CC	N7

Broken up by drilling.
CHERT (vitreous) light gray (N7) with irregular contact to grayish red (10R 4/2). Surface covered with white FORAM NANNO CHALK, also partly filling vugs.
Many resilicified fractures in chert.

Composition of chalk crust

Nannos	A
Forams	C
Recrystallized calcite	A

Site 305 Hole Core 58 Cored Interval: 541.0-550.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN	Watznaueria oblonga Globigerinelloides ferreolensis Acaeniotyle umbillicata	N R F	A C R	P M P	0	Core Catcher		bx	*CC	N9 10YR 6/2

Sediment brecciated by drilling.
White (N9) RADIOLARIAN NANNO LIMESTONE and pale yellowish brown (10YR 6/2) CHERT with laminae of very pale orange (10YR 8/2). Chert shows many subparallel fractures filled with chalcedony.

Composition of limestone

Nannos	A
Rads	A
Recrystallized calcite	R
Recrystallized silica	R

Carbon-Carbonate
CC (7.6-0-63)

Site 305 Hole Core 59 Cored Interval: 550.5-560.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN	Watznaueria oblonga Globigerinelloides ferreolensis Acaeniotyle umbillicata	R N F	C A F	M P M	0					
					1	0.5	VOID		100	
						1.0		bx	*	
									*140	

Fragmented by drilling. No core catcher sample retrieved.

FORAM-RADIOLARIAN-BEARING NANNO LIMESTONE, white (N9) with medium light gray (N6) laminae.

CHERT pieces showing sharp contact with limestone. Colors of chert are dominantly pale brown (10YR 5/2) and pale yellowish brown (10YR 6/2). Chert is also found as small nodules (<3 cm) in limestone.

Smear Slide at 1-140

Composition	
Nannos	A
Forams	C
Rads	R-C
Recrystallized calcite	C
Recrystallized silica	R
Light glass	R

X-ray	1-130	1-140
Calc	38%	93%
Quar	61%	7%
Mica	1%	0%
Amor	34.9%	32.8%

Site 305 Hole Core 60 Cored Interval: 560.0-569.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
APTIAN TO BARREMIAN	Watznaueria oblonga / Acaeniotyle umbilicata	R / R	R / C	P / M	0				
					1	0.5 / 1.0	VOID		
		N / F	A / —	P / —	Core Catcher			bx	* 115 CC

LITHOLOGIC DESCRIPTION

Brecciated by drilling. Silicified RADIOLARIAN NANNO LIMESTONE white (N9), laminated.

CHERT (vitreous), pale yellowish brown (10YR 6/2) with laminae of moderate yellowish brown (10YR 5/4). Many subparallel fractures welded by silica. Sharp contacts with limestone. A few pieces are dark reddish brown (10R 3/4) and moderate brown (5YR 4/4).

Smear Slide at 1-115

Composition	
Rads	A
Nannos	C
Forams	R
Recrystallized calcite	R
Recrystallized silica	R

Carbon-Carbonate
1-104 (3.8-0-31)

X-ray 1-104
Calc 47%
Quar 53%
Amor 33.4%

Site 305 Hole Core 61 Cored Interval: 569.5-579.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
APTIAN TO BARREMIAN	Watznaueria oblonga / Acaeniotyle umbilicata				0				
					1	0.5 / 1.0	VOID		
		F / N	— / A	— / M	Core Catcher				* 147 CC

LITHOLOGIC DESCRIPTION

Silicified RADIOLARIAN NANNO LIMESTONE. Thinly laminated white (N9), light gray (N7) and light olive gray (5Y 6/1). Burrows common.

CHERT brownish gray (5YR 4/1) and (5YR 4/1) with sharp boundaries with limestone. No vugs.

Proportion of chert markedly lower than in upper cores.

Fragmented by drilling.

Smear Slide at 1-147

Composition	
Rads	A
Nannos	C
Recrystallized calcite	C
Recrystallized silica	C

Carbonate
1-135 (33)

Site 305 Hole Core 62 Cored Interval: 579.0-588.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
APTIAN TO BARREMIAN	Watznaueria oblonga				0				
		N / R / F	C / R / —	P / P / —	Core Catcher			bx	CC

LITHOLOGIC DESCRIPTION

Fragmented by drilling.

CHERT with vitreous luster and conchoidal fractures. Mottled with pinkish gray (5YR 8/1) and medium light gray (N6) colors. Small vugs and chert surfaces lined with partly silicified RADIOLARIAN-BEARING NANNO CHALK.

Site 305 Hole Core 63 Cored Interval: 588.5-598.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
APTIAN TO BARREMIAN	Watznaueria oblonga / Acaeniotyle umbilicata				0				
		R	F	M	1	0.5 / 1.0	VOID		* 100
		N / F	A / R	M / P	Core Catcher			bx	* 140 * CC

LITHOLOGIC DESCRIPTION

Brecciated by drilling.

PORCELLANITE with common Radiolaria. It is irregularly laminated with shades of light gray (N7) and bioturbated.

RADIOLARIAN-NANNO LIMESTONE, white (N9) with sharp contact to chert.

CHERT is partly laminated and shows a porcellaneous luster. Colors are light brownish gray (5YR 6/1) and pinkish gray (5YR 8/1).

Composition of limestone 1-140

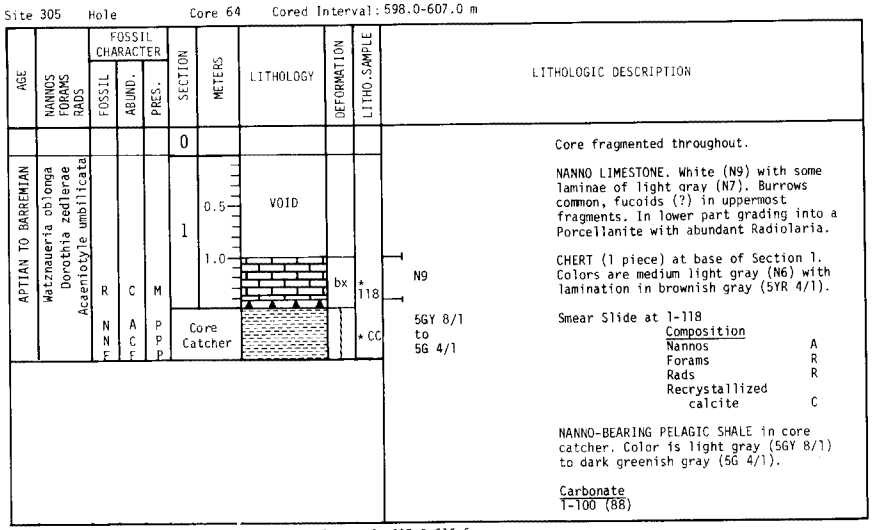
Rads	A
Nannos	C
Recrystallized calcite	C
Recrystallized silica	C
Detrital clay	R

Minor lithology is dark yellowish brown (10YR 4/2) NANNO-BEARING PELAGIC SHALE.

Smear Slide at 1-100

Composition	
Nannos	C
Recrystallized calcite	R
Hematite	R
Detrital clay	A

Site 305 Hole Core 64 Cored Interval: 598.0-607.0 m



Core fragmented throughout.

NANNO LIMESTONE. White (N9) with some laminae of light gray (N7). Burrows common, fucoids (?) in uppermost fragments. In lower part grading into a Porcellanite with abundant Radiolaria.

CHERT (1 piece) at base of Section 1. Colors are medium light gray (N6) with lamination in brownish gray (5YR 4/1).

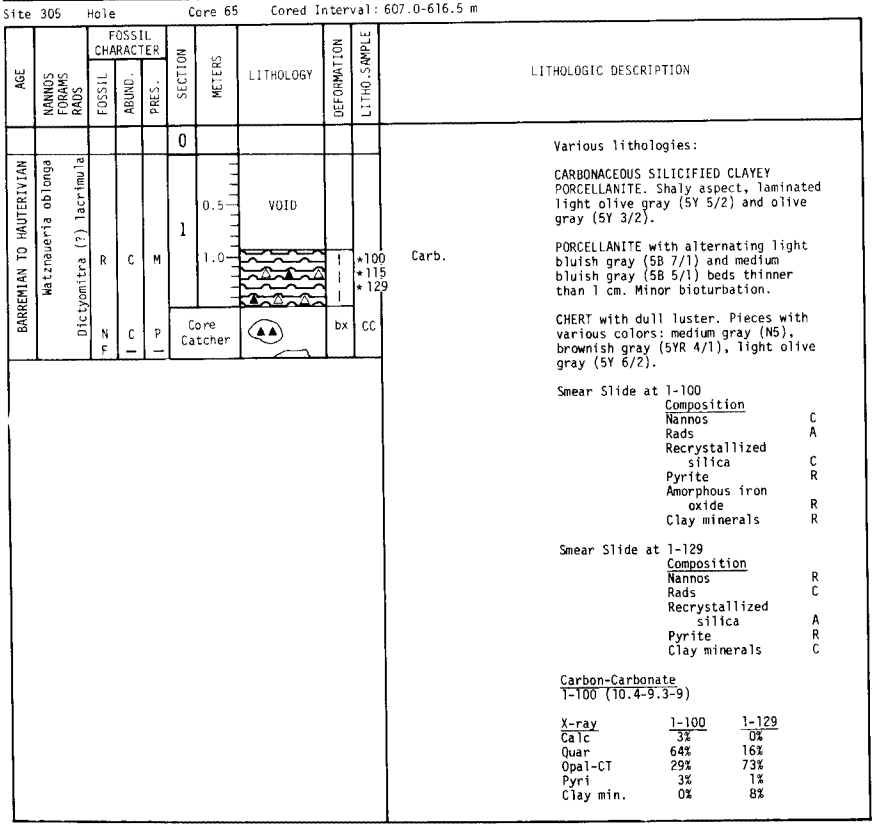
Smear Slide at 1-118

Composition	
Nannos	A
Forams	R
Rads	R
Recrystallized calcite	C

NANNO-BEARING PELAGIC SHALE in core catcher. Color is light gray (5GY 8/1) to dark greenish gray (5G 4/1).

Carbonate
1-100 (88)

Site 305 Hole Core 65 Cored Interval: 607.0-616.5 m



Various lithologies:

CARBONACEOUS SILICIFIED CLAYEY PORCELLANITE. Shaly aspect, laminated light olive gray (5Y 5/2) and olive gray (5Y 3/2).

PORCELLANITE with alternating light bluish gray (5B 7/1) and medium bluish gray (5B 5/1) beds thinner than 1 cm. Minor bioturbation.

CHERT with dull luster. Pieces with various colors: medium gray (N5), brownish gray (5YR 4/1), light olive gray (5Y 6/2).

Smear Slide at 1-100

Composition	
Nannos	C
Rads	A
Recrystallized silica	C
Pyrite	R
Amorphous iron oxide	R
Clay minerals	R

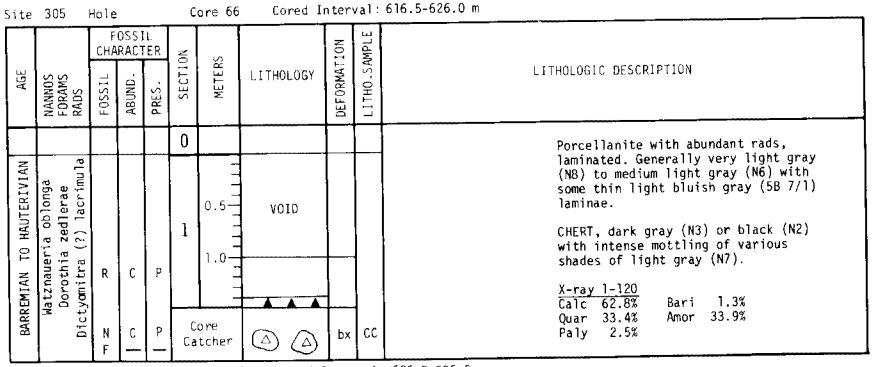
Smear Slide at 1-129

Composition	
Nannos	R
Rads	C
Recrystallized silica	A
Pyrite	R
Clay minerals	C

Carbon-Carbonate
1-100 (10.4-9.3-9)

X-ray	1-100	1-129
Calc	3%	0%
Quar	64%	16%
Opal-CT	29%	73%
Pyri	3%	1%
Clay min.	0%	8%

Site 305 Hole Core 66 Cored Interval: 616.5-626.0 m



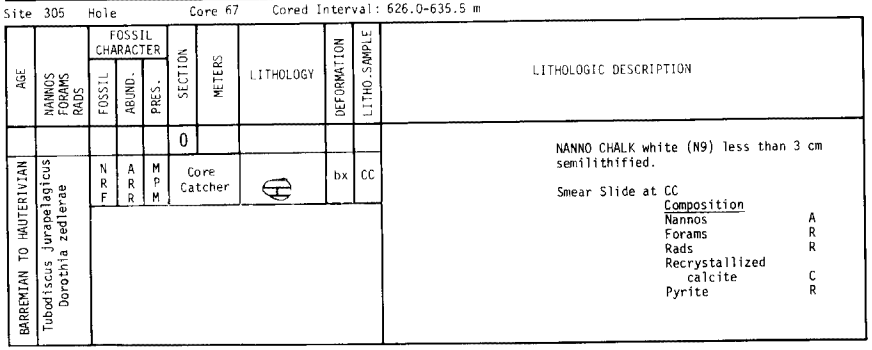
Porcellanite with abundant rads, laminated. Generally very light gray (N8) to medium light gray (N6) with some thin light bluish gray (5B 7/1) laminae.

CHERT, dark gray (N3) or black (N2) with intense mottling of various shades of light gray (N7).

X-ray 1-120

Calc	62.8%	Bari	1.3%
Quar	33.4%	Amor	33.9%
Paly	2.5%		

Site 305 Hole Core 67 Cored Interval: 626.0-635.5 m

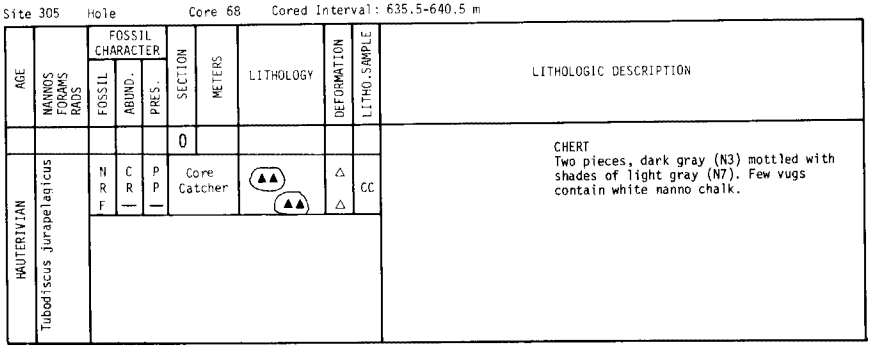


NANNO CHALK white (N9) less than 3 cm semilithified.

Smear Slide at CC

Composition	
Nannos	A
Forams	R
Rads	R
Recrystallized calcite	C
Pyrite	R

Site 305 Hole Core 68 Cored Interval: 635.5-640.5 m



CHERT
Two pieces, dark gray (N3) mottled with shades of light gray (N7). Few vugs contain white nanno chalk.

DEEP SEA DRILLING PROJECT

LEG 32 SITE 306

SITE SUMMARY SHEET

POSITION: Latitude: 31°52.02'N Longitude: 157°28.71'E

Water depth: 3399 corrected meters (echo sounding)

Bottom felt at: 3416 meters (drill pipe) Penetration: 475 meters

Number of Holes: 1 Number of Cores: 42

Total length of cored section: 380.5 m Total core recovered: 27.3 m

Percentage of core recovery: 7.2%

OLDEST SEDIMENT CORED:

Depth below sea floor: 475 meters Nature: Green marl and chert

Age: Valanginian-Berriasian

BASEMENT:

Depth below sea floor: Not reached

PRINCIPAL RESULTS:

Southwest flank of Shatsky Rise has a cover mainly of interbedded chert and chalk: 25 meters Albian, 85 meters Albian-Aptian, on 125 meters Aptian-Barremian, on 85 meters Hauterivian-Valanginian, on 65 meters Valanginian, on 95 meters Valanginian-Berriasian, at total depth, perhaps about 80 meters above basement.

Site 306 Hole Core 1 Cored Interval: 0.0-9.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
MIXED MESOZOIC AND CENOZOIC	Artostrobium tumidulum	N	A	M	0		VOID		
					1	0.5			10YR 7/3
						1.0			10YR 4/3
					2				10YR 7/3
									graded
									* 100
									10YR 5/4
									* 131
					3				10YR 7/3
					4				Motted with 10YR 8/2 & 10YR 4/4
									10YR 8/2
					5				Mottled with 10YR 8/2, 10YR 4/4 & N7
					6				
							VOID		* 100
		N F	A A	P G	Core Catcher				* CC

Core is deformed throughout. Colors are grayish orange (10YR 7/3, 10YR 4/3) or mottled with very pale orange (10YR 8/2), moderate brown (10YR 4/4) and white (N7). Mottling caused by drilling. Core is soft and contains many pieces of stiff, white chalk, some Mn-nodules, pumice and chert fragments. Chert is moderate brown.

Sediment is dominantly a NANNO FORAM OOZE, partly mixed with patches and disturbed layers of SILICEOUS FORAM NANNO OOZE.

NANNO FORAM OOZE.

Smear Slide at 2-100

Composition	
Forams	A
Nannos	A
Light and brown glass	C
Clay	R

Minor lithology is SILICEOUS FORAM NANNO OOZE.

Smear Slide at 2-131

Composition	
Nannos	A
Forams	C
Diatoms	C
Rads	C
Sponge spicules	R
Volcanic glass	R-C
Quartz and feldspar	C
Clay	R

Grain Size
2-103 (0-21-79) clay

Carbon-Carbonate
2-133 (7.2-0.1-60)

X-ray 2-128

Calc 85%	Plag 1.5%	Amor 53.4%	
Quar 8.5%	Mica 5%		

Site 306 Hole Core 2 Cored Interval: 9.5-19.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
ALBIAN	Lithraphidites alatus Rotalipora apenninica Dictyomitra somphedia	N F R	C C F	M M P	0		Core Catcher	bx	* CC

CHERT with vitreous luster and conchoidal fractures and streaks and blebs of partly silicified chalk. Color is moderate yellowish brown (10YR 5/4).

Thin crust of grayish yellow (5Y 8/1) silicified RADIOLARIAN-FORAM-BEARING CHALK on chert pieces.

Composition of chalk

Nannos	A
Forams	C
Rads	C
Recrystallized silica	C
Clay	R

Carbonate
CC (57)

Site 306 Hole Core 3 Cored Interval: 19.0-28.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
ALBIAN	Lithraphidites alatus Rotalipora apenninica Dictyomitra somphedia	N F R	A A F	P G P	0		Core Catcher	bx	* CC

CHERT, 2 types:
1) Dark yellowish brown (10YR 4/2), vitreous; gradational decrease of silicification towards adjacent chalk.
2) Mottled grayish black (N2) and medium dark gray (N4). Vugs up to 1 cm common, partly filled with chalk.

FORAM-BEARING NANNO CHALK and OOZE, white (N7). Faintly laminated.

Composition of chalk

Nannos	A
Forams	C
Echinoid spines	R
Phillipsite	R

Site 306 Hole Core 4 Cored Interval: 37.5-47.0 m

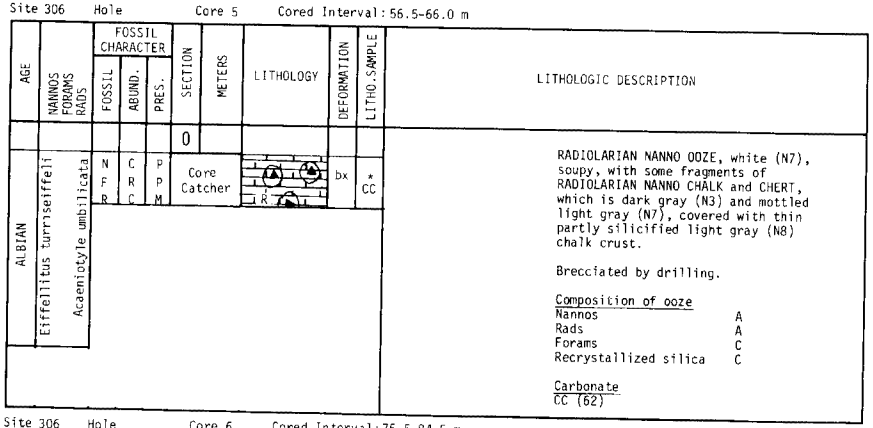
AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE
ALBIAN	Eiffellithus turriseiffeli Ticinella primula Dictyomitra somphedia	N F R	A C C	M G P	0				
					1	0.5	VOID		
						1.0			
					Core Catcher			bx	* CC

Brecciated by drilling. White (N7) RADIOLARIAN-FORAM-BEARING NANNO OOZE, soupy, mixed with dark gray (N3) CHERT fragments showing only partly silicified very light gray (N8) rim.

Composition of ooze

Nannos	A
Forams	C
Rads	C
Echinoid spines	R
Recrystallized calcite	R
Dark glass	R
Clay	R

Site 306 Hole Core 5 Cored Interval: 56.5-66.0 m



RADIOLARIAN NANNO OOZE, white (N7), soupy, with some fragments of RADIOLARIAN NANNO CHALK and CHERT, which is dark gray (N3) and mottled light gray (N7), covered with thin partly silicified light gray (N8) chalk crust.

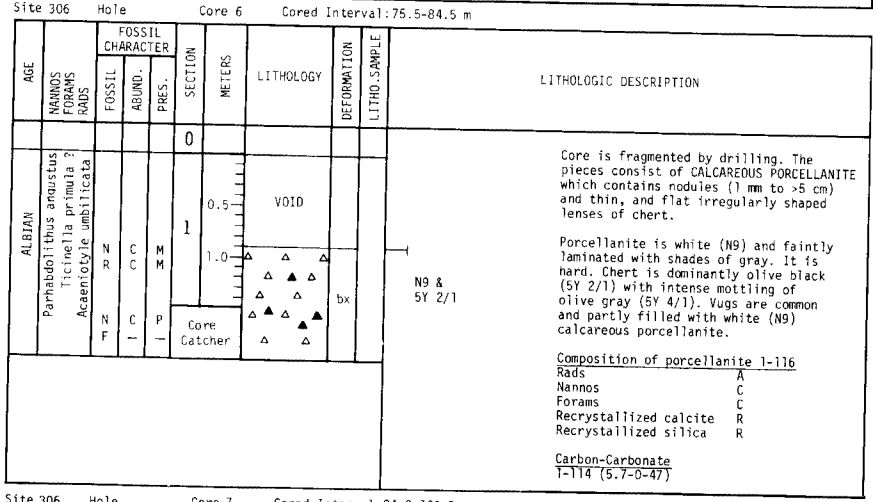
Brecciated by drilling.

Composition of ooze

Nannos	A
Rads	A
Forams	C
Recrystallized silica	C

Carbonate
CC (62)

Site 306 Hole Core 6 Cored Interval: 75.5-84.5 m



Core is fragmented by drilling. The pieces consist of CALCAREOUS PORCELLANITE which contains nodules (1 mm to >5 cm) and thin, and flat irregularly shaped lenses of chert.

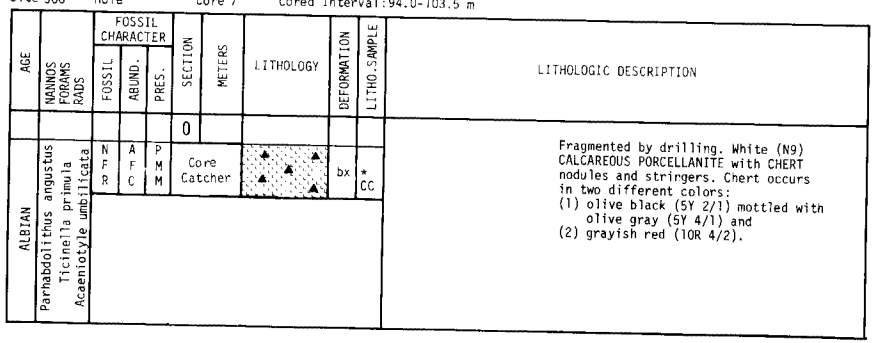
Porcellanite is white (N9) and faintly laminated with shades of gray. It is hard. Chert is dominantly olive black (5Y 2/1) with intense mottling of olive gray (5Y 4/1). Vugs are common and partly filled with white (N9) calcareous porcellanite.

Composition of porcellanite 1-116

Rads	A
Nannos	C
Forams	C
Recrystallized calcite	R
Recrystallized silica	R

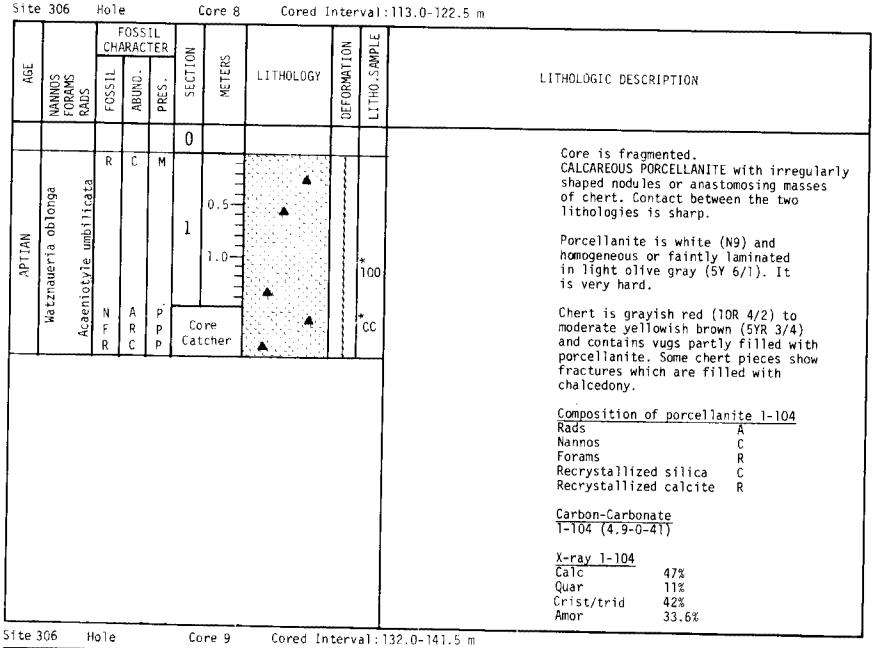
Carbon-Carbonate
1-114 (5.7-0-47)

Site 306 Hole Core 7 Cored Interval: 94.0-103.5 m



Fragmented by drilling. White (N9) CALCAREOUS PORCELLANITE with CHERT nodules and stringers. Chert occurs in two different colors:
(1) olive black (5Y 2/1) mottled with olive gray (5Y 4/1) and
(2) grayish red (10R 4/2).

Site 306 Hole Core 8 Cored Interval: 113.0-122.5 m



Core is fragmented.
CALCAREOUS PORCELLANITE with irregularly shaped nodules or anastomosing masses of chert. Contact between the two lithologies is sharp.

Porcellanite is white (N9) and homogeneous or faintly laminated in light olive gray (5Y 6/1). It is very hard.

Chert is grayish red (10R 4/2) to moderate yellowish brown (5YR 3/4) and contains vugs partly filled with porcellanite. Some chert pieces show fractures which are filled with chalcedony.

Composition of porcellanite 1-104

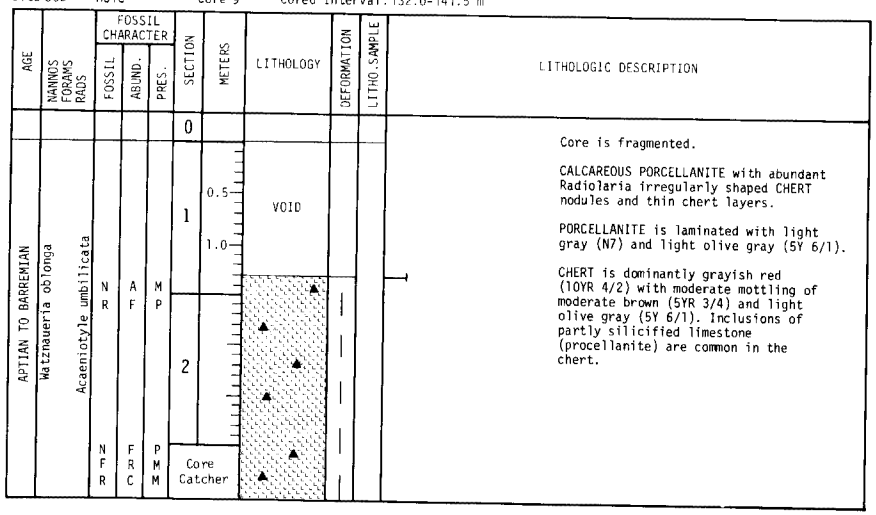
Rads	A
Nannos	C
Forams	R
Recrystallized silica	C
Recrystallized calcite	R

Carbon-Carbonate
1-104 (4.9-0-41)

X-ray 1-104

Calc	47%
Quar	11%
Crist/trid	42%
Amor	33.6%

Site 306 Hole Core 9 Cored Interval: 132.0-141.5 m



Core is fragmented.

CALCAREOUS PORCELLANITE with abundant Radiolaria irregularly shaped CHERT nodules and thin chert layers.

PORCELLANITE is laminated with light gray (N7) and light olive gray (5Y 6/1).

CHERT is dominantly grayish red (10YR 4/2) with moderate mottling of moderate brown (5YR 3/4) and light olive gray (5Y 6/1). Inclusions of partly silicified limestone (procellanite) are common in the chert.

Site 306 Hole Core 10 Cored Interval: 151.0-160.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					CALCAREOUS PORCELLANITE with abundant Radiolaria, laminated (<2 mm) greenish gray (5G 6/1 and 5GY 6/1) and very light gray (N8) with CHERT moderate brown (5YR 3/4) to grayish red (10R 4/2). Small stringers are light gray (N7). Some fractures filled with clear chalcedony. Proportion of chert smaller than in Core 9.
APTIAN TO BARREMIAN	Watznaueria oblonga Acaeniotyle umbilicata	R	C	M	1	0.5 1.0	VOID			
		N F R	R I C	M I M	Core Catcher					

Site 306 Hole Core 11 Cored Interval: 169.5-179.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					CALCAREOUS PORCELLANITE with abundant Radiolaria very light gray (N8) to light olive gray (5Y 6/1), laminated, and contains chert stringers. Carbonate content 25%.
APTIAN TO BARREMIAN	Watznaueria oblonga Acaeniotyle umbilicata	R	C	M	1	0.5 1.0	VOID	△ △ △		CHERT nodules of irregular shape intercalated in porcellanite. Colors: moderate brown (5YR 3/4) with minor mottling of grayish red (10R 4/2). Many inclusions of white less silicified limestone.
		N F R	C I C	P I M	Core Catcher					Fragmented by drilling.

Site 306 Hole Core 12 Cored Interval: 188.5-198.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					Core is fragmented.
APTIAN TO BARREMIAN	Watznaueria oblonga Dorothia zedlevae Acaeniotyle umbilicata	F N R	R A C	G M M	1	0.5 1.0	VOID			CALCAREOUS PORCELLANITE with some CHERT nodules.
					Core Catcher				* CC	Porcellanite is greenish gray (5GY 6/1) and light gray (N7). It is generally faintly laminated with numerous thin burrows. According to X-ray analysis both quartz and opal-CT are present.

Chert is mottled with olive gray (5Y 4/1) and greenish gray (5G 6/1).

Minor lithology: a thin layer of CARBONACEOUS SILICIFIED RADIOLARIAN SHALE occurs in the CC.

Smear Slide at CC

Composition	
Rads	C
Forams	R
Recrystallized silica	C
Pyrite	C
Detrital clay	C
Dark glass	R

Carbonate (porcellanite)
CC (14)

Site 306 Hole Core 13 Cored Interval: 207.5-217.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					PORCELLANITE (noncalcareous) thinly laminated grayish olive green (5GY 3/2), greenish black (5GY 2/1) and black. Thin layer of black CARBONACEOUS, SILICIFIED RADIOLARIAN SHALE.
APTIAN TO BARREMIAN	Watznaueria oblonga	N R	R C	P P	Core Catcher		△ △ △		* CC	

Site 306 Hole Core 14 Cored Interval: 217.0-226.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					Pieces of homogeneous light gray (N7) CALCAREOUS PORCELLANITE and of dominantly greenish gray (5GY 6/1) laminated and faintly bioturbated noncalcareous PORCELLANITE. Both lithologies contain abundant Radiolaria.
BARREMIAN TO HAUTERIVIAN	Dictyomitra lacrimula	R	C	M	Core Catcher		△ △ △ △ △ △ △ △ △	bx		Carbonate CC (27)

Site 306 Hole Core 15 Cored Interval: 226.0-235.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					Small amount of scrapings retrieved, appears to be porcellanite.
					Core Catcher					

Site 306 Hole Core 16 Cored Interval: 235.0-244.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
BARREMIAN TO HAUTERIVIAN	Dictyomitra lacrimula				0					CHERT, grayish black (N2) with minor mottling of medium gray (N5). Thin crust of CALCAREOUS PORCELLANITE, very light gray (N8) on chert fragments. Broken up by drilling.
					Core Catcher					

Site 306 Hole Core 17 Cored Interval: 244.0-253.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
BARREMIAN TO HAUTERIVIAN	Tubodiscus jurapelagicus / Dictyomitra lacrimula				0					CHERT grayish black (N2) with moderate mottling of medium gray (N5) with minor NANNO OOZE, yellowish gray (5Y 8/1). Smear Slide at CC Composition Nannos D Rads R Dolomite R Recrystallized calcite R
		N	A	M	Core Catcher			bx	* CC	

Site 306 Hole Core 18 Cored Interval: 253.0-262.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
BARREMIAN TO HAUTERIVIAN	Tubodiscus jarapelagicus / Dictyomitra lacrimula				0					Pieces of CHERT and CALCAREOUS PORCELLANITE. Chert is grayish black (N2) with moderate mottling of gray (N5). It contains vugs filled with silicified NANNO CHALK. Color of porcellanite is light gray (N8). Minor lithology NANNO CHALK. Smear Slide at CC Composition Nannos D Recrystallized calcite R Recrystallized silica R
		N	A	M	Core Catcher			bx	*	

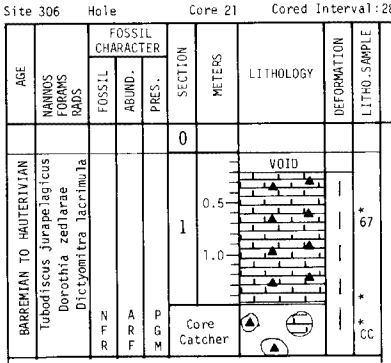
Site 306 Hole Core 19 Cored Interval: 262.5-271.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
BARREMIAN TO HAUTERIVIAN	Tubodiscus jurapelagicus / Dorothia zedlarae / Dictyomitra lacrimula				0					CHERT grayish black (N2) with moderate mottling of gray (N5). Rare vugs filled with silicified chalk. Clayey NANNO OOZE, dusky yellowish green (5GY 5/2). Fragmented by drilling.
		N F	A R	M G	Core Catcher			△ △	* CC	

Site 306 Hole Core 20 Cored Interval: 271.5-281.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
BARREMIAN TO HAUTERIVIAN	Tubodiscus jurapelagicus / Dorothia zedlarae				0					Core is deformed throughout. Originally it was a chalk which was completely broken up to soft ooze by drilling. Lumps of chalk and chips of chert are dispersed throughout the core. Colors of ooze are white (N9), dusky yellow (5Y 6/2) and yellowish gray (5Y 7/2). NANNO OOZE. Smear Slide at 1-105 Composition Nannos D Recrystallized calcite C Dolomite R Detrital clay R
		N F R	C R R	P G P	1	0.5	VOID		* ** 105 * CC	5Y 7/2 5Y 6/2 N9
					2	1.0				
					Core Catcher					

Site 306 Hole Core 21 Cored Interval: 281.0-290.5 m



LITHOLOGIC DESCRIPTION

Core is moderately deformed.

NANNO CHALK alternating with CHERT nodules.

Chalk is faintly laminated with numerous small burrows. Its colors are light olive gray (5Y 5/2) and yellowish gray (5Y 7/2).

Chert nodules are grayish black (N2) or dark gray (N3).

NANNO CHALK.

Smear Slide at 1-67

Composition	
Nannos	D
Recrystallized calcite	R
Pyrite	R
Amorphous iron oxide	R
Clay	R

Minor lithology: RAD-BEARING NANNO CHALK.

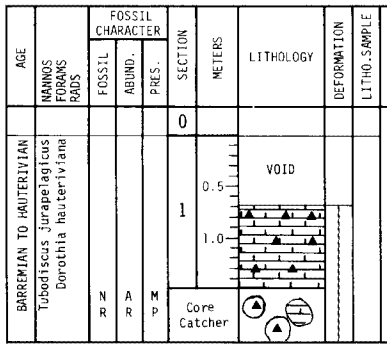
Smear Slide at CC

Composition	
Nannos	D
Rads	C
Forams	R
Recrystallized silica	R
Pyrite	R
Amorphous iron oxide	R
Detrital clay	R

Carbon-Carbonate
1-67 (10.3-0.2-84)
1-144 (10.7-1.2-79)

X-ray	1-67	1-144
Calc	93%	91%
Quar	6%	7%
Mica	0%	1%
Bari	1%	1%
Amor	31.0%	33.1%

Site 306 Hole Core 22 Cored Interval: 290.5-300.0 m

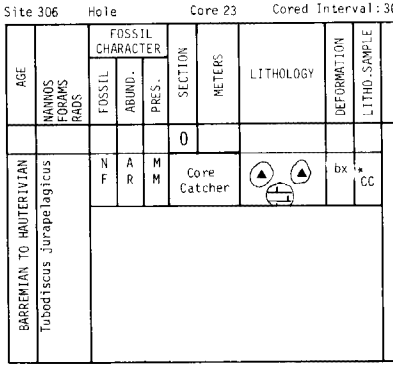


LITHOLOGIC DESCRIPTION

CHERT mainly with some NANNO CHALK. Chert is intensely mottled dark gray (N3) and medium gray (N5).

Chalk laminated light olive gray (5Y 5/2) and yellowish gray (5Y 7/2), bioturbated. Generally disturbed by drilling.

Site 306 Hole Core 23 Cored Interval: 300.0-309.0 m



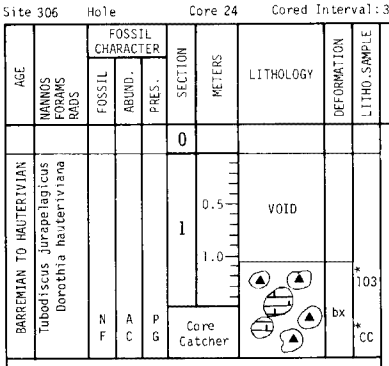
LITHOLOGIC DESCRIPTION

CHERT, intensely mottled dark gray (N3) and medium gray (N5), irregular shape, with minor NANNO CHALK with thin lamination largely disturbed by bioturbation. Light olive gray (5Y 5/2) and yellowish gray (5Y 7/2) mottling.

Smear Slide at CC

Composition	
Nannos	D
Recrystallized calcite	C
Pyrite	R
Dark glass	R

Site 306 Hole Core 24 Cored Interval: 309.0-218.5 m



LITHOLOGIC DESCRIPTION

Core brecciated by drilling.

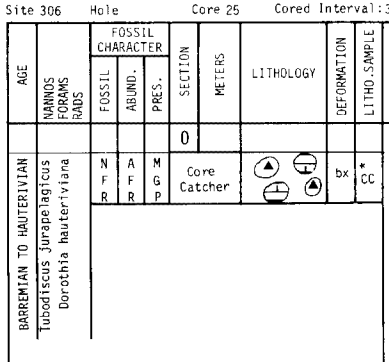
CHERT. Intensely mottled olive gray (5Y 4/1), olive black (5Y 2/1) and dark gray (N3) and NANNO CHALK with wavy lamination and burrows. Dominantly light olive gray (5Y 5/2) and yellowish gray (5Y 7/2).

Smear Slide at 1-103

Composition	
Nannos	D
Recrystallized calcite	C
Pyrite	R
Dark glass	R

Carbon-Carbonate
1-102 (11.5-0.2-95)

Site 306 Hole Core 25 Cored Interval: 318.5-327.5 m



LITHOLOGIC DESCRIPTION

Brecciated by drilling.

CHERT mottled olive gray (5Y 4/1), olive black (5Y 2/1) and dark gray (N3), and NANNO CHALK light olive gray (5Y 5/2).

Smear Slide at CC

Composition	
Nannos	D
Recrystallized calcite	R
Detrital clay	R

Carbonate
CC (93)

Site 306 Hole Core 26 Cored Interval: 327.5-337.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
BARREMIAN TO HAUTERIVIAN Tubodiscus jurapelagicus Dorothia hauteriviana		N R	A R	M P	Core Catcher			bx	* CC	Brecciated by drilling. CHERT mottled olive gray (5Y 4/1), olive black (5Y 2/1) and dark gray (N3) and pieces of NANNO CHALK, light olive gray (5Y 5/2). Smear Slide at CC Composition Nannos D Recrystallized calcite C Carbonate CC (94)

Site 306, Core 27, 337.0-346.5 m: NO RECOVERY

Site 306 Hole Core 28 Cored Interval: 346.5-355.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
HAUTERIVIAN TO VALANGINIAN Tubodiscus jurapelagicus		N R	C R	P P	Core Catcher					CHERT intensely mottled olive black (5Y 2/1) and olive gray (5Y 4/1) with some fractures filled with chalcedony. NANNO CHALK, thin layer on chert light gray (5Y 7/1). Broken up by drilling.

Site 306 Hole Core 29 Cored Interval: 335.5-365.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
HAUTERIVIAN TO VALANGINIAN Tubodiscus jurapelagicus		N F	A F	M G	Core Catcher			bx	* CC	Pieces of NANNO CHALK and CHERT. CHALK is light gray (5Y 7/1) and strongly bioturbated. CHERT is intensely and irregularly mottled olive black (5Y 2/1) and olive gray (5Y 4/1). The lighter lithology is a CALCAREOUS PORCELLANITE. Because of the very irregular silicification the chert shows rather the dull luster, typical of porcellanite. Microcrystalline quartz and some chalcedony are the only silica phases present in the chert. NANNO CHALK. Smear Slide at CC Composition Nannos D Recrystallized calcite R Pyrite R Clay R Carbon-Carbonate CC (11.5-0.1-95) X-ray CC Calc 86% Quar 14% Amor 31.4%

Site 306 Hole Core 30 Cored Interval: 365.0-374.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
HAUTERIVIAN TO VALANGINIAN Tubodiscus jurapelagicus		N R	A R	P P	Core Catcher					CHERT intensely mottled olive black (5Y 2/1), olive gray (5Y 4/1) and medium light gray (N6). Relic burrow structures and abundant Radiolaria. Crust of partly silicified nanno chalk white (N9) on chert fragments.

Site 306, Core 31, 374.5-376.5 m: NO RECOVERY

Site 306 Hole Core 32 Cored Interval: 376.5-384.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
HAUTERIVIAN TO VALANGINIAN	Watznaueria britannica	N R	A R	P P	Core Catcher			△ △		CHERT olive black (5Y 2/1) and olive gray (5Y 4/1) mottling with irregular patches of very light gray (N8) porcellanite. Broken up by drilling.

Site 306 Hole Core 33 Cored Interval: 384.0-393.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
HAUTERIVIAN TO VALANGINIAN	Watznaueria britannica	R	R	P	Core Catcher			△ △		CHERT (2 pieces) intensely mottled medium gray (N5) and light olive gray (5Y 6/1), containing irregular layers of white (N9) to light olive gray (5Y 6/1) PORCELLANITE.

Site 306 Hole Core 34 Cored Interval: 393.0-402.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
HAUTERIVIAN TO VALANGINIAN	Watznaueria britannica	N R	C R	P P	Core Catcher			△ △		CHERT olive black (5Y 2/1) with moderate mottling of olive gray (5Y 4/1) and crust of light gray (N8) PORCELLANITE. Broken up by drilling.

Site 306 Hole Core 35 Cored Interval: 402.0-411.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
VALANGINIAN	Watznaueria britannica	N R	O R	O P	Core Catcher			bx		Few CHERT pieces which were fragmented by drilling. CHERT is intensely mottled medium gray (N5) and light olive gray (5Y 6/1). It contains irregular less silicified layers and patches of white (N9) to light olive gray (5Y 6/1) CALCAREOUS PORCELLANITE. Therefore the chert shows rather porcellanite-like dull luster. Curved fractures in the chert are filled with chalcedony.

Site 306 Hole Core 36 Cored Interval: 411.5-421.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
VALANGINIAN	Watznaueria britannica	N F R	A R R	P P P	Core Catcher			bx	* CC	Pieces of NANNO CHALK and CHERT. NANNO CHALK is light olive gray (5Y 6/1) with irregular lamination, partly disrupted by bioturbation structures. CHERT is olive black (5Y 2/1), moderately mottled with olive gray (5Y 4/2). It contains layers, laminae and roundish patches of light gray (N7) to light olive gray (5Y 6/1) CALCAREOUS PORCELLANITE. Therefore, the chert appear rather dull than vitreous, although it shows conchoidal fractures. NANNO CHALK. Smear Slide at CC Composition Nannos D Recrystallized calcite C Pyrite R Carbon-Carbonate CC (10.6-0.2-86) X-ray CC Calc 97.5% Bari 1.5% Pyri 0.5% Amor 30.1%

Site 306 Hole Core 37 Cored Interval: 421.0-430.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
VALANGINIAN	Watznaueria britannica	N F R	A R R	P P P	Core Catcher			bx	* CC	

Pieces of NANNO CHALK and CHERT.

NANNO CHALK is light olive gray (5Y 6/1). Its irregular lamination is partly disturbed by bioturbation structures.

CHERT is olive black (5Y 2/1) and moderately mottled with olive gray (5Y 4/2). It contains irregular layers and patches of light gray (N7) to light olive gray (5Y 6/1) CALCAREOUS PORCELLANITE. Therefore the chert shows rather a dull luster. It fractures conchoidally.

NANNO CHALK.

Smear Slide at CC

Composition	
Nannos	D
Rads	R
Recrystallized calcite	R
Pyrite	R

Carbonate
CC (96)

Site 306 Hole Core 38 Cored Interval: 430.5-440.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
VALANGINIAN	Watznaueria britannica	N F	O F	O P	Core Catcher			bx	* CC	

Pieces of NANNO CHALK and CHERT.

NANNO CHALK is light olive gray (5Y 6/1). It is irregularly laminated and slightly bioturbated.

CHERT is olive black (5Y 2/1) with moderate mottling of olive gray (5Y 4/2). It contains irregular layers and patches of light gray (N7) to light olive gray CALCAREOUS PORCELLANITE giving the whole rock a rather dull luster.

NANNO CHALK.

Smear Slide at CC

Composition	
Nannos	A
Recrystallized calcite	C
Pyrite	R
Dark glass	R

Carbonate
CC (93)

Site 306 Hole Core 39 Cored Interval: 440.0-449.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
		P	R	P	Core Catcher			bx		

Few CHERT pieces only.

CHERT is olive black (5Y 2/1) and mottled with olive gray (5Y 4/2). It contains light gray (N7) to light olive gray (5Y 6/1) layers and irregular patches of less silicified CALCAREOUS PORCELLANITE. Therefore chert shows dull, porcellanite-like luster.

Site 306 Hole Core 40 Cored Interval: 449.5-459.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
					0					
VALANGINIAN	Watznaueria britannica	N F R	A R C	P P P	1	0.5	VOID			
						1.0				
					Core Catcher			bx	* CC	

Intensely disturbed to brecciated CHERT and CHALK.

CHERT is dominantly grayish brown (5YR 5/2) mottled with patches and discontinuous laminae of dark greenish gray (5GY 4/1) PORCELLANITE and olive black (5Y 2/1) CHERT.

NANNO CHALK with some Radiolaria is thinly laminated grayish green (5G 5/2) and light olive gray (5Y 6/1).

NANNO CHALK.

Smear Slide at CC

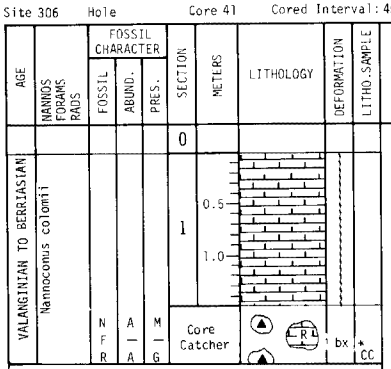
Composition	
Nannos	A
Rads	R
Dolomite	R
Pyrite	R

Carbon-Carbonate
1-110 (10.5-0.2-86)
1-95 (0-0-42)
CC (0-0-80)

X-ray 1-135

Calc	96.5%	Bari	3.0%
Quar	0.5%	Amor	43.5%

Site 306 Hole Core 41 Cored Interval: 459.0-467.5 m



LITHOLOGIC DESCRIPTION

Core is severely deformed. Dominant lithologies are silicified NANNO CHALK and CHERT with minor RAD NANNO CHALK.

CHERT is laminated moderate brown (5YR 3/4), olive black (5Y 2/1) and dark greenish gray (5GY 4/1) with well preserved burrows. Chert grades into slightly CALCAREOUS PORCELLANITE of grayish green (5GY 5/2) color. Chert is interbedded with chalk.

SILICIFIED CHALK is thinly laminated with grayish green (5G 5/2) and light olive gray (5Y 6/1). It contains laminae rich in celadonite, dolomite and colored glass.

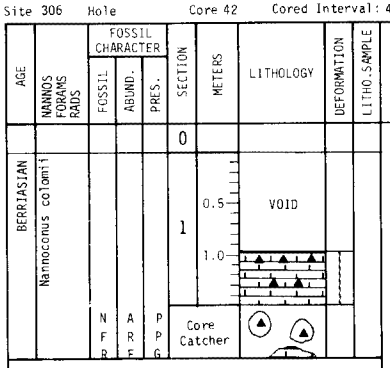
Minor lithology in core catcher silicified RAD-BEARING NANNO CHALK.

Smear Slide at CC

Composition	
Nannos	C
Rads	C
Recrystallized calcite	R
Recrystallized silica	C

Carbon-Carbonate
1-76 (6.5-0.2-53)
1-71 (0-0-70)
CC (0-0-77)

Site 306 Hole Core 42 Cored Interval: 467.5-475.0 m



LITHOLOGIC DESCRIPTION

Core severely disturbed. CHERT interbedded with NANNO CHALK.

CHERT is dominantly olive black (5Y 2/1) with mottling of olive gray (5Y 4/1) and rarely also with dusky brown (5YR 2/2). Chalcedony filled veins are common.

NANNO CHALK is laminated grayish green (5GY 5/2) and light olive gray (5Y 6/1). Greenish laminae contain abundant celadonite, dolomite rhombs and some colored volcanic glass.

Smear Slide at 1-112

Composition	
Nannos	A
Recrystallized calcite	C
Recrystallized silica	C
Pyrite	R
Clay minerals	R

DEEP SEA DRILLING PROJECT

LEG 32 SITE 307

SITE SUMMARY SHEET

POSITION: Latitude: 28°35.26'N Longitude: 161°00.28'E

Water depth: 5696 corrected meters (echo sounding)

Bottom felt at: 5708 meters (drill pipe) Penetration: 316.5 meters

Number of Holes: 1 Number of Cores: 13

Total length of cored section: 111 m Total core recovered: 19.4 m

Percentage of core recovery: 17.5%

OLDEST SEDIMENT CORED:

Depth below sea floor: 297.5 meters Nature: Chert

Age: Valanginian to Berriasian Measured Velocity: Too fragmentary

BASEMENT:

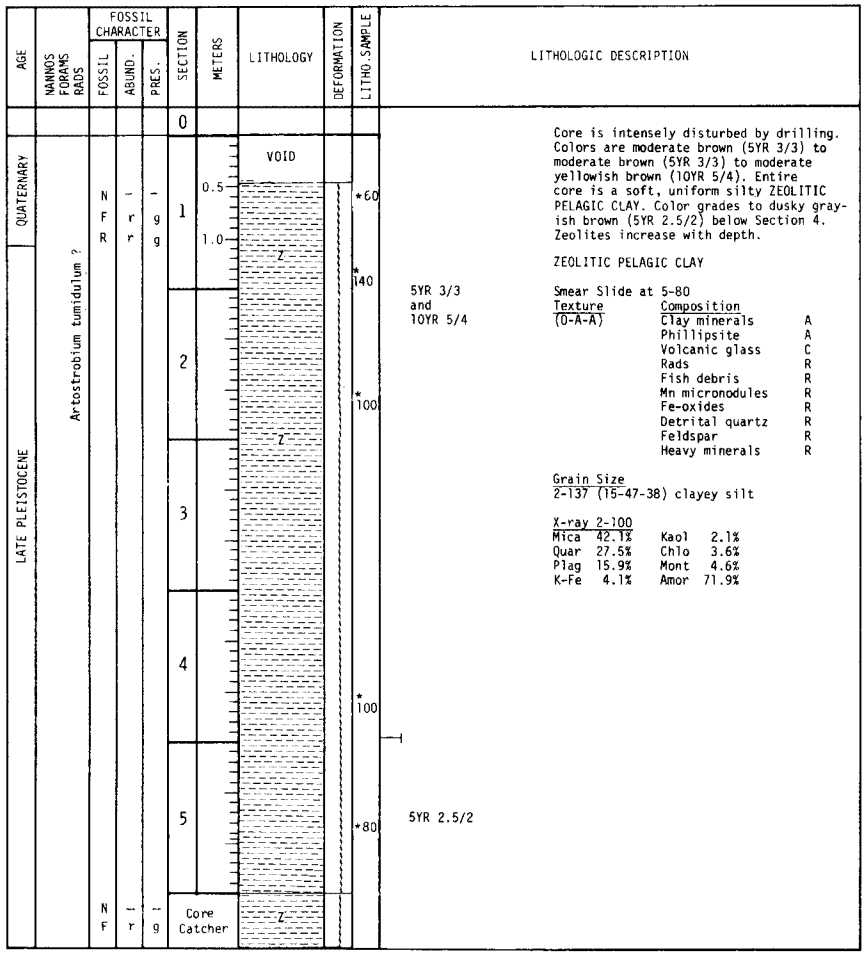
Depth below sea floor: Probable top at 298 meters Nature: Altered basalt and hyaloclastite

Velocity of basement: 3.3-5.0 km/sec

PRINCIPAL RESULTS:

Dated extrusive basement as at least Valanginian to Berriasian at Mesozoic magnetic anomaly M-21 of Hawaiian sequence.

Site 307 Hole Core 1 Cored Interval: 0.0-9.0 m



Core is intensely disturbed by drilling. Colors are moderate brown (5YR 3/3) to moderate brown (5YR 3/3) to moderate yellowish brown (10YR 5/4). Entire core is a soft, uniform silty ZEOLITIC PELAGIC CLAY. Color grades to dusky grayish brown (5YR 2.5/2) below Section 4. Zeolites increase with depth.

ZEOLITIC PELAGIC CLAY

Smear Slide at 5-80

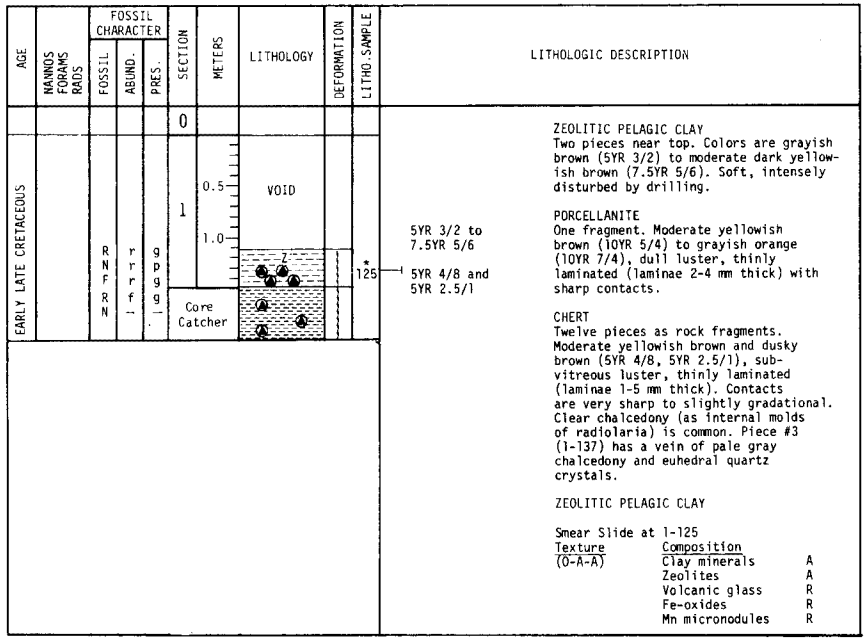
Texture (O-A-A)	Composition	
	Clay minerals	A
	Phillipsite	A
	Volcanic glass	C
	Rads	R
	Fish debris	R
	Mn micronodules	R
	Fe-oxides	R
	Detrital quartz	R
	Feldspar	R
	Heavy minerals	R

Grain Size
2-137 (15-47-38) clayey silt

X-ray 2-100

Mica	42.1%	Kaol	2.1%
Quar	27.5%	Chlo	3.6%
Plag	15.9%	Mont	4.6%
K-Fe	4.1%	Amor	71.9%

Site 307 Hole Core 2 Cored Interval: 37.5-47.0 m



ZEOLITIC PELAGIC CLAY
Two pieces near top. Colors are grayish brown (5YR 3/2) to moderate dark yellowish brown (7.5YR 5/6). Soft, intensely disturbed by drilling.

PORCELLANITE
One fragment. Moderate yellowish brown (10YR 5/4) to grayish orange (10YR 7/4), dull luster, thinly laminated (laminae 2-4 mm thick) with sharp contacts.

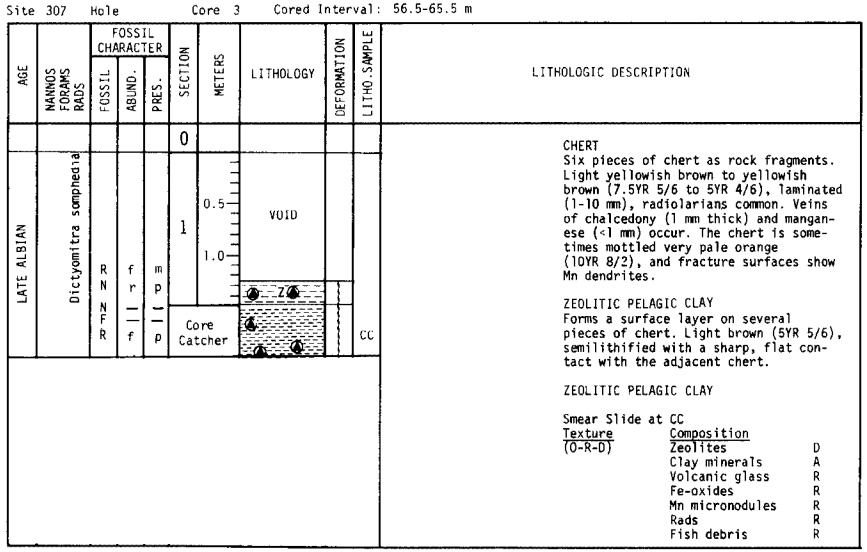
CHERT
Twelve pieces as rock fragments. Moderate yellowish brown and dusky brown (5YR 4/8, 5YR 2.5/1), subvitreous luster, thinly laminated (laminae 1-5 mm thick). Contacts are very sharp to slightly gradational. Clear chalcedony (as internal molds of radiolaria) is common. Piece #3 (1-137) has a vein of pale gray chalcedony and euhedral quartz crystals.

ZEOLITIC PELAGIC CLAY

Smear Slide at 1-125

Texture (O-A-A)	Composition	
	Clay minerals	A
	Zeolites	A
	Volcanic glass	R
	Fe-oxides	R
	Mn micronodules	R

Site 307 Hole Core 3 Cored Interval: 56.5-65.5 m



CHERT
Six pieces of chert as rock fragments. Light yellowish brown to yellowish brown (7.5YR 5/6 to 5YR 4/6), laminated (1-10 mm), radiolarians common. Veins of chalcedony (1 mm thick) and manganese (<1 mm) occur. The chert is sometimes mottled very pale orange (10YR 8/2), and fracture surfaces show Mn dendrites.

ZEOLITIC PELAGIC CLAY
Forms a surface layer on several pieces of chert. Light brown (5YR 5/6), semilithified with a sharp, flat contact with the adjacent chert.

ZEOLITIC PELAGIC CLAY

Smear Slide at CC

Texture (O-R-D)	Composition	
	Zeolites	D
	Clay minerals	A
	Volcanic glass	R
	Fe-oxides	R
	Mn micronodules	R
	Rads	R
	Fish debris	R

Site 307 Hole Core 4 Cored Interval: 84.5-85.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
ALBIAN	Acaenrotyle umbilicata	N R	r f	p e	0	Core Catcher			CC	

CHERT
Moderate brown to moderate light brown (5YR 3/4 to 5YR 4/6) with some light dusky brown (5YR 2.5/2). Laminated (1-8 mm), with thin (<1 mm) manganese veins. Laminae contacts are gradational. Radiolarian molds of clear chalcedony are common.

ZEOLITIC-BEARING PELAGIC CLAY
Forms a thin, semilithified coating on one piece of chert. Color is moderate yellowish brown (7.5YR 4/4). Sharp contact with chert.

ZEOLITIC-BEARING PELAGIC CLAY

Smear Slide at CC

Texture (O-R-D)	Composition	
	Clay minerals	A
	Zeolites	C
	Volcanic glass	R
	Fe-oxides	R
	Mn micronodules	R
	Fish debris	R

Site 307 Hole Core 5 Cored Interval: 103.0-112.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO BARREMIAN	Dictyomitra lacrimula	N R	f	g	0	Core Catcher	R		CC	

RADIOLARIAN-BEARING ALTERED VOLCANIC ASH. Consists mainly of stiff clay and semilithified fragments. Color is dark greenish yellow (5Y 7/2) to dusky yellow (5Y 6/4), with vein filling of darker greenish yellow (10Y 6/6) and laminae (~2 mm) of dusky yellow gray (5Y 6/2).

RADIOLARIAN-BEARING ALTERED VOLCANIC ASH.

Smear Slide at CC

Texture (O-A-A)	Composition	
	Clay minerals	A
	Zeolites	C
	Rads	C
	Volcanic glass	C
	Quartz	R
	Feldspar	R
	Heavy minerals	R

X-ray CC

Plag	34.3%	K-Fe	6.6%
Clin	19.5%	Quar	5.8%
Mont	23.3%	Amor	78.2%
Mica	10.6%		

Site 307 Hole Core 6 Cored Interval: 121.5-130.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
APTIAN TO BARREMIAN	Dictyomitra lacrimula	N R	r c	p g	0	Core Catcher				

CHERT
Three pieces as rock fragments. Color is dark yellowish orange (10YR 6/8) or moderate reddish brown (2.5YR 3/4). Irregular chalcedony veins (< 1 mm) and vugs are common. The vugs are partly filled with PORCELLANITE. Within the chert there is a gradation in color to dark reddish brown (10R 3/2), grayish brown (5YR 3/2) and grayish yellow (2.5Y 8/2). The contact between porcellanite and chert is sharp. Quartz crystals line some vugs.

Site 307 Hole Core 7 Cored Interval: 158.0-167.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
HAUTERIVIAN TO VALANGINIAN	Dictyomitra lacrimula	R N F R	c l l g	m l l g	0					
					1	0.5	R		*25	
		N	a	p		1.0				
						Core Catcher				

PORCELLANITE
Twenty pieces as rock fragments. Color is moderate brown (7.5YR 5/4). The rock is massive, has a dull luster and radiolarian molds (as chalcedony) are common. Some pieces grade from semilithified RADIOLARIAN PELAGIC CLAYSTONE to PORCELLANITE.

CHERT
Fourteen pieces as rock fragments. Color is dark reddish brown (10R 3/3), faintly laminated (<1 mm) with gradational contacts. Fracture and vein fillings of light olive gray (5Y 3/2) chert. Dendritic manganese on fracture surfaces. One to two mm calcite vein in one piece.

RADIOLARIAN PELAGIC CLAYSTONE (minor lithology).
Smear Slide at 1-25

Texture (O-R-D)	Composition	
	Clay minerals	A
	Rads	A
	Volcanic glass	R
	Feldspar	R
	Heavy minerals	R
	Zeolites	R
	Nannos	R

Site 307 Hole Core 8 Cored Interval: 195.0-204.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
					0				
HAUTERIVIAN TO VALANGINIAN	Tubodiscus jurapelagicus / Sethocapsa trachyostraca	N F / N F / R	a — / f r — c	p — / p p — g	1	0.5 / 1.0	VOID / Core Catcher		* 97

LITHOLOGIC DESCRIPTION

Core is deformed throughout. Consists of twenty-four pieces of CHERT as rock fragments and a minor amount of stiff NANNO CHALK.

CHERT
35-78 cm: Color is dark reddish brown (10R 3/3). Vugs and fractures are filled with light olive gray (5Y 3/2) chert. Manganese specks common.

78-88 cm: Color is grayish brown (5YR 3/2) with vug fillings of moderate yellowish brown (10YR 6/3) and grayish orange (10YR 7/4), partly SILICIFIED CARBONATE.

92-110 cm: Color is moderate brown (5YR 4/4) chert. Fractures are filled with quartz crystals and yellowish gray (5Y 7/1) chert. Some sharp contacts with NANNO CHALK. Sparse radiolaria.

110-150 cm: Color is moderate brown (5YR 4/4). Chert has fracture fillings of light olive gray (5Y 3/2) chert.

NANNO CHALK
88-92 cm: Color is orange pink (5YR 7/4). Semilithified with slight mottling.

NANNO CHALK

Smear Slide at 1-97

Texture	Composition	
(0-R-D)	Nannos	D
	Dolomite	R
	Calcite	R
	Fe-oxides	R
	Clay minerals	R
	Volcanic glass	R

Site 307 Hole Core 9 Cored Interval: 232.5-241.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
					0				
HAUTERIVIAN TO VALANGINIAN	Tubodiscus jurapelagicus / Sethocapsa trachyostraca	N R / R / N F	c c / r / a —	p g / P / p —	1	0.5 / 1.0	VOID / Core Catcher		* 83

LITHOLOGIC DESCRIPTION

CHERT
Color is reddish brown (10R 5/6) to moderate light brown (5YR 5/4) to pale grayish brown (2.5YR 4/2). Manganese specks and dendrites are common. Rare radiolarians. Some mottling and fracture filling of light olive gray (5Y 5/1) chert.

DOLOMITE BEARING NANNO CHALK
80-84 cm: Color is grayish orange pink (7.5YR 7/4), semilithified. Has sharp contact with chert.

DOLOMITIC PORCELLANITE
110-135 cm: Color is grayish yellow green (5GY 7/2) to olive gray brown (5Y 4/1). Faint laminations. Radiolarians generally rare.

CALCAREOUS PORCELLANITE
135-150 cm: Color is light bluish gray (5B 7/1). Vughs are common and are filled with orange/pink partly silicified carbonate.

DOLOMITE-BEARING NANNO CHALK

Smear Slide at 1-83

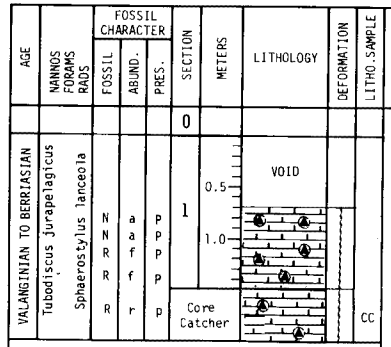
Texture	Composition	
(0-C-D)	Nannos	A
	Dolomite	C
	Rads	R
	Calcite	R
	Recrystallized silica	R
	Fe-oxides	R
	Volcanic glass	R
	Quartz	R

Carbon-Carbonate
1-148 (3.2-0-26)

X-ray 1-110

Quar	91.3%	Calc	3.1%
Dolo	5.6%	Amor	49.6%

Site 307 Hole Core 10 Cored Interval: 270.0-279.0 m



CALCAREOUS PORCELLANITE
70-130 cm: Color is grayish orange pink (2.5YR 6/2) and dark reddish brown (10R 3/4), with laminae (~3 mm) of dark yellowish orange (10YR 6/6). Sharp contact with yellowish gray (5Y 7/1) porcellanite. Some vugs. Also some porcellanite that is slightly mottled and streaked: gray (2.5Y 7/0), dark gray (2.5Y 4/0) and moderate brown (5YR 4/4). Some fragments have NANNO CHALK coatings (sharp contact).

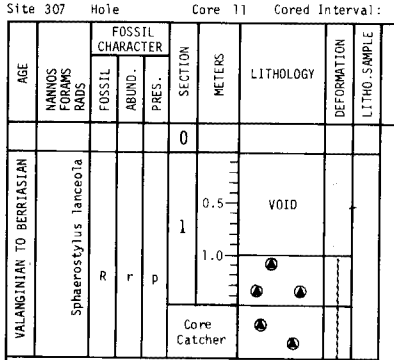
CHERT
130-150 cm: Color is light reddish brown (2.5YR 4/6) to moderate brown (5YR 4/3), black (2.5YR 2.5/0), gray brown (2.5YR 4/0) and dark yellowish orange (10YR 6/6). Thin laminae (<1 mm) with sharp contacts are common. Numerous vugs and veins that are generally filled with chalcedony or partly silicified carbonate.

NANNO CHALK (minor lithology).

Smear Slide at CC

Texture (O-R-D)	Composition	
	Nannos	A
	Fe-oxides	A
	Dolomite	C
	Rads	R
	Calcite	R
	Recrystallized silica	R
	Clay minerals	R

Site 307 Hole Core 11 Cored Interval: 288.5-297.5 m



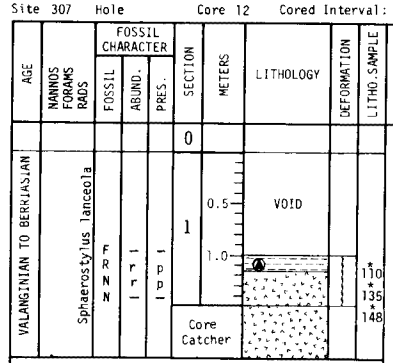
DOLOMITIC PORCELLANITE
One fragment. Color is reddish brown (2.5YR 4/6), manganese dendrites common.

CHERT
Several pieces as rock fragments. Color is reddish brown (2.5YR 4/6) to light yellowish brown (5YR 7/8), moderate brown (4YR 4/2), and moderate reddish brown (10R 4/8). Veins and vug fillings of chalcedony and quartz are common. One vug is lined with euhedral barite crystals. The chert is sometimes laminated and the contacts between the various colors of chert are gradational.

X-ray 1-100

Dolo	84.6%	Cris	6.9%
Quar	8.6%	Amor	51.1%

Site 307 Hole Core 12 Cored Interval: 297.5-307.0 m



Ferruginous SILICEOUS PELAGIC CLAYSTONE. Color is moderate red brown (2.5YR 3/6). Lithified and massive with Mn blebs scattered throughout.

Smear Slide at 1-110

Texture (O-C-D)	Composition	
	Clay minerals	A
	Recrystallized silica	A
	Fe-oxides	C
	Quartz	R
	Mn micronodules	R
	Nannos	R

CHERT
Two fragments. Color is dark yellow brown (7.5YR 4/2). Veins and vugs are common and filled with quartz crystals and manganese.

Smear Slide at 1-135 (vein filling)

Composition	
Clay minerals	C
Hematite	C
Fe-oxides	C
Recrystallized silica	C
Calcite	R
Palagonite	R

Smear Slide at 1-148 (hyaloclastite)

Composition	
Clay minerals	A
Palagonite	A
Feldspar	C
Recrystallized silica	C
Fe-oxides	R

X-ray 1-110

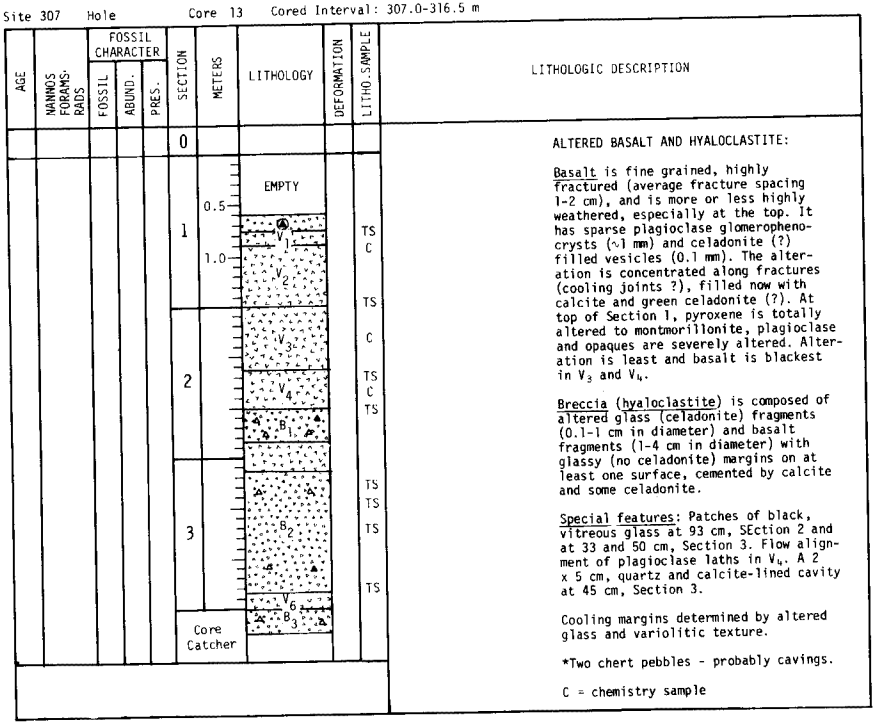
Quar	78.5%	Goet	TR%
Hema	10.5%	Amor	67.0%
Mixed layer	11.0%		

X-ray CC

K-Fe	51.4%	Kaol	7.1%
Mont	32.9%	Quar	7.2%
Anat	1.3%	Amor	58.3%

ALTERED BASALT (HYALOCLASTITE). Semi-lithified. Consists of a fractured breccia with hematite and calcite veins common. Each fragment has concentric color zones: grayish orange pink (5YR 7/3), grayish yellow orange (10YR 7/6), dark reddish brown (10R 3/3), pale yellow green (10GY 7/2).

Site 307 Hole Core 13 Cored Interval: 307.0-316.5 m



ALTERED BASALT AND HYALOCLASTITE:

Basalt is fine grained, highly fractured (average fracture spacing 1-2 cm), and is more or less highly weathered, especially at the top. It has sparse plagioclase glomerophenocrysts (~1 mm) and celadonite (?) filled vesicles (0.1 mm). The alteration is concentrated along fractures (cooling joints ?), filled now with calcite and green celadonite (?). At top of Section 1, pyroxene is totally altered to montmorillonite, plagioclase and opaques are severely altered. Alteration is least and basalt is blackest in V_3 and V_4.

Breccia (hyaloclastite) is composed of altered glass (celadonite) fragments (0.1-1 cm in diameter) and basalt fragments (1-4 cm in diameter) with glassy (no celadonite) margins on at least one surface, cemented by calcite and some celadonite.

Special features: Patches of black, vitreous glass at 93 cm, SEction 2 and at 33 and 50 cm, Section 3. Flow alignment of plagioclase laths in V_4. A 2 x 5 cm, quartz and calcite-lined cavity at 45 cm, Section 3.

Cooling margins determined by altered glass and variolitic texture.

*Two chert pebbles - probably cavings.

C = chemistry sample

DEEP SEA DRILLING PROJECT

LEG 32 SITE 308

SITE SUMMARY SHEET

POSITION: Latitude: 34°58.94'N Longitude: 172°08.98'E

Water depth: 1331 corrected meters (echo sounding)

Bottom felt at: 1346 meters (drill pipe) Penetration: 68.5 meters

Number of Holes: 1 Number of Cores: 4

Total length of cored section: 30.5 m Total core recovered: 7.3 m

Percentage of core recovery: 24%

OLDEST SEDIMENT CORED:

Depth below sea floor: 68.5 meters Nature: Calcareous volcanic sandstone

Age: Early Eocene Measured Velocity: 2.8 to 3.6 km/sec

BASEMENT:

Depth below sea floor: Not reached

PRINCIPAL RESULTS:

Paleontologic age about 6 m.y. older than radiometric ages of ARIES 7 dredge hauls. No post-Eocene sediment.

Site 308 Hole Core 1 Cored Interval: 0.0-3.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
					0				
QUAT.	▲ Discoaster lodoensis	N	F	M	1	0.5	VOID		*42
EARLY EOCENE	Globorotalia formosa formosa	R N F	— F A	— M G		1.0			*110
					Core Catcher				*CC

LITHOLOGIC DESCRIPTION

10YR 3/4

ALTERED VOLCANIC ASH, dark yellowish brown (10YR 3/4), stiff to semi-lithified, homogeneous, with similar material of medium dark gray (N4) composing layers 2 to 5 mm thick and at 5 to 10 cm intervals above 82 cm.

Smear Slide at 1-42

Texture (R-D-A)	Composition	
	Palagonite	A
	Volcanic glass	R
	Carbonate fragments	R
	Nannos	R
	Fish debris	R

Smear Slide at 1-110

Texture (D-C-A)	Composition	
	Volcanic glass	A
	Palagonite	A
	Carbonate fragments	R-C
	Nannos	R
	Fish debris	R
	Unknown crystals	R

Smear Slide at 1-CC

Texture (D-C-A)	Composition	
	Volcanic glass	C
	Palagonite	C
	Carbonate fragments	R-C
	Nannos	R
	Fish debris	R

Carbon-Carbonate
1-115 (0.3-0.1-2.0)
1-120 (0.5-0.1-3.0)

X-ray 1-110

Calc	6.9%	Clin	5.4%
Quar	3.9%	Pyri	1.0%
K-Fe	37.0%	Augi	5.4%
Plag	16.7%	Amor	78.2%
Mont	23.8%		

▲ Gephyrocapsa oceanica
Emiliania huxleyi

Site 308 Hole Core 2 Cored Interval:

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
					0				
EARLY EOCENE	Discoaster lodoensis Globorotalia formosa formosa	N	C	M	1	0.5	VOID		N4
		F R N F	A — F C	G — P G		1.0	V. VOID		*5
					2		V.		N4 *112
					Core Catcher				*CC

LITHOLOGIC DESCRIPTION

BIOGENOUS VOLCANIC SILT, medium dark gray (N4), soupy at top becoming stiff, homogeneous with abundant thin-walled and partically dissolved pelecypod fragments. Alternation of semilithified and stiff sections throughout Section 2.

Binocular observations reveal abundant well-rounded silt- and sand-sized volcanic rock fragments with abundant benthonic foraminifers, rare bryozoa, ostracods, and small gastropods, all within a fine-grained matrix.

Smear Slide at 2-5

Texture (D-D-D)	Composition	
	Carbonate fragments	A
	Volcanic glass	R-C
	Palagonite	R
	Pyrite micronodules	R
	Nannos	R
	Fish debris	R
	Zeolites	R

Smear Slide at 2-112

Texture (D-A-C)	Composition	
	Carbonate fragments	A-C
	Volcanic glass	C
	Palagonite	R
	Pyrite micronodules	C-R
	Nannos	R
	Fish debris	R
	Zeolites	R-C

Smear Slide at CC

Texture (D-D-D)	Composition	
	Carbonate fragments	C
	Volcanic glass	R
	Palagonite	R
	Pyrite micronodules	R
	Zeolites	C
	Nannos	R
	Fish debris	R

Zeolites predominately clinoptilolite.

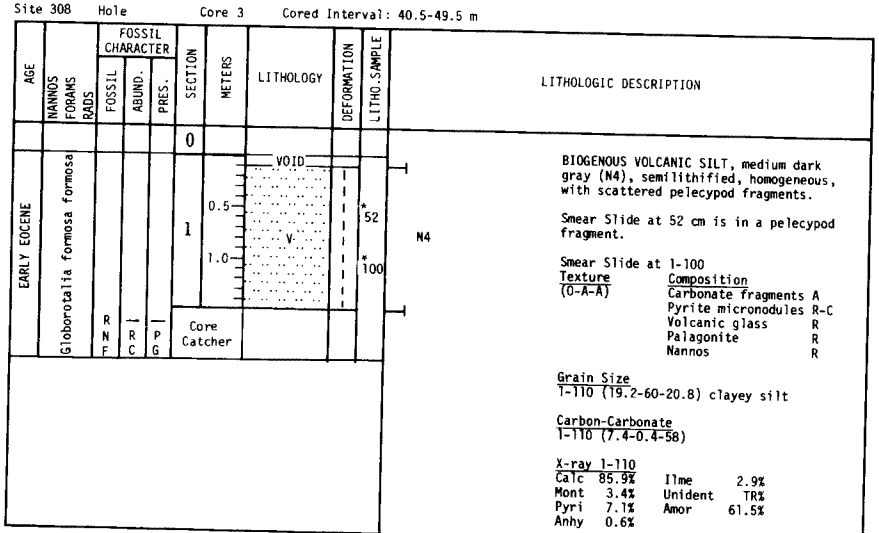
Grain Size
2-50 (14.8-50.6-34.6) clayey silt

Carbon-Carbonate
2-50 (5.4-0.3-43)

X-ray 2-50

Calc	56.4%	Clin	6.0%
K-Fe	10.3%	Pyri	2.9%
Plag	6.6%	Ilme	5.9%
Mont	11.9%	Amor	64.2%

Site 308 Hole Core 3 Cored Interval: 40.5-49.5 m



LITHOLOGIC DESCRIPTION

BIOGENOUS VOLCANIC SILT, medium dark gray (N4), semilithified, homogeneous, with scattered pelecypod fragments.

Smear Slide at 52 cm is in a pelecypod fragment.

Smear Slide at 1-100

Texture (O-A-A)	Composition	
	Carbonate fragments	A
	Pyrite micronodules	R-C
	Volcanic glass	R
	Palagonite	R
	Nannos	R

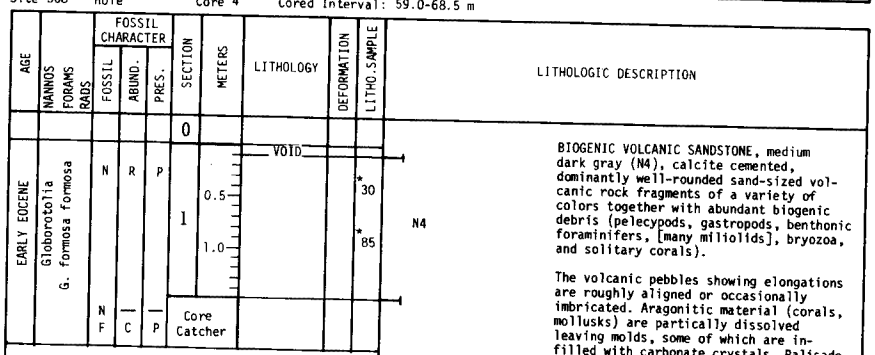
Grain Size
1-110 (19.2-60-20.8) clayey silt

Carbon-Carbonate
1-110 (7.4-0.4-58)

X-ray 1-110

Calc	85.9%	Ilme	2.9%
Mont	3.4%	Unident	TR%
Pyri	7.1%	Amor	61.5%
Anhy	0.6%		

Site 308 Hole Core 4 Cored Interval: 59.0-68.5 m



LITHOLOGIC DESCRIPTION

BIOGENIC VOLCANIC SANDSTONE, medium dark gray (N4), calcite cemented, dominantly well-rounded sand-sized volcanic rock fragments of a variety of colors together with abundant biogenic debris (pelecypods, gastropods, benthonic foraminifers, [many miliolids], bryozoa, and solitary corals).

The volcanic pebbles showing elongations are roughly aligned or occasionally imbricated. Aragonitic material (corals, mollusks) are partically dissolved leaving molds, some of which are infilled with carbonate crystals. Palisade structure calcite cement is apparent. Encrusting coralline algae found in core catcher sample.

Smear Slide at 1-30

Texture (O-A-O)	Composition	
	Carbonate fragments	A
	Pyrite micronodules	C-R
	Volcanic glass	R
	Palagonite	R
	Zeolites	R
	Forams	R
	Nannos	R
	Fish debris	R

Smear Slide at 1-85

Texture (O-A-C)	Composition	
	Carbonate fragments	A-D
	Pyrite micronodules	C-R
	Volcanic glass	R
	Palagonite	R
	Celadonite	R
	Fish debris	R

DEEP SEA DRILLING PROJECT

LEG 32 SITE 309

SITE SUMMARY SHEET

POSITION: Latitude: 34°54.32'N Longitude: 171°33.67'E

Water depth: 1454 corrected meters (echo sounding)

Bottom felt at: 1470 meters (drill pipe) Penetration: 12 meters

Number of Holes: 1 Number of Cores: 1

Total length of cored section: 2 m Total core recovered: Trace

Percentage of core recovery: Less than 1%

OLDEST SEDIMENT CORED:

Depth below sea floor: 2 meters Nature: Foram-bearing carbonate sand

Age: Quaternary mixed with mid-Tertiary Measured Velocity: Fragmentary recovery

BASEMENT:

Depth below sea floor: Not reached

PRINCIPAL RESULTS:

Twisted off lower part of bottom hole assembly in hard sediment of unknown age.

Site 309 Hole Core 1 Cored Interval: 0.0-2.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					0					
QUATERNARY	Gephyrocapsa oceanica and Emiliania huxleyi N22/N23	D N	R C	P M	Core Catcher					5Y 4/4

Description from Smear Slide only.

FORAM-BEARING BIOGENIC CARBONATE SAND, moderate olive brown (5Y 4/4).

Smear Slide at CC

Texture (A-C-O)	Composition	
	Carbonate fragments	A
	Forams	C
	Volcanic glass	R
	Palagonite	R
	Nannos	R
	Rads	R
	Sponge spicules	R
	Fish debris	R

DEEP SEA DRILLING PROJECT

LEG 32 SITE 310

SITE SUMMARY SHEET

POSITION: Latitude: 36°52.11'N Longitude: 176°54.09'E

Water depth: 3516 corrected meters (echo sounding)

Bottom felt at: 3524 meters (drill pipe) Penetration: 352.5 meters

Number of Holes: 2 Number of Cores: 39

Total length of cored section: 357 m Total core recovered: 173.1 m

Percentage of core recovery: 48.5%

OLDEST SEDIMENT CORED:

Depth below sea floor: 352.5 meters Nature: Chert and nannofossil chalk

Age: Latest Albian Measured Velocity: Too fragmentary

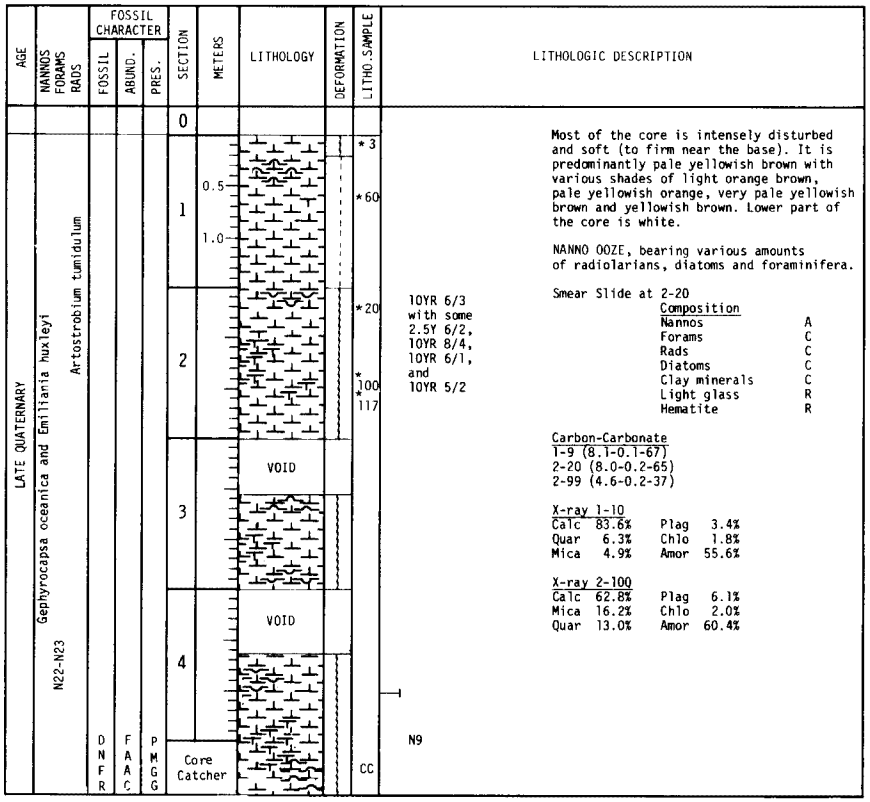
BASEMENT:

Depth below sea floor: Not reached

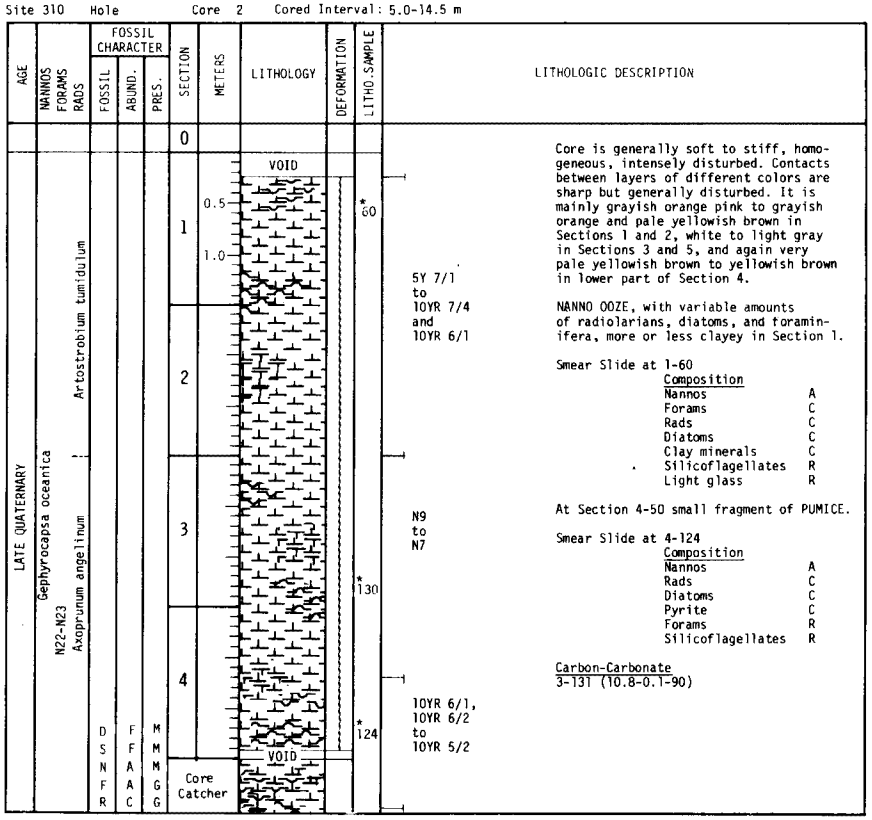
PRINCIPAL RESULTS:

Recovery of a thick Neogene, especially Quaternary, section for paleo-oceanographic studies. Three Paleogene hiatuses. About 250 meters of Upper Cretaceous nannofossil ooze and chalks, and cherts, to be compared with Shatsky section. Basement not reached, but by extrapolation is probably Late Early Cretaceous in age.

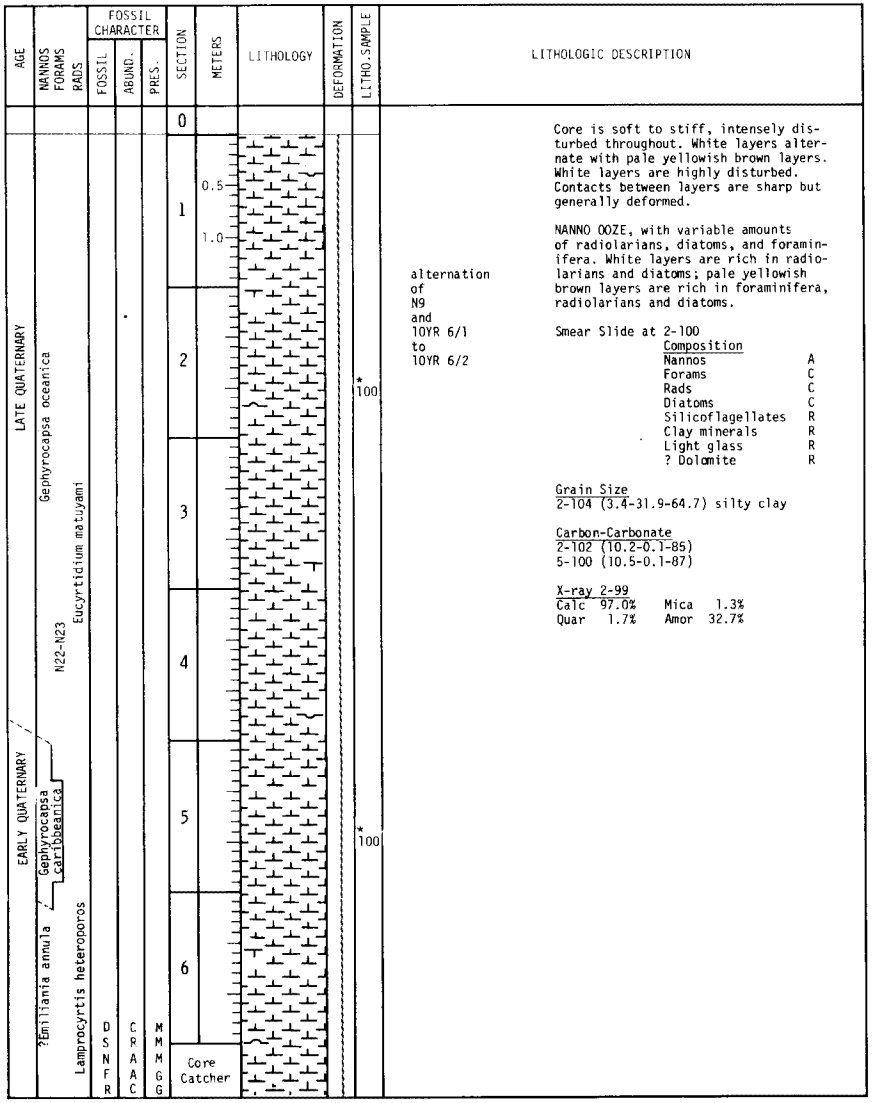
Site 310 Hole Core 1 Cored Interval: 0.0-5.0 m



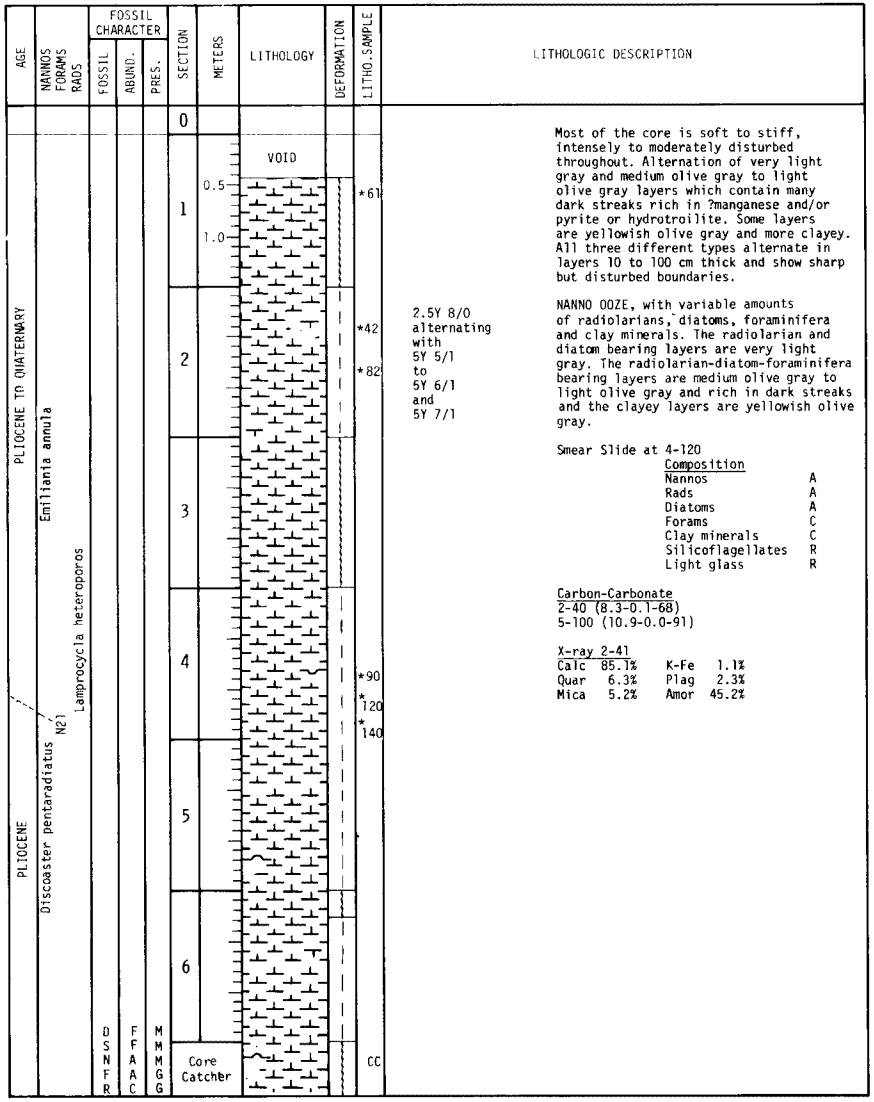
Site 310 Hole Core 2 Cored Interval: 5.0-14.5 m



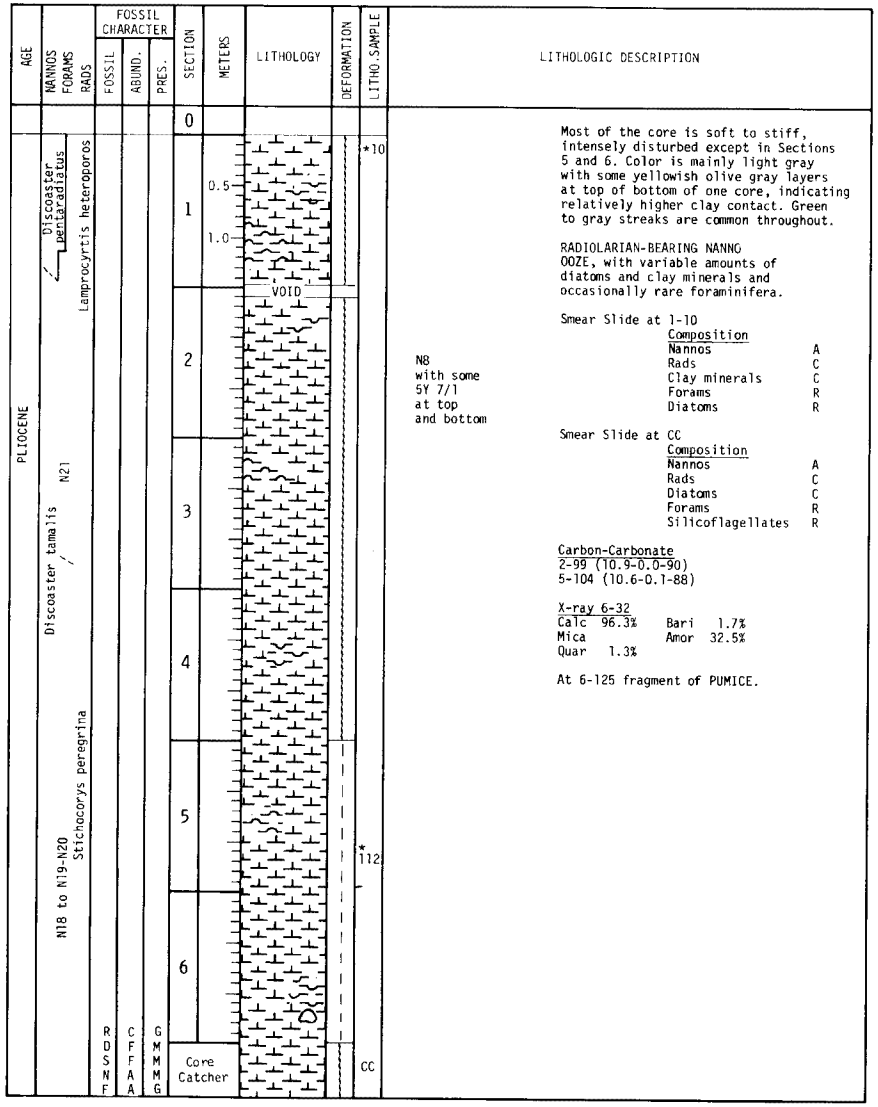
Site 310 Hole Core 3 Cored Interval: 14.5-24.0 m



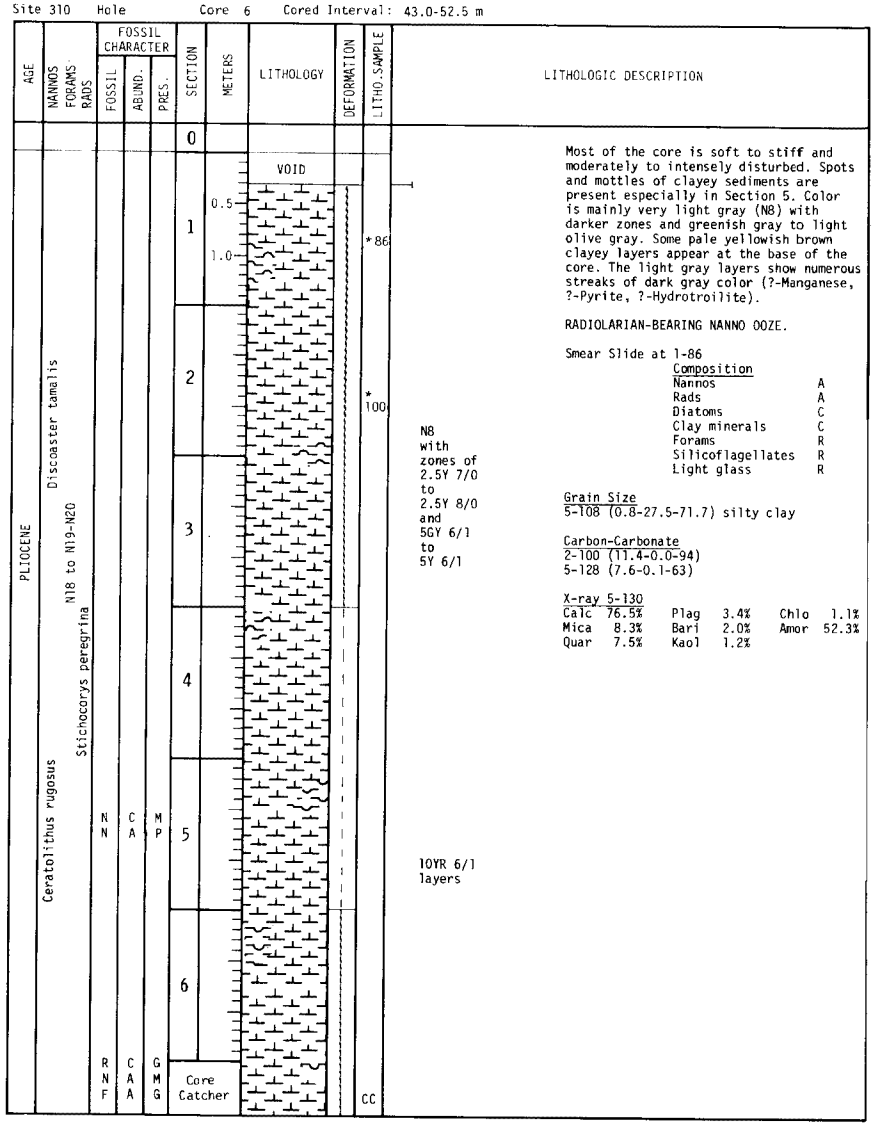
Site 310 Hole Core 4 Cored Interval: 24.0-33.5 m



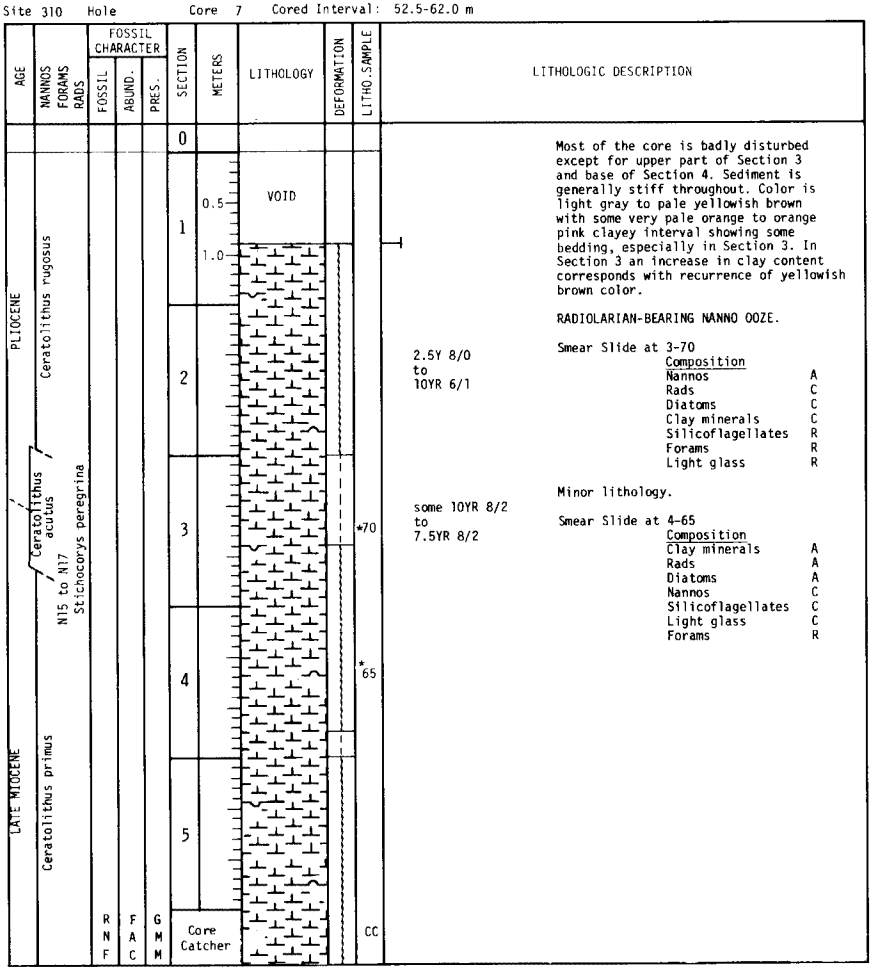
Site 310 Hole Core 5 Cored Interval: 33.5-43.0 m



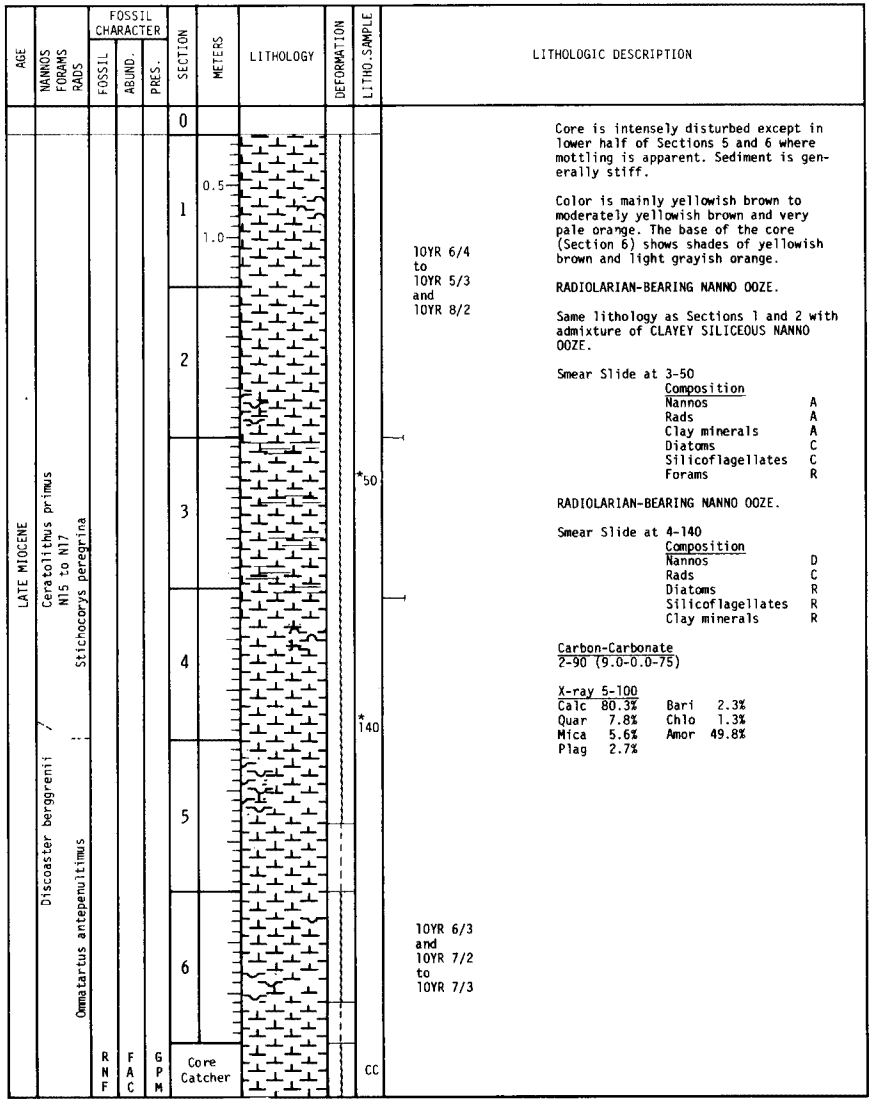
Site 310 Hole Core 6 Cored Interval: 43.0-52.5 m



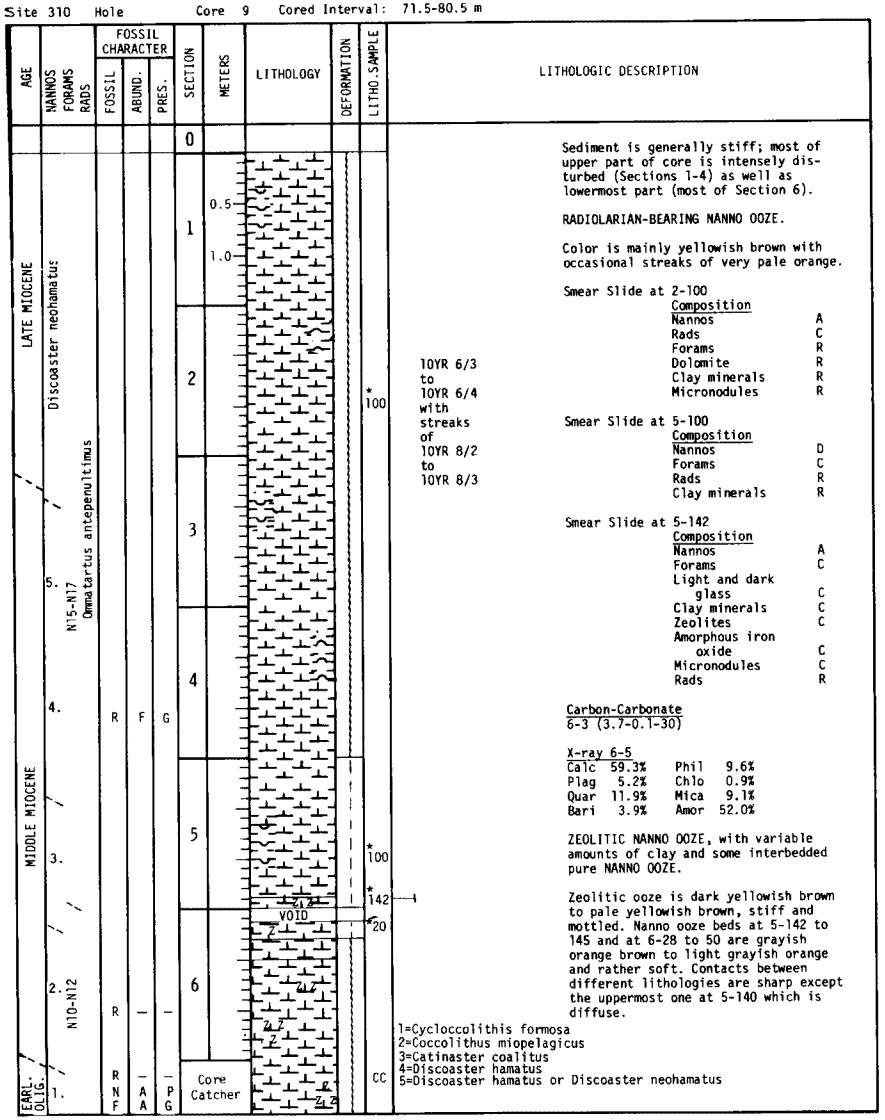
Site 310 Hole Core 7 Cored Interval: 52.5-62.0 m



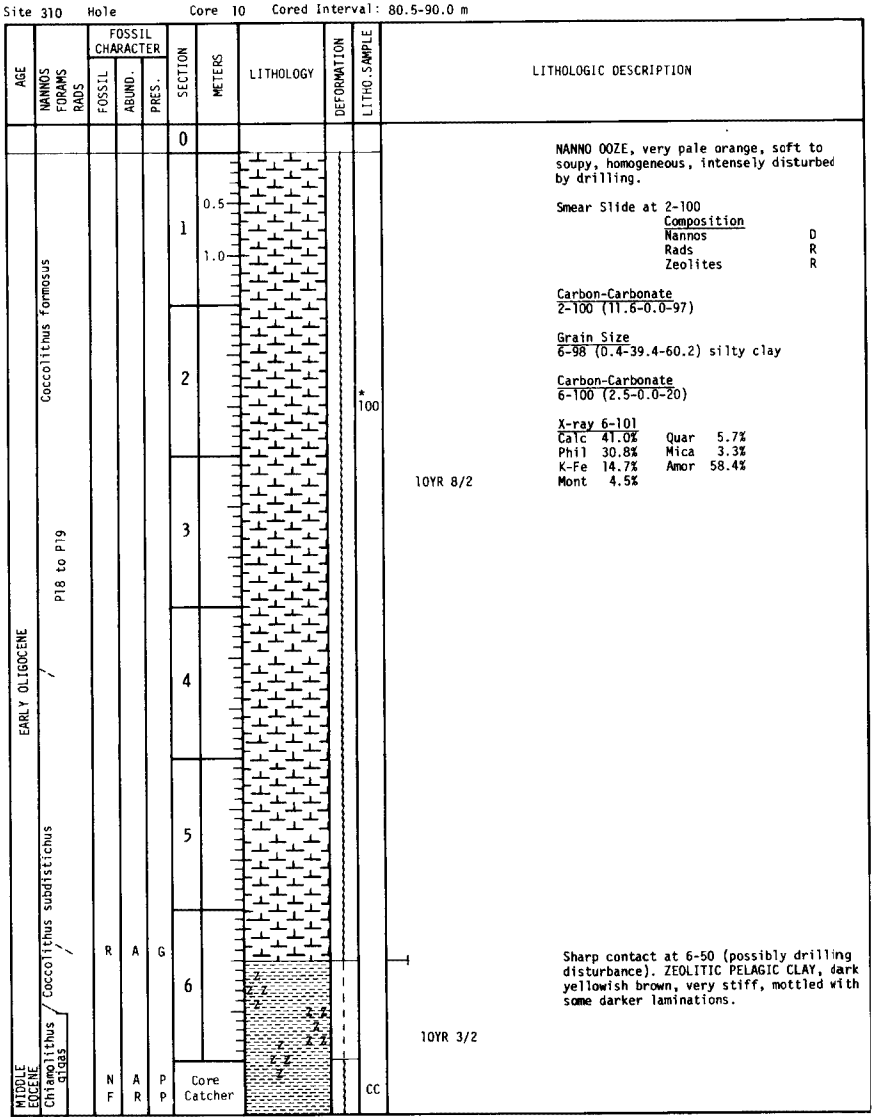
Site 310 Hole Core 8 Cored Interval: 62.0-71.5 m



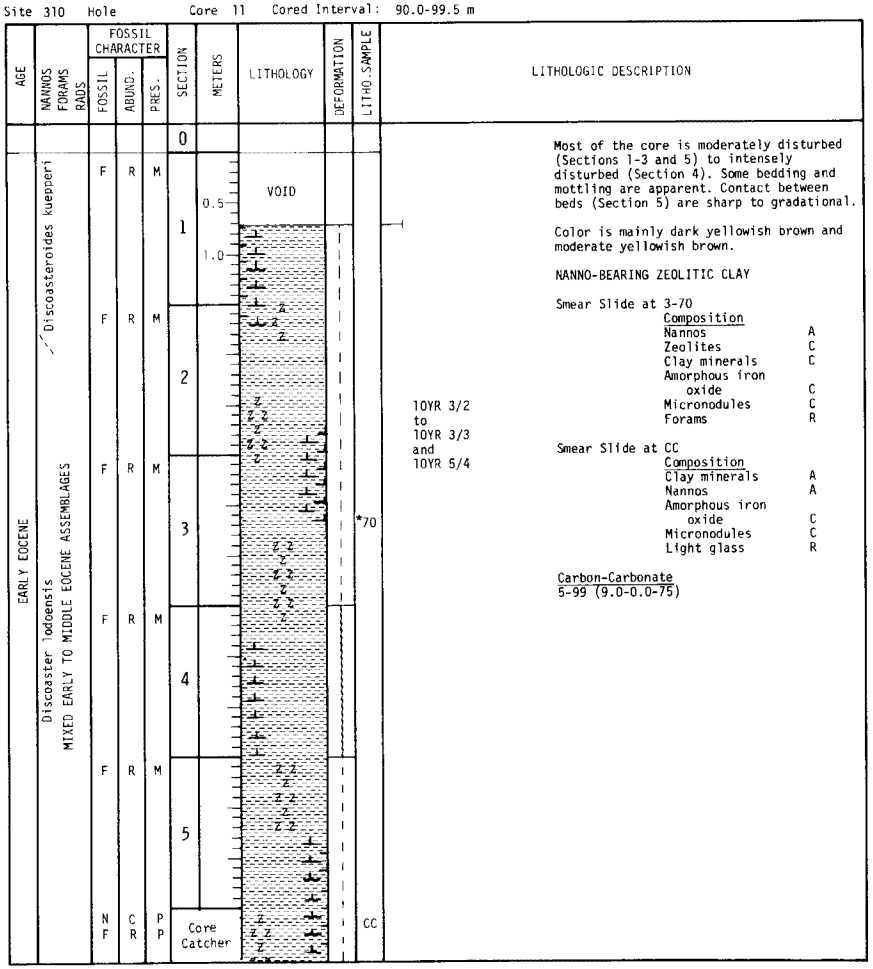
Site 310 Hole Core 9 Cored Interval: 71.5-80.5 m



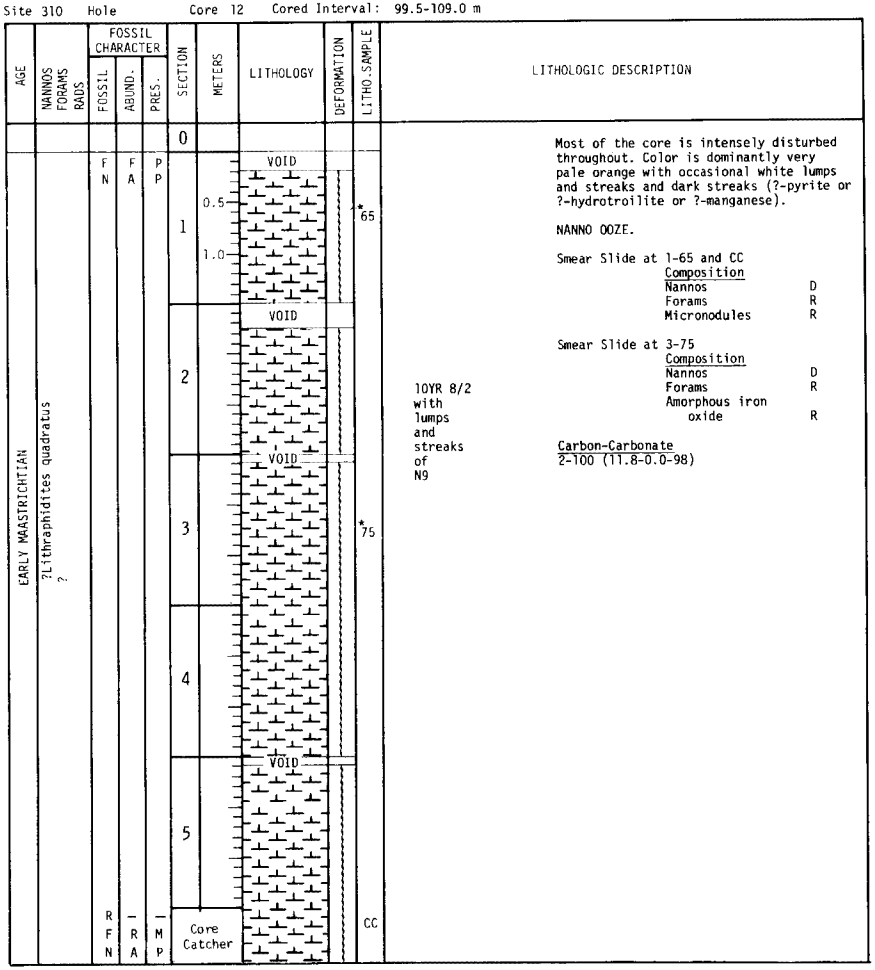
Site 310 Hole Core 10 Cored Interval: 80.5-90.0 m



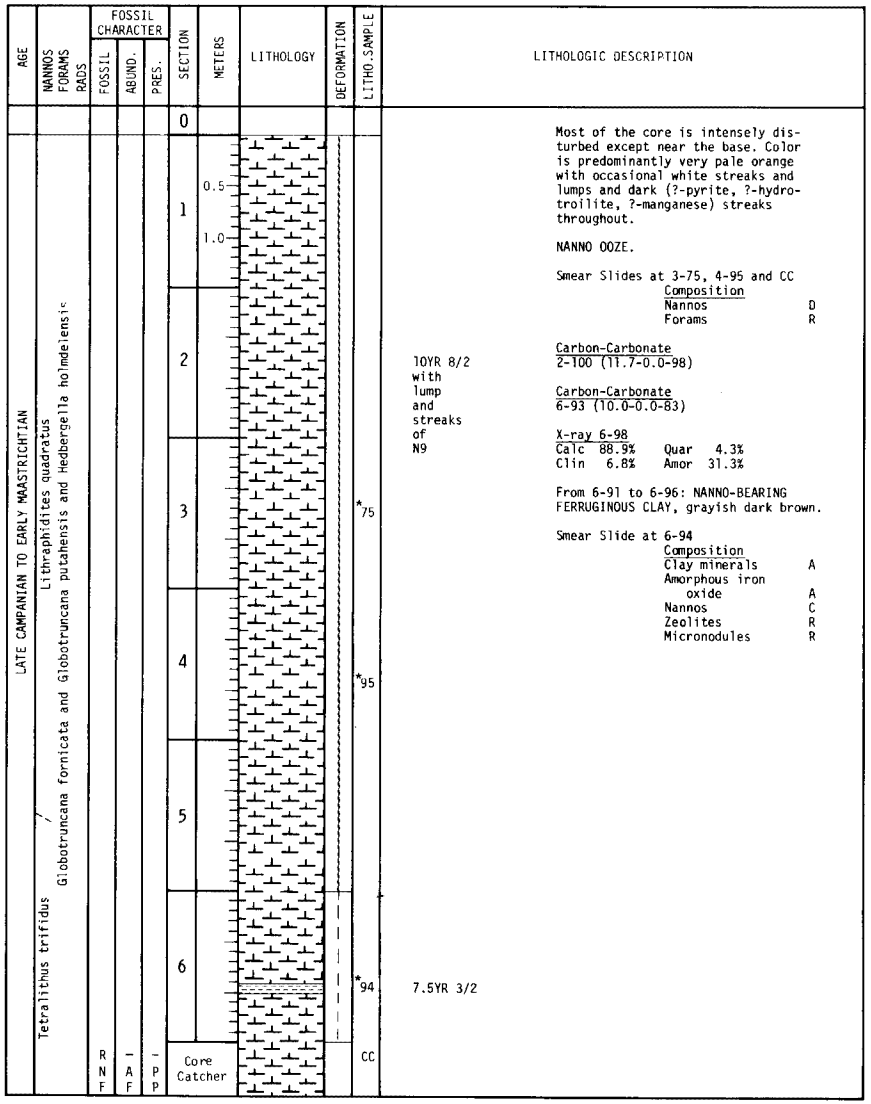
Site 310 Hole Core 11 Cored Interval: 90.0-99.5 m



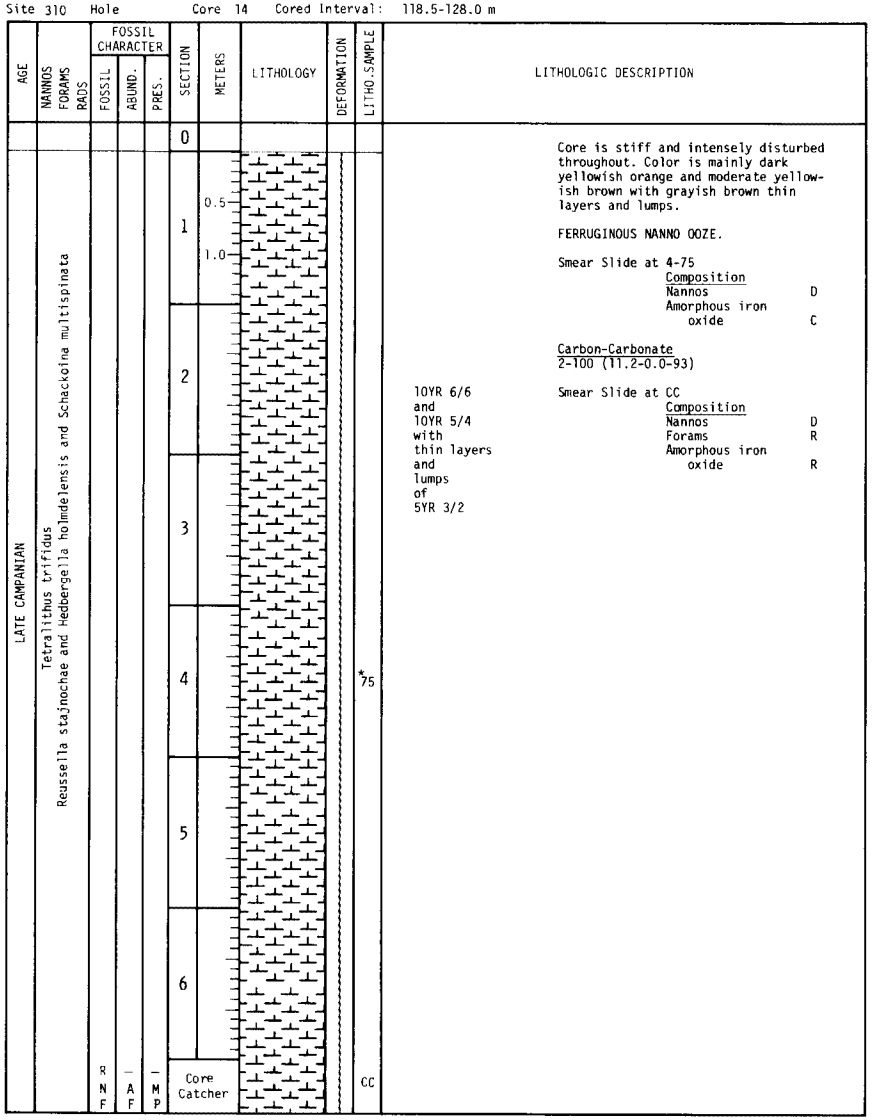
Site 310 Hole Core 12 Cored Interval: 99.5-109.0 m



Site 310 Hole Core 13 Cored Interval: 109.0-118.5 m



Site 310 Hole Core 14 Cored Interval: 118.5-128.0 m



Site 310 Hole Core 15 Cored Interval: 128.0-137.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE CAMPANIAN	Tetralithus trifidus	R N F	– O F	– O P	0 1 2 Core Catcher	0.5 1.0		bx	*75 CC	Upper half of core is intensely disturbed and soupy, lower half is essentially a drilling breccia. Color is predominantly moderate grayish yellow with blackish red chert fragments. 1-0 to 1-50: small CHERT fragments mixed up with NANNO OOZE. 1-50 to CC: NANNO OOZE with occasional CHERT fragments, subvitreous to vitreous. At 2-114 to 120: layer of CHERT fragments in soupy mud. 2.5Y 7/4 with 10R 2.5/1 fragments Smear Slide at 2-75 Composition Nannos D Forams R Amorphous iron oxide R

Site 310 Hole Core 16 Cored Interval: 137.5-147.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN	Eiffellithus eximius +G. fornicata, G. stuartiformis, G. tricarinata, G. lenpoldi	F N	C C	M M	0 1 2 3 4 Core Catcher	0.5 1.0	VOID VOID		*90 CC	Core is intensely disturbed, soft and soupy throughout. Color is predominantly moderate grayish yellow with blackish red chert fragments and occasional white soft spots and deformed beds. NANNO OOZE with abundant small CHERT fragments. 2.5Y 7/4 with occasional N9 and 10R 2.5/1 fragments Smear Slide at 4-90 Composition Nannos D Forams R Smear Slide at CC Composition Nannos D Rads R Zeolites R Hematite R Light glass R Carbon-Carbonate 4-90 (11.7-0.0-97) + G.= Globotruncana

Site 310 Hole Core 17 Cored Interval: 147.0-156.9 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
CAMPANIAN	Eiffellithus eximius +G. fornicata, G. stuartiformis, G. tricaninata, G. arca, G. lenpoldi	R N F	O A	O M	0 1 2 3 4 5 6 Core Catcher	0.5 1.0			*75 CC	Core is intensely disturbed, soft and soupy throughout. Color is mainly moderate grayish yellow with abundant small blackish red chert fragments and some white lumps and spots in Sections 3, 4 and 6. NANNO OOZE with abundant small CHERT chips (particularly abundant in top 50 cm of Section 6). 7.5Y 7/4 with 10R 2.5/1 chert fragments and occasional N9 spots and lumps Smear Slide at 3-75 Composition Nannos D Forams R Light glass R Carbon-Carbonate 5-100 (11.6-0.0-97) Smear Slide at CC Composition Nannos D Forams R Light glass R Amorphous iron oxide R Zeolites R +G.= Globotruncana

Site 310 Hole Core 18 Cored Interval: 156.5-165.5 m

AGE: CAMPANIAN
NANNOS FORAMS RADS: Eiffellithus eximius
+G. formicata, G. linneiana, G. tricarinata, G. arca, G. lenpoldi, G. bulloides
FOSSIL CHARACTER: FOSSIL: N F R; ABUND.: A C I; PRES.: M M I
SECTION: 0, 1, 2, 3, 4, Core Catcher
METERS: 0.5, 1.0
LITHOLOGY: VOID
DEFORMATION
LITHO.SAMPLE: CC

2.5Y 7/4 with 10R 2.5/1 fragments

2.5Y 7/4 with 10R 2.5/1 fragments and N9 spots and lumps

2.5Y 7/4 with 10R 2.5/1 fragments

LITHOLOGIC DESCRIPTION

Core is intensely disturbed, soft and soupy throughout. Color is mainly moderate grayish yellow with small blackish red chert fragments and occasional white lumps and spots in Section 2.

NANNO OOZE with small abundant CHERT fragments.

Smear Slide at CC

Composition	
Nannos	D
Forams	R
Amorphous iron oxide	R

Carbon-Carbonate
4-100 (11.8-0.0-98)

+G.= Globotruncana

Site 310 Hole Core 19 Cored Interval: 165.5-174.5 m

AGE: CAMPANIAN
NANNOS FORAMS RADS: + G. elevata, G. stuartiformis
FOSSIL CHARACTER: FOSSIL: R N F; ABUND.: R A C; PRES.: P M M
SECTION: 0, Core Catcher
METERS
LITHOLOGY
DEFORMATION
LITHO.SAMPLE: CC

LITHOLOGIC DESCRIPTION

CHERT fragments in soupy NANNO OOZE.

Smear Slide at CC

Composition	
Nannos	A
Forams	C
Light glass	R
Amorphous iron oxide	R
*Rads	R
*Diatoms	R

*Probable pollution from upper parts of the hole.

+G.= Globotruncana

Site 310 Hole Core 20 Cored Interval: 174.5-184.0 m

AGE: CAMPANIAN
NANNOS FORAMS RADS: MIXED LATE MIOCENE AND CRETACEOUS
Eiffellithus eximius
Globotruncana fornicata, Globotruncana stuartiformis
FOSSIL CHARACTER: FOSSIL: N F R; ABUND.: A F F; PRES.: M M G
SECTION: 0, 1, 2, 3, 4, Core Catcher
METERS: 0.5, 1.0
LITHOLOGY
DEFORMATION
LITHO.SAMPLE: *34, CC

2.5Y 7/4 with 10R 2.5/1 fragments

LITHOLOGIC DESCRIPTION

Core is intensely disturbed, soft and soupy throughout. Color is predominantly moderate grayish yellow with small blackish red chert fragments.

NANNO OOZE with abundant small CHERT fragments. Chert fragments become especially abundant in lower part of the core (Section 4-60 to 100 and 118 to 150).

Smear Slide at 2-34

Composition	
Nannos	D
Forams	R

A small fragment of pink VOLCANIC CLAYSTONE was found in the core catcher.

Smear Slide at CC

Composition	
Clay minerals	A
Amorphous iron oxide	C
Light and dark glass	C
Hematite	C

**CAVINGS: Late Miocene coccoliths, diatoms, silicoflagellates

XCAVINGS: Neogene radiolarians

Site 310 Hole Core 21 Cored Interval: 184.0-193.5 m

AGE: CAMPANIAN
NANNOS FORAMS RADS: MIXED PLEISTOCENE AND CRETACEOUS
+ G. formicata, G. stuartiformis
FOSSIL CHARACTER: FOSSIL: R N F; ABUND.: C A —; PRES.: G M —
SECTION: 0, 1, 2, Core Catcher
METERS: 0.5, 1.0
LITHOLOGY: VOID
DEFORMATION
LITHO.SAMPLE: CC

10R 2.5/1 fragments

LITHOLOGIC DESCRIPTION

Core is intensely disturbed, mainly a gravel composed of blackish red chert chips and fragments.

1-90 to 2-137: CHERT fragments with small amounts of NANNO OOZE.

2-137 to CC: CHERT fragments and mud (cavings from upper parts of the hole).

Smear Slide at CC (cavings)

Composition	
Nannos	A
Diatoms	A
Forams	C
Rads	C
Clay minerals	C
Silicoflagellates	R
Sponge spicules	R
Amorphous iron oxide	R
Light glass	R

**CAVINGS: Neogene radiolarians

XCAVINGS: Abundant Pleistocene assemblage with Coccolithus pelagicus, Coccolithus pliopelagicus, ceratolithus cristatus

+G.= Globotruncana

Site 310 Hole A Core 1 Cored Interval: 95.0-104.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
MAASTRICHTIAN	Micula mura / Globotruncana stuartiformis, Globotruncana havanensis / ?Lithraphidites quadratus	F N	C A	C M	0					
					1	0.5 – 1.0				10YR 8/2 with occasional N9 lumps and streaks
					2				*0	
					3					
					4					
					5				*100	
					6					
		N F	A C	M M	Core Catcher				CC	

Core is intensely disturbed, soft to stiff throughout. Color is mainly very orange with slightly darker shades and occasional white streaks and lumps.

NANNO OOZE.

Smear Slide at 2-0

Composition	
Nannos	D
Micronodules	R

Smear Slide at 5-100

Composition	
Nannos	D
Forams	R

Smear Slide at CC

Composition	
Nannos	D
Forams	R
Dark glass	R

Carbon-Carbonate
1-100 (11.7-0.0-97)

Site 310 Hole A Core 2 Cored Interval: 104.5-114.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE CAMPANIAN?	Tetralithus trifidus / Globotruncana calcarata				0					
					1	0.5 – 1.0				10YR 8/2
					2				*92	
					3					10Y 6/4 with 7.5YR 3/2 laminae
					4					
					5					
					6					
		N F	A C	M P	Core Catcher				CC	

Most of the core is moderately disturbed except for the upper half which is often more intensely disturbed (Section 2 and upper half of Section 1). Color is very pale orange for the uppermost meter of core, with some mottling. The rest is mainly yellowish brown with occasional thin (millimetric to centimetric) dark brown layers and mottles.

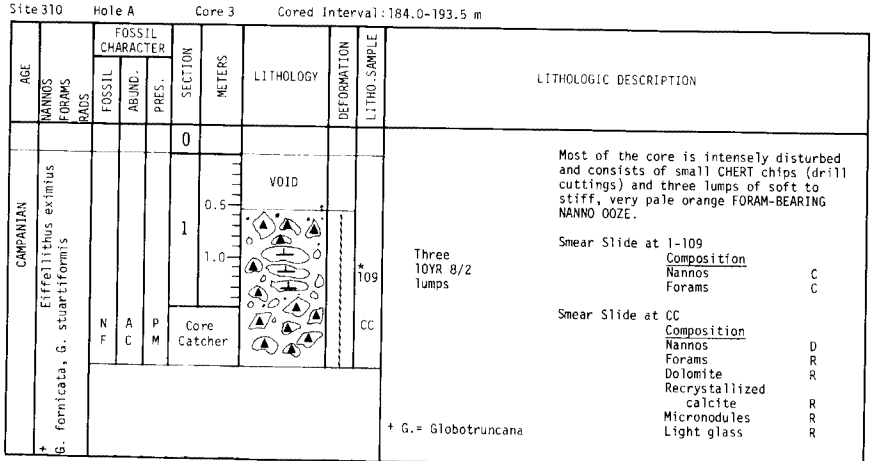
NANNO OOZE.

Smear Slide at 2-92

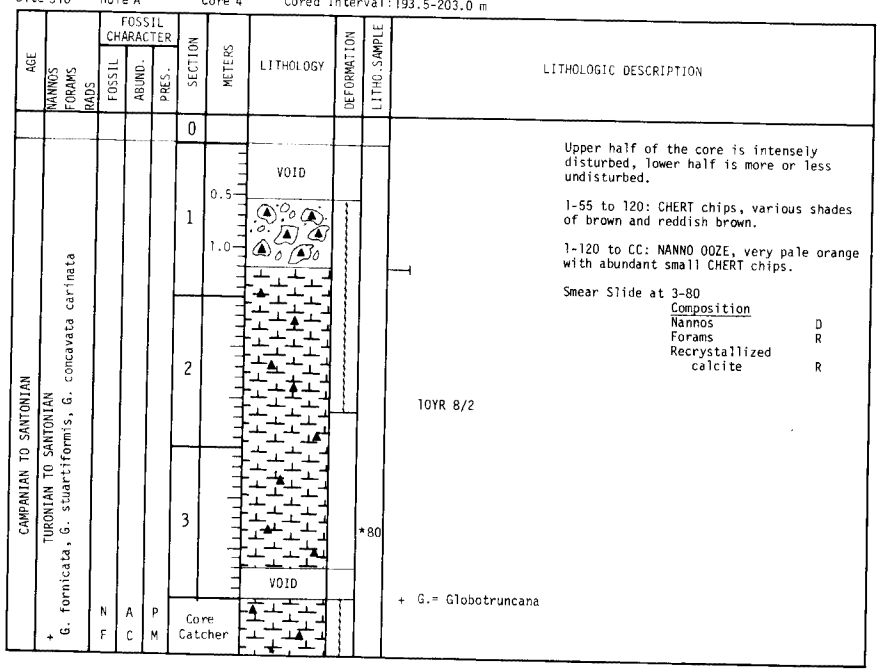
Composition	
Nannos	D
Amorphous iron oxide	C
Light and dark glass	R
Micronodules	R
Forams	R

Carbon-Carbonate
2-100 (10.4-0.0-86)

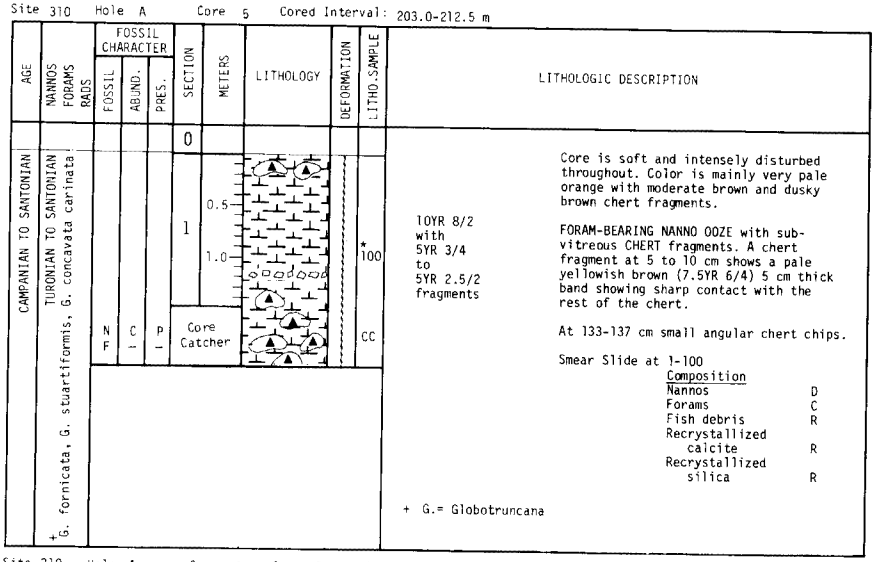
Site 310 Hole A Core 3 Cored Interval: 184.0-193.5 m



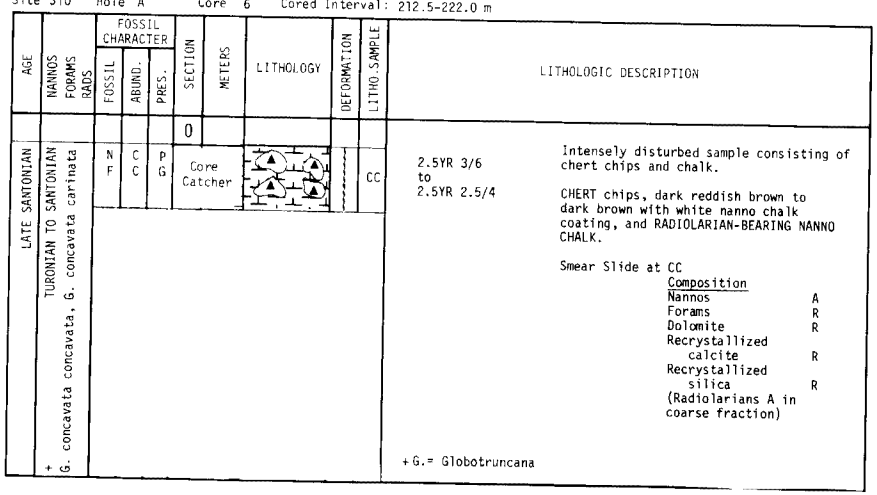
Site 310 Hole A Core 4 Cored Interval: 193.5-203.0 m



Site 310 Hole A Core 5 Cored Interval: 203.0-212.5 m



Site 310 Hole A Core 6 Cored Interval: 212.5-222.0 m



Site 310 Hole A Core 7 Cored Interval: 222.0-231.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
LATE SANTONIAN	TURONIAN TO SANTONIAN	N F	A I	M I	0					
	+ G. concavata concavata, G. concavata carinata				Core Catcher				CC	10R 4/6 CHERT fragments and chips, moderate reddish brown, with subvitreous, various shades of red and brown. Some chips have white coating of RADIOLARIAN-BEARING NANNO CHALK. Smear Slide at CC Composition Nannos D Recrystallized calcite C Forams R Recrystallized silica R Light glass R + G.= Globotruncana

Site 310 Hole A Core 8 Cored Interval: 231.5-241.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
SANTONIAN	TURONIAN TO SANTONIAN	R N F	C A I	M P I	0					
	Santonian to Campanian				Core Catcher				CC	10R 4/6 and N9 laminated with 10G 8/2 CHERT chips, mainly moderate reddish brown, subvitreous, with some white chalk coating, and RADIOLARIAN-BEARING NANNO CHALK, white, semilithified, laminated with a very pale green band with a hard white calcite vein coated with a thin black film. Smear Slide at CC Composition Nannos A Rads C Recrystallized calcite C Dolomite R

Site 310 Hole A Core 9 Cored Interval: 241.0-250.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
EARLY SANTONIAN	TURONIAN TO SANTONIAN	N F	C C	P G	0					
	+ G. fornicata, G. concavata concavata, G. primitiva, G. imbricata				Core Catcher				CC	10R 4/6 and 2.5Y 4/6 CHERT chips and fragments, mainly moderate reddish brown and dark gray, rich in recrystallized radiolarians. Some pieces show white NANNO CHALK coating, partly silicified. Smear Slide at CC Composition Nannos D Recrystallized calcite C Amorphous iron oxide R + G.= Globotruncana

Site 310 Hole A Core 10 Cored Interval: 250.0-259.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
LATE CONIACIAN	TURONIAN TO SANTONIAN +G. fornicata, G. concavata concavata, G. primitiva, G. imbricata, G. schneegansi Turonian to Santonian	R N	C A	M P	0 Core Catcher				CC

5YR 3/1 and 2.5Y 8/0

CHERT fragments, dark grayish brown subvitreous, banded, dense and hard; and NANNO CHALK, light gray, fairly well-lithified.

Smear Slide at CC

Composition	
Nannos	A
Dolomite	C
Recrystallized calcite	C
Forams	R
Rads	R

+ G.= Globotruncana

Site 310 Hole A Core 11 Cored Interval: 259.5-269.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
CONIACIAN	TURONIAN TO SANTONIAN +G. primitiva, G. marginata, G. imbricata, G. schneegansi Turonian to Santonian	R N F	C C C	P P G	0 Core Catcher				CC CC

10R 4/6

2.5Y 8/0 and N9

CHERT fragments and chips, moderate reddish brown, subvitreous; RADIOLARIAN-BEARING NANNO CHALK, light gray; and white NANNO CHALK, semilithified.

Smear Slide at CC (in gray chalk)

Composition	
Nannos	A
Rads	C
Recrystallized calcite	C
Forams	R
Dolomite	R

Smear Slide at CC (in white chalk)

Composition	
Nannos	D
Forams	R
Rads	R
Recrystallized calcite	R
Zeolites	R
Light glass	R
Amorphous iron oxide	R
Micronodules	R

+ G.= Globotruncana

Site 310 Hole A Core 12 Cored Interval: 269.0-278.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
CONIACIAN	+ G. primitiva, G. marginata, G. imbricata, G. schneegansi Turonian to Santonian	R F	C A	P G	0 Core Catcher				CC

2.5Y 4/0
10YR 3/2 chert
2.5Y 3/2

N8 = chalk

CHERT, dark gray and dark grayish brown, vitreous, showing sharp contact with SILICEOUS CHALK, very light gray, lithified, with thin (1-4 mm) laminae of chert, olive gray. Radiolarians are visible in chalk.

Smear Slide at CC (in chalk)

Composition	
Nannos	A
Rads	C
Forams	C
Recrystallized silica	C
Recrystallized calcite	C
Dolomite	R

+ G.= Globotruncana

Site 310 Hole A Core 13 Cored Interval: 278.0-287.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
CONIACIAN	(CAVED NEOGENE) * *	R N F	C A (CAVED)	P M	0 Core Catcher				CC

5YR 5/8 and 10YR 8/0 to 7.5YR 5/2

CHERT, pale brown, vitreous, bedded, homogeneous, and CALCAREOUS PORCELLANITE, light gray to gray, bedded, well lithified with apparent recrystallized radiolarians. Some pieces of chert show sharp contact with porcellanite.

Smear Slide at CC (in porcellanite)

Composition	
Recrystallized silica	A
Nannos	C
Rads	C
Forams	R

**CAVINGS: Early Pliocene Reticulofenestra pseudoumbilica, Ceratolithus rugosus and Eocene Discoaster barbadiensis

Site 310 Hole A Core 14 Cored Interval: 287.5-292.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
CONIANCIAN	+ G. primitira, G. schneegansi, G. sigai	N / F	A / A	M / G	0				
					1	0.5 – 1.0	VOID		
		R / N / F	R / A / A	P / P / G	Core Catcher				CC / CC

7.5YR 3/2 (chert) and 5GY 7/7 to chalk 10YR 8/2

+ G.= Globotruncana

CHERT, dark brown, some with small vugs filled with chalcedony fragments and chips; and NANNO OOZE, intensely disturbed (probably originally chalk) grayish yellow green to very pale orange.

Smear Slide at CC (in white chalk)

Composition	
Nannos	A
Forams	C
Recrystallized calcite	C
Recrystallized silica	C
Rads	R
Hematite	R
Amorphous iron oxide	R

Smear Slide at CC (in greenish chalk)

Composition	
Nannos	A
Recrystallized calcite	A
Recrystallized silica	C
Forams	R

Site 310 Hole A Core 15 Cored Interval: 297.0-306.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
TURONIAN	CENOMANIAN TO EARLY TURONIAN Globotruncana helvetica * *	N / F (CAVINGS	A	M	0				
					Core Catcher				CC

Smear of small CHERT chips, reddish and brown, and a few small lumps of NANNO CHALK and NANNO OOZE.

Smear Slide at CC (in chalk)

Composition	
Nannos	A
Recrystallized calcite	C
Forams	R
Rads	R
Light glass	R
Amorphous iron oxide	R

**CAVINGS: Maastrichtian Arkhangelskiella cymbiformis, Crelarhabdus conicus, Prediscosphaera lata, Cylindralithus gallicus

Site 310 Hole A Core 16 Cored Interval: 306.5-315.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
TURONIAN	CENOMANIAN TO TURONIAN Globotruncana helvetica Cenomanian to Turonian	R / N / F	C / F / A	M / P / G	0				
					Core Catcher				CC

2.5Y 3/0

5YR 3/3

CHERT, very dark gray, with apparent radiolarians and moderate brown, banded, with apparent radiolarians and some coating of white silicified chalk.

Smear Slide at CC (in white coating)

Composition	
Nannos	A
Recrystallized calcite	C
Recrystallized silica	C
Forams	R
Rads	R
Light glass	R

Site 310 Hole A Core 17 Cored Interval: 325.0-334.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
CENOMANIAN	Lithraphidites alatus (CAVED) Dictyomitra somphedia	N / F / R	A / A / C	M / G / M	0				
					Core Catcher				CC

CHERT, PORCELLANITE, ZEOLITIC PELAGIC CLAY and CARBONACEOUS PELAGIC SHALE.

CHERT, dark gray (2.5YR 4/0) and dark yellowish brown (10YR 4/3) vitreous, vugs filled with silicified chalk, some with coating of drussy quartz crystals, and showing sharp contact with white (N9) silicified nanno chalk.

PORCELLANITE is greenish gray (5G 6/1) to greenish black (5G 2/1), finely laminated, with small crystals of pyrite in some laminae.

Smear Slide at CC (porcellanite)

Composition	
Recrystallized silica	D
Nannos	R

ZEOLITIC PELAGIC CLAY, dark greenish gray (5G 4/1) with burrow-like lenses (2-4 mm) of black (N1) clay, soft and plastic, fissile.

Smear Slide at CC (in zeolitic clay)

Composition	
Clay minerals	A
Zeolites	A
Pyrite	C
Light and dark glass	C

CARBONACEOUS PELAGIC SHALE, black (N1), laminated, subfissile to fissile (partly silicified) with some dark grayish brown (2.5Y 3/2) laminae; well-crystallized thin pyrite laminae clearly visible; bituminous odor, burns when heated.

Smear Slide at CC (in black shale)

Composition	
Organic matter	A
Nannos	C
Clay minerals	C
Zeolites	R
Dark glass	R
Siderite	R

X-ray CC

Bari	28.8%	Cris	13.1%	Mica	6.6%
Pyri	14.2%	Quar	9.9%	Plag	2.8%
Trid	13.3%	Paly	8.7%	Clin	2.5%

Site 310 Hole A Core 18 Cored Interval: 343.5-352.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
CENOMANIAN	Lithraphidites alatus LATE ALBIAN TO EARLY CENOMANIAN	R / N / F	F / A / A	P / M / G	0				
					Core Catcher				

Small lump of FORAM-BEARING NANNO CHALK.

DEEP SEA DRILLING PROJECT

LEG 32 SITE 311

SITE SUMMARY SHEET

POSITION: Latitude: 28°07.46'N Longitude: 179°44.25'E

Water depth: 5775 corrected meters (echo sounding)

Bottom felt at: 5780 meters (drill pipe) Penetration: 37 meters

Number of Holes: 1 Number of Cores: 5

Total length of cored section: 37.0 m Total core recovered: 19.0 m

Percentage of core recovery: 51.5%

OLDEST SEDIMENT CORED:

Depth below sea floor: 37 meters Nature: Volcanic sandstone

Age: Early late Oligocene Measured Velocity: 3.4 km/sec at 29 meters

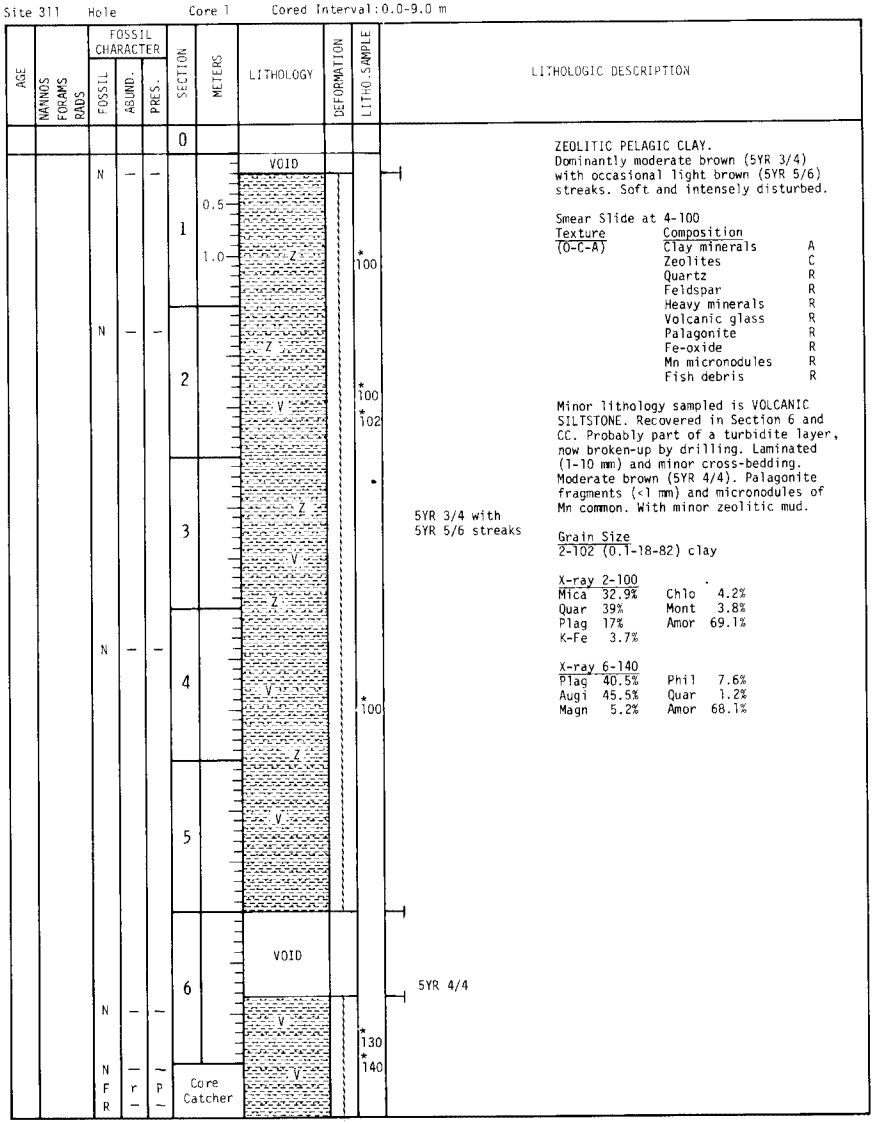
BASEMENT:

Depth below sea floor: Not reached

PRINCIPAL RESULTS:

Twenty-one meters of unfossiliferous brown pelagic clay over a hard turbidite sequence of palagonite and other volcanic grains of early late Oligocene age and unknown thickness. This dates the volcanism of the nearest large seamount, which is in the Hawaiian chain, as about 27 to 30 m.y.

Site 311 Hole Core 1 Cored Interval: 0.0-9.0 m



ZEOLITIC PELAGIC CLAY.
Dominantly moderate brown (5YR 3/4) with occasional light brown (5YR 5/6) streaks. Soft and intensely disturbed.

Smear Slide at 4-100

Texture (0-C-A)	Composition	
	Clay minerals	A
	Zeolites	C
	Quartz	R
	Feldspar	R
	Heavy minerals	R
	Volcanic glass	R
	Palagonite	R
	Fe-oxide	R
	Mn micronodules	R
	Fish debris	R

Minor lithology sampled is VOLCANIC SILTSTONE. Recovered in Section 6 and CC. Probably part of a turbidite layer, now broken-up by drilling. Laminated (1-10 mm) and minor cross-bedding. Moderate brown (5YR 4/4). Palagonite fragments (<1 mm) and micronodules of Mn common. With minor zeolitic mud.

Grain Size
2-102 (0.1-18-82) clay

X-ray 2-100

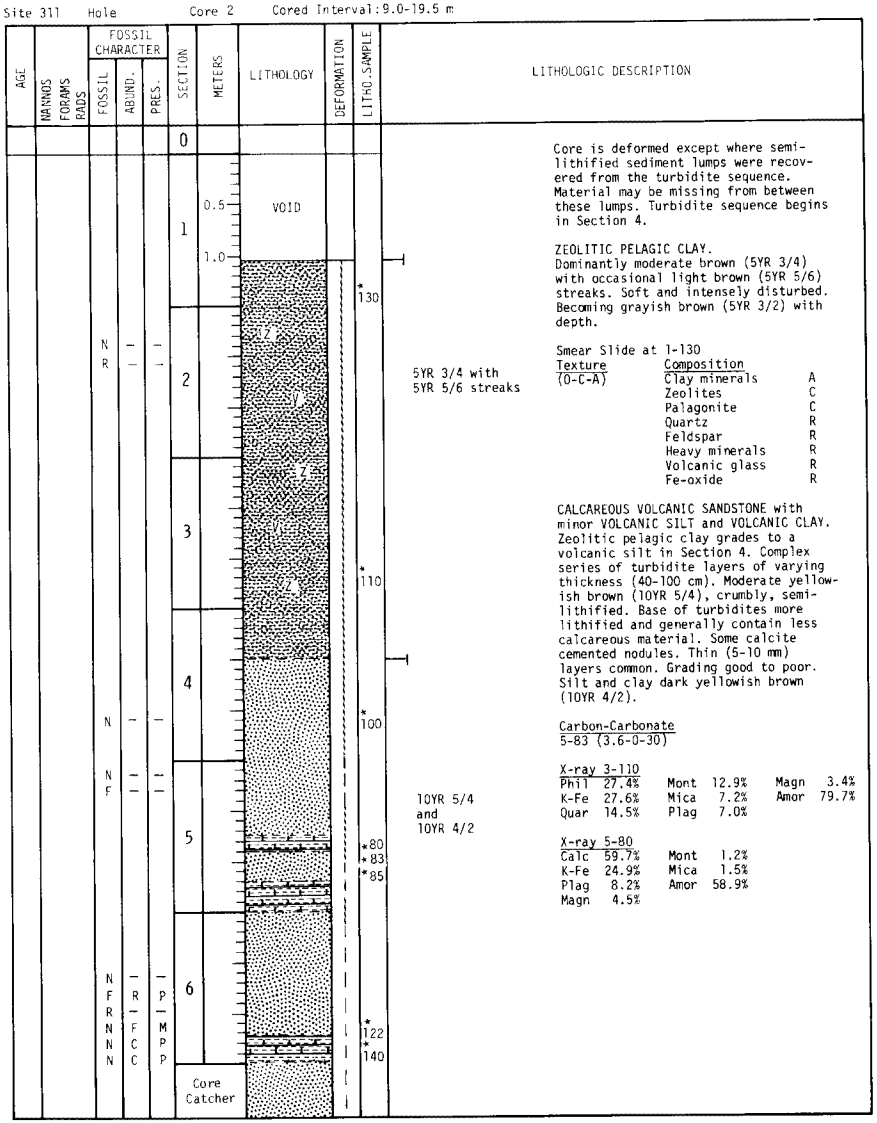
Mica	32.9%	Chlo	4.2%
Quar	39%	Mont	3.8%
Plag	17%	Amor	69.1%
K-Fe	3.7%		

X-ray 6-140

Plag	40.5%	Phil	7.6%
Augi	45.5%	Quar	1.2%
Magn	5.2%	Amor	68.1%

Explanatory notes in Chapter 1

Site 311 Hole Core 2 Cored Interval: 9.0-19.5 m



Core is deformed except where semi-lithified sediment lumps were recovered from the turbidite sequence. Material may be missing from between these lumps. Turbidite sequence begins in Section 4.

ZEOLITIC PELAGIC CLAY.
Dominantly moderate brown (5YR 3/4) with occasional light brown (5YR 5/6) streaks. Soft and intensely disturbed. Becoming grayish brown (5YR 3/2) with depth.

Smear Slide at 1-130

Texture (0-C-A)	Composition	
	Clay minerals	A
	Zeolites	C
	Palagonite	C
	Quartz	R
	Feldspar	R
	Heavy minerals	R
	Volcanic glass	R
	Fe-oxide	R

CALCAREOUS VOLCANIC SANDSTONE with minor VOLCANIC SILT and VOLCANIC CLAY. Zeolitic pelagic clay grades to a volcanic silt in Section 4. Complex series of turbidite layers of varying thickness (40-100 cm). Moderate yellowish brown (10YR 5/4), crumbly, semi-lithified. Base of turbidites more lithified and generally contain less calcareous material. Some calcite cemented nodules. Thin (5-10 mm) layers common. Grading good to poor. Silt and clay dark yellowish brown (10YR 4/2).

Carbon-Carbonate
5-83 (3.6-0-30)

X-ray 3-110

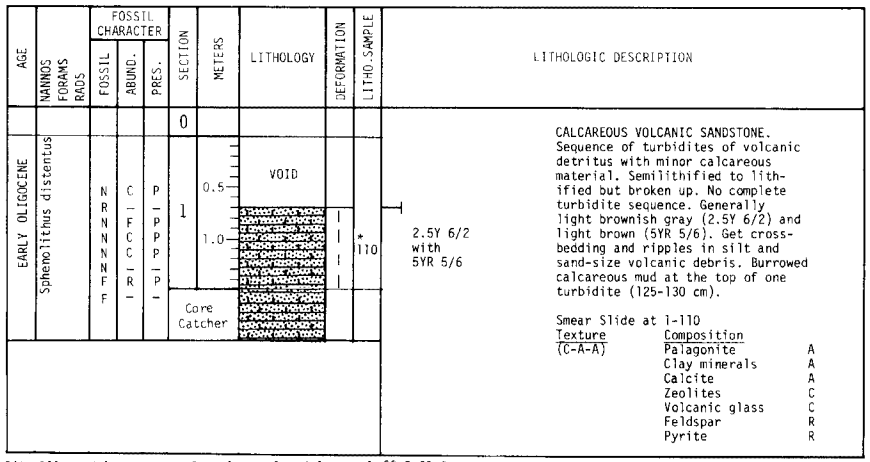
Phil	27.4%	Mont	12.9%	Magn	3.4%
K-Fe	27.6%	Mica	7.2%	Amor	79.7%
Quar	14.5%	Plag	7.0%		

X-ray 5-80

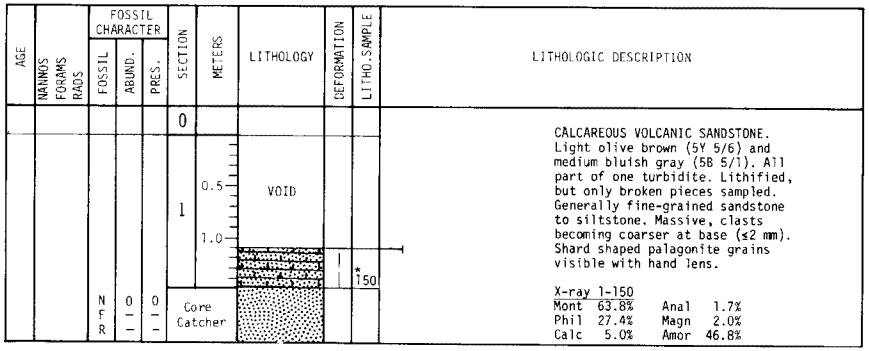
Calc	59.7%	Mont	1.2%
K-Fe	24.9%	Mica	1.5%
Plag	8.2%	Amor	58.9%
Magn	4.5%		

Explanatory notes in Chapter 1

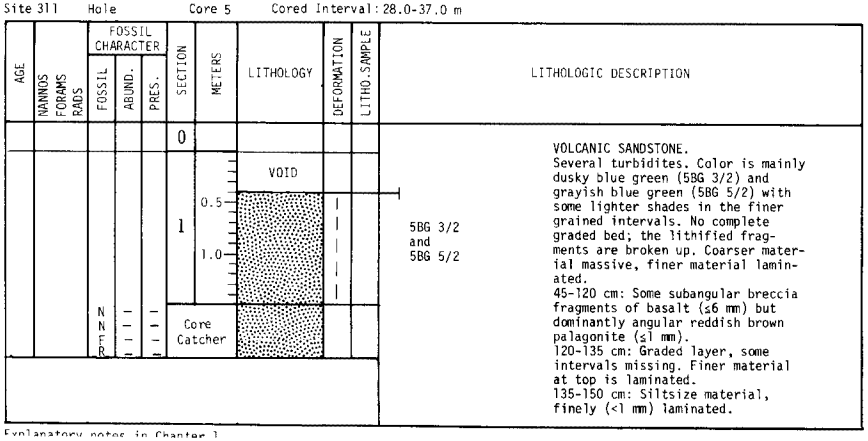
Site 311 Hole Core 3 Cored Interval: 19.5-22.5 m



Site 311 Hole Core 4 Cored Interval: 22.5-28.0 m



Site 311 Hole Core 5 Cored Interval: 28.0-37.0 m



Explanatory notes in Chapter 1

42

DEEP SEA DRILLING PROJECT

LEG 32 SITE 312

SITE SUMMARY SHEET

POSITION: Latitude: 25°34.70'N Longitude: 178°08.00'W

Water depth: 5345 corrected meters (echo sounding)

Bottom felt at: Not reached Penetration: 0 meters

PRINCIPAL RESULTS:

Unable to run pipe at site because of bad weather. Not enough time remaining to achieve primary objective of dating basement here.

DEEP SEA DRILLING PROJECT

LEG 32 SITE 313

SITE SUMMARY SHEET

POSITION: Latitude: 20°10.52'N Longitude: 170°57.15'W

Water depth: 3484 corrected meters (echo sounding)

Bottom felt at: 3492 meters (drill pipe) Penetration: 606 meters

Number of Holes: 1 Number of Cores: 44

Total length of cored section: 394.5 m Total core recovered: 220.5 m

Percentage of core recovery: 55.9%

OLDEST SEDIMENT CORED:

Depth below sea floor: 583 meters Nature: Limestone and volcanic sandstone

Age: Late Campanian Measured Velocity: 2.9 km/sec

BASEMENT:

Depth below sea floor: 606 meters (drilled) Nature: Basalt

Velocity of basement: 3.7 to 5.2 km/sec

PRINCIPAL RESULTS:

This section penetrated Cenozoic calcareous oozes to middle Eocene at 150 meters; Eocene, some Paleocene, and Maastrichtain chalk with minor chert and porcellanite to 400 meters (Paleocene unconformity at about 230 meters); and Campanian turbidite sequences of limestones and volcanic sandstones and breccias to extrusive basalt, which correlates with acoustic basement at 0.55 seconds, at 594 meters.

Site 313 Hole Core 1 Cored Interval: 0.0-8.0 m

AGE: PLIOCENE QUATERNARY / LATE MIOCENE
Discoaster quinqueramus

NANNOS FORAMS RADS

FOSSIL CHARACTER: FOSSIL N F R; ABUND. A A R; PRES. M G G

SECTION: 1 2 3 4 5 6 Core Catcher

METERS: 0 0.5 1.0

LITHOLOGY: VOID; VOID; Core Catcher

DEFORMATION

LITHO.SAMPLE: *100 *102 *15 *128 *50 *52 CC

LITHOLOGIC DESCRIPTION

ZEOLITIC NANNO OOZE yellowish brown (10YR 5/4) to light yellowish brown (10YR 6/4), soft.
2-145: Possible base of turbidite.

Smear Slide at 3-128

Texture (C-A-A)	Composition	
	Nannos	A
	Zeolites	C
	Forams	C
	Clay minerals	C
	Fish debris	R
	Mn micronodules	R
	Fe-oxide	R
	Volcanic glass	R
	Feldspar	R
	Quartz	R

10YR 5/4 and 10YR 6/4 with some 10YR 6/3

Minor lithology sampled.

FORAM NANNO OOZE.
Occurs as layers of pale brown (10YR 6/3).

Carbon-Carbonate
2-102 (10.3-0-85)
5-52 (2.9-0.1-24)

X-ray 2-100

Calc	98.5%				
Quar	1.5%				
Amor	30.5%				

X-ray 5-50

Calc	46.2%	Plag	13.5%	Chlo	2.5%
Quar	13.5%	Mica	13.0%	Mont	3.4%
K-Fe	6.6%	Kaol	1.4%	Amor	65.8%

sharp contact

Site 313 Hole Core 2 Cored Interval: 35.5-45.0 m

AGE: MIDDLE MIOCENE
Sphenolithus heteromorphus
Calocycletta costata

NANNOS FORAMS RADS

FOSSIL CHARACTER: FOSSIL N F R; ABUND. A A C; PRES. M G G

SECTION: 1 2 3 Core Catcher

METERS: 0 0.5 1.0

LITHOLOGY: VOID

DEFORMATION

LITHO.SAMPLE: *108 *97 *100 *70 *100 *140 CC

LITHOLOGIC DESCRIPTION

RADIOLARIAN NANNO OOZE very pale brown (10YR 7/3) to (10YR 7/4) with darker shades of brown (10YR 5/3). Soft and uniform. Composes most of the core.

10YR 4/4

10YR 7/3 to 10YR 7/4

Smear Slide at 3-140

Texture (C-O-D)	Composition	
	Nannos	D
	Rads	A
	Forams	R
	Fe-oxide	R

Minor lithologies sampled:

ZEOLITIC NANNO OOZE.
At top of core. Dark yellowish brown (10YR 4/4). Soft.

FORAM NANNO OOZE.

Smear Slide at 3-70

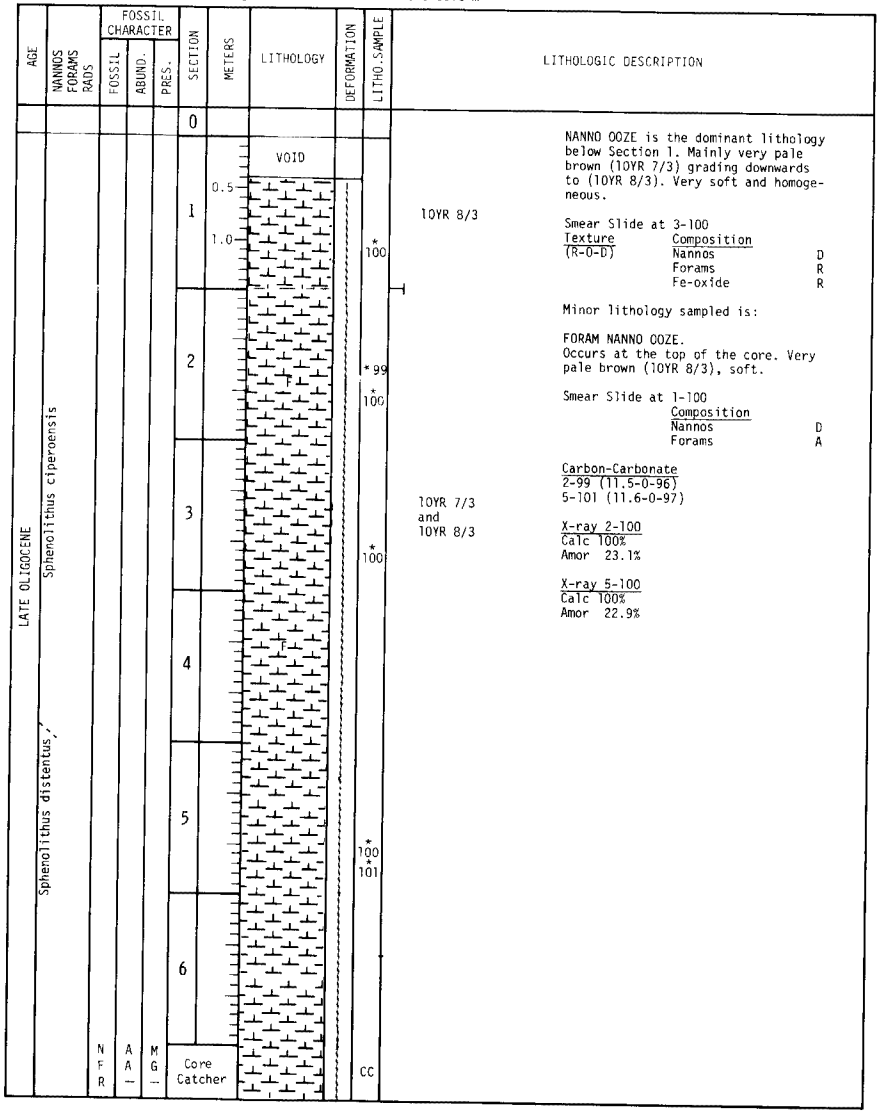
Composition	
Nannos	D
Forams	C
Fe-oxide	R
Volcanic glass	R

Carbon-Carbonate
2-97 (11.1-0-92)

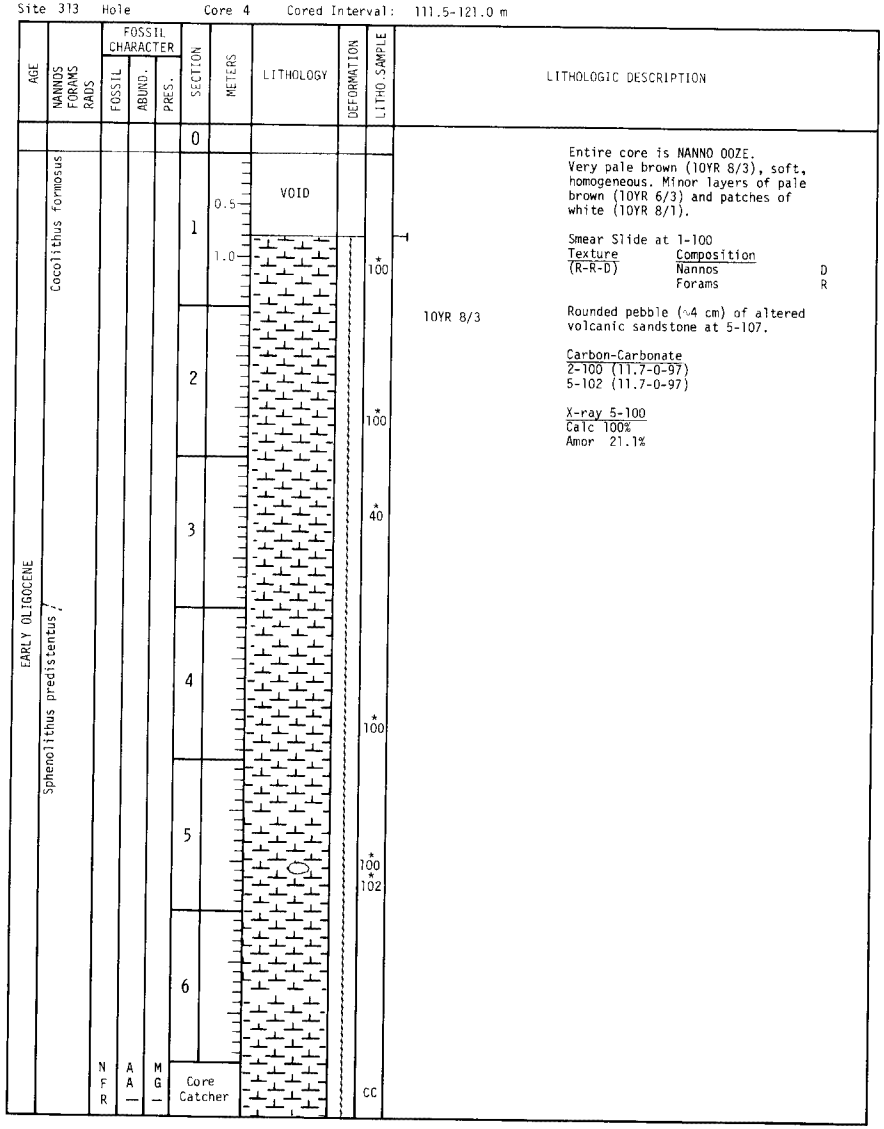
X-ray 2-100

Calc	100%
Amor	30.6%

Site 313 Hole Core 3 Cored Interval: 73.5-83.0 m



Site 313 Hole Core 4 Cored Interval: 111.5-121.0 m



Site 313 Hole Core 5 Cored Interval: 149.5-159.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
EARLY OLIGENE *					0				
MIDDLE EOCENE / LATE EOCENE	Discoaster barbadiensis / Discoaster saipanensis?, Globoratalia lehneri?	N	A	P	1	0.5, 1.0			* 4, * 100, * 128
					2				* 70, * 72
					3				
					4				
					5				* 100
					6				
		N F R	A A —	M G —	Core Catcher				CC

*Coccolithus subdistichus Subzone
EARLY OLIGOCENE
313-5-0, 0-1 cm
Discoaster barbadiensis Zone
LATE EOCENE
313-5-0, 18-21 cm
Has common reworked CRETACEOUS AND PALEOCENE
313-5-0, 46-47 cm

10YR 6/4

NANNO CHALK.
Light yellowish brown (10YR 6/4) with layers of dark yellowish brown (10YR 4/4). Composes most of the core. When not disturbed is finely laminated (≤1 mm), some cross-bedding and graded bedding.

Smear Slide at 1-100

Texture	Composition	
(0-R-D)	Nannos	D
	Forams	R
	Zeolites	R
	Fe-oxide	R

Base of a graded layer at 3-68.

Minor lithology is:
CHERT nodule, layered dark grayish brown (10YR 4/2) and light gray (10YR 6/1 to 10YR 7/1). Some as fragments, mainly dark brown (10YR 3/3) with bands (2-3 mm) and spots of very pale brown (10YR 7/3).

Carbon-Carbonate
2-72 (11.4-0-95)
5-100 (11.6-0-96)

X-ray 2-70
Calc 100%
Amor 23.1%

Site 313 Hole Core 6 Cored Interval: 159.0-168.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
MIDDLE EOCENE	Reticulofenestra umbilica / Globigerinatheka subconglobata subconglobata to Globorotalia lehneri	R N F R	I A C I —	I M G I —	0				
					1	0.5, 1.0	VOID		* 148
					Core Catcher				CC

Core consists of interbedded NANNO OOZE and NANNO CHALK. Mainly light yellowish brown (10YR 6/4). Thin white (10YR 8/2) layers at 133, 141 and 145 cm.

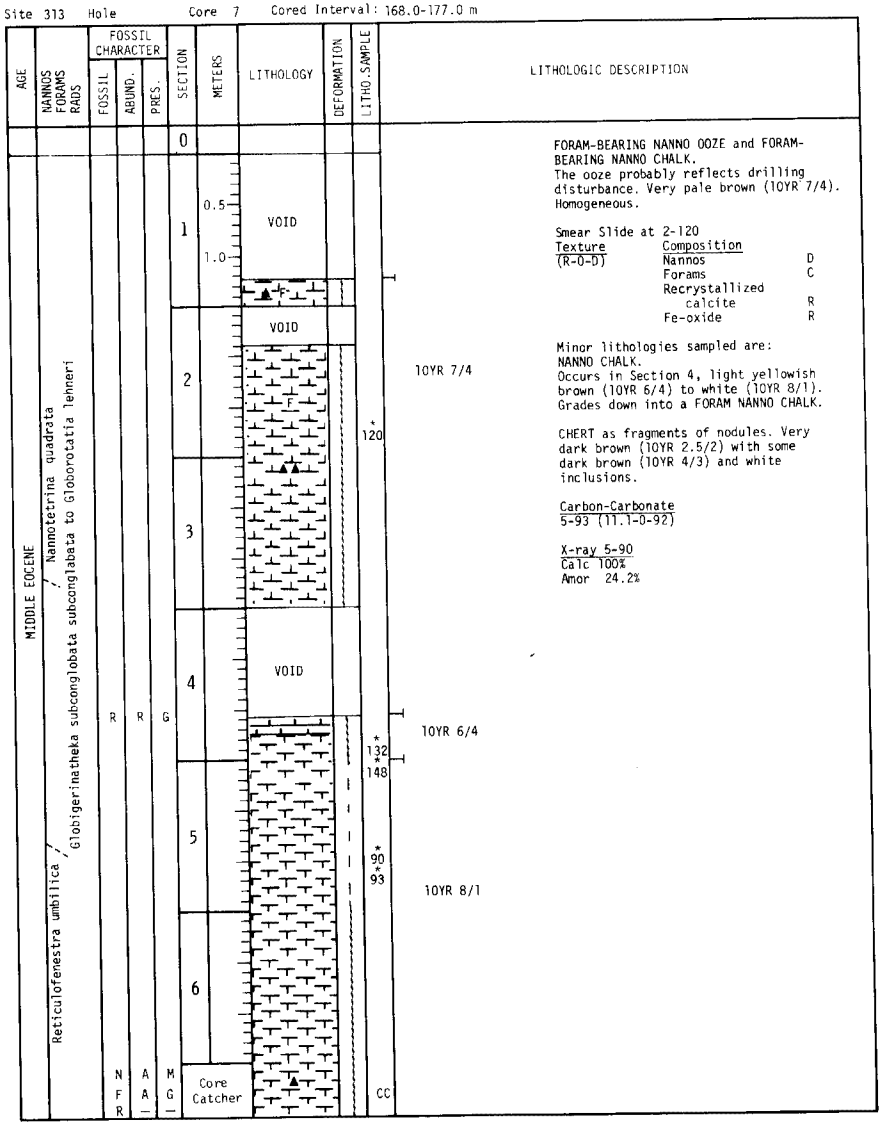
NANNO OOZE.

Smear Slide at 1-148

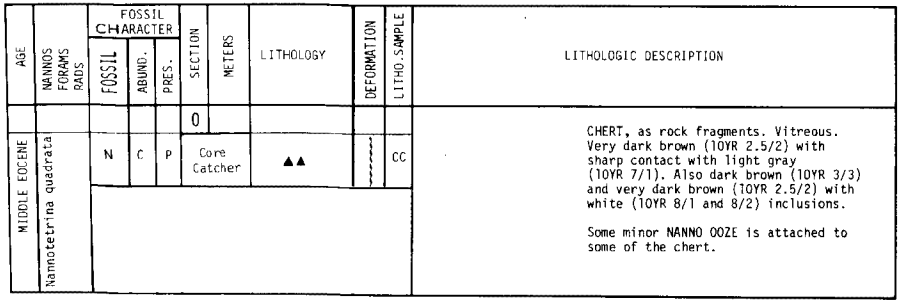
Texture	Composition	
(C-0-D)	Nannos	D
	Forams	C
	Fe-oxide	R

Minor lithology is:
CHERT fragments. Vitreous dark brown (10YR 4/3) and some white inclusions.

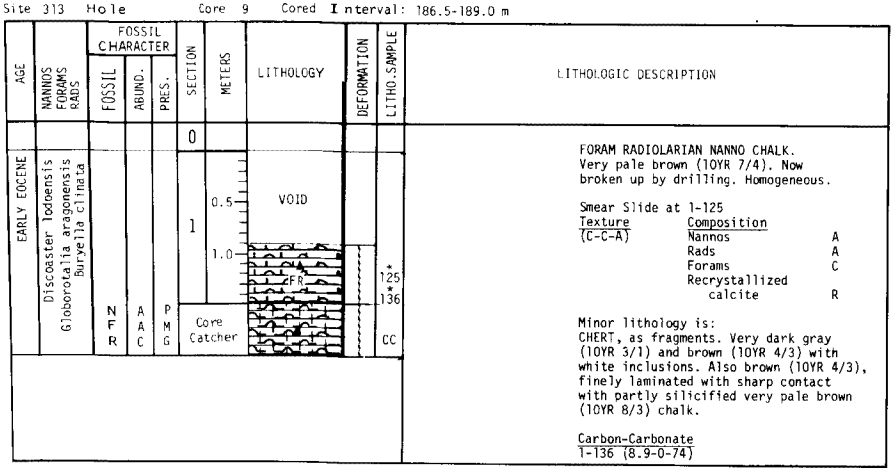
Site 313 Hole Core 7 Cored Interval: 168.0-177.0 m



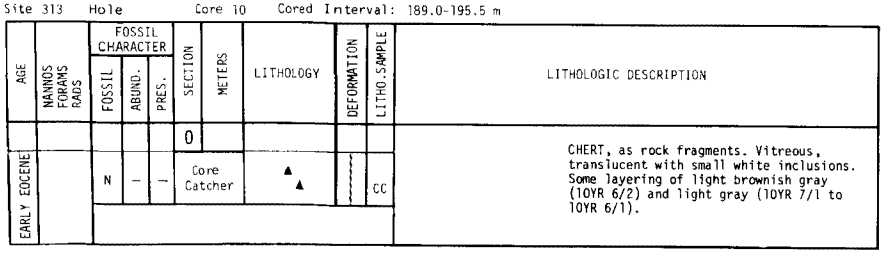
Site 313 Hole Core 8 Cored Interval: 177.0-186.5 m



Site 313 Hole Core 9 Cored Interval: 186.5-189.0 m



Site 313 Hole Core 10 Cored Interval: 189.0-195.5 m



Site 313 Hole Core 11 Cored Interval: 195.5-205.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					0					CHERT, as rock fragments. Translucent, light gray (10YR 6/1). Numerous small white inclusions (≤2 mm)
EARLY EOCENE		N	1	1	Core Catcher		▲ ▲		CC	

Site 313 Hole Core 12 Cored Interval: 205.0-214.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					0					The whole core is badly disturbed by drilling. RADIOLARIAN FORAM NANNO OOZE. White (10YR 8/1), homogeneous. Contains rare CHERT fragments and lumps of RADIOLARIAN FORAM NANNO CHALK. Smear Slide at 4-100 Texture (A-C-A) Composition: Forams A; Nannos A; Rads A; Recrystallized calcite R; Volcanic glass R Minor lithology is: CHERT, as rock fragments and chips. Very dark brown (10YR 2.5/2) and dark yellowish brown (10YR 4/4). Very sharp contact between colors. Carbon-Carbonate 2-101 (9.1-0-76) X-ray 2-100 Calc 100% Amor 39.5%
EARLY EOCENE Tribrachiatus orthostylus Globorotalia subbotinae Bekoma bidarfensis			N F R	O A C	O M G	1	0.5 1.0	VOID		
						2			★100 ★101	
						3				
						4			★100	
						5				
					Core Catcher				CC	

Site 313 Hole Core 13 Cored Interval: 214.0-223.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
					0					Core is completely disturbed by drilling and consists of RADIOLARIAN FORAM NANNO CHALK. Very pale brown (10YR 8/3) to white (10YR 8/1). Homogeneous. Semilithified broken white lumps occur in Section 1. Smear Slide at 1-10 Texture (A-C-A) Composition: Rads A; Forams A; Nannos C; Recrystallized calcite C Carbon-Carbonate 2-102 (9.5-0-79) X-ray 2-100 Calc 100% Amor 29.0%
EARLY EOCENE Discoaster diastypus Globorotalia subbotinae Bekoma bidarfensis					1	0.5 1.0				
					2				★88 ★100 ★102	
					3					
					4					
					5					
					6					
					Core Catcher				CC	

Site 313 Hole Core 14 Cored Interval: 223.0-232.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
EARLY EOCENE	Discoaster diastypus	N	A	M	0	Core Catcher	▲ ▲		CC	CHERT, as rock fragments. Vitreous. Very dark brown (10YR 3/3) and dark brown (10YR 2.5/2) with some light gray fragments. Minor nanno chalk smeared on some fragments.

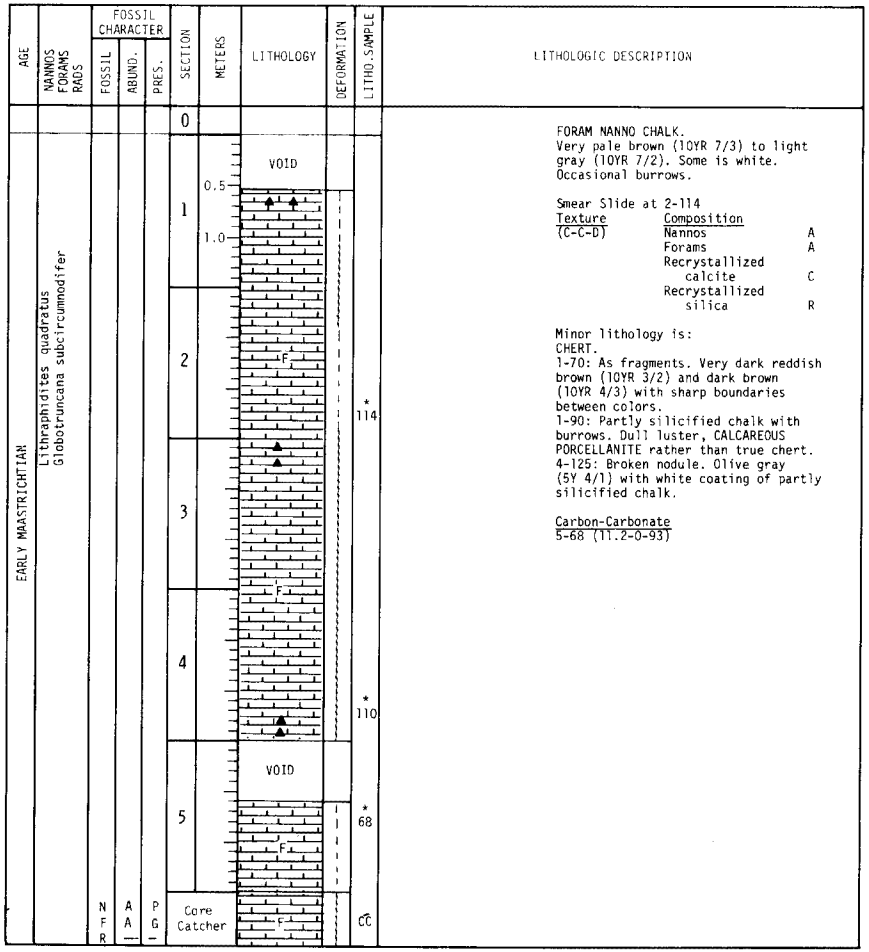
Site 313 Hole Core 15 Cored Interval: 232.5-242.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MAASTRICHTIAN	Globotruncana Lithraphidites quadratus	N	C	P	0					
					1	0.5 – 1.0	VOID; FL		* 60	FORAM-BEARING NANNO CHALK. Dominant lithology in the core. White (10YR 8/1) with some pale brown (10YR 8/4) and several bands of pale greenish yellow (10Y 8/2). Faint laminations and burrows.
					2		FL		* 50 * 52 * 100	Smear Slide at 2-100 Texture (A-C-A): Composition: Nannos A, Forams C, Recrystallized calcite A Minor lithology is: CHERT, dark reddish brown (5YR 3/3). As rock fragments, vitreous. Carbon-Carbonate 2-52 (11.1-0-92) X-ray 2-50: Calc 98.1% Bari 1.7% Quar 0.3% Amor 23.7%
					3		FL			
					4		F			
		N F R	A A R	P G P	Core Catcher				CC	

Site 313 Hole Core 16 Cored Interval: 242.0-251.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE	LITHOLOGIC DESCRIPTION
MIDDLE MAASTRICHTIAN	Lithraphidites quadratus Globotruncana gansseri				0					
					1	0.5 – 1.0	VOID; F		* 110	FORAM-BEARING NANNO CHALK. Constitutes most of the core. White (10YR 8/1 to 10YR 8/2). Layered (~5 cm) with minor burrowing. Grades downward into a FORAM NANNO CHALK in Section 5.
					2		F		* 95	Smear Slide at 1-110 Texture (C-C-A): Composition: Nannos A, Forams C, Recrystallized calcite C Minor lithology is: CHERT, as rock fragments. Light yellowish brown (10YR 6/4) and dark brown (7.5YR 4/4). Curved outer surface of nodule present on one piece. Carbon-Carbonate 2-95 (11.5-0-95)
					3		VOID; F			
					4		VOID; F			
					5		VOID; F		* 120	
		N F R	A A L	M G L	Core Catcher		F		CC	

Site 313 Hole Core 17 Cored Interval: 260.5-270.0 m



FORAM NANNO CHALK.
Very pale brown (10YR 7/3) to light gray (10YR 7/2). Some is white. Occasional burrows.

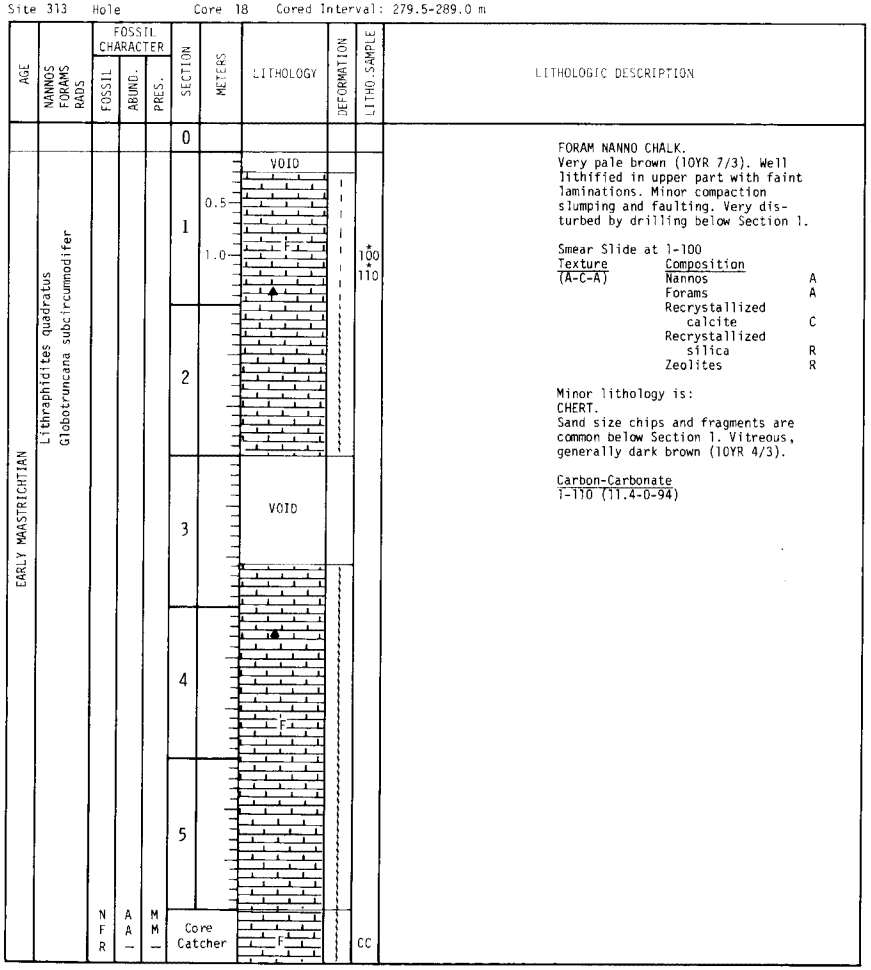
Smear Slide at 2-114

Texture	Composition	
(C-C-D)	Nannos	A
	Forams	A
	Recrystallized calcite	C
	Recrystallized silica	R

Minor lithology is:
CHERT.
1-70: As fragments. Very dark reddish brown (10YR 3/2) and dark brown (10YR 4/3) with sharp boundaries between colors.
1-90: Partly silicified chalk with burrows. Dull luster, CALCAREOUS PORCELLANITE rather than true chert.
4-125: Broken nodule. Olive gray (5Y 4/1) with white coating of partly silicified chalk.

Carbon-Carbonate
5-68 (11.2-0-93)

Site 313 Hole Core 18 Cored Interval: 279.5-289.0 m



FORAM NANNO CHALK.
Very pale brown (10YR 7/3). Well lithified in upper part with faint laminations. Minor compaction slumping and faulting. Very disturbed by drilling below Section 1.

Smear Slide at 1-100

Texture	Composition	
(A-C-A)	Nannos	A
	Forams	A
	Recrystallized calcite	C
	Recrystallized silica	R
	Zeolites	R

Minor lithology is:
CHERT.
Sand size chips and fragments are common below Section 1. Vitreous, generally dark brown (10YR 4/3).

Carbon-Carbonate
1-110 (11.4-0-94)

120

Site 313 Hole Core 19 Cored Interval: 298.5-308.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
EARLY MAASTRICHTIAN	Lithraphidites quadratus Globotruncana subcircumnodifer	N F R	A A —	P G —	0				
					1	0.5 – 1.0	F		★100
					2		F		★30
					3				
					4		F		
					5				★100
					6				★100
					Core Catcher		F		CC

LITHOLOGIC DESCRIPTION

FORAM NANNO CHALK.
White (N9). Generally disturbed and homogenized by drilling.

Smear Slide at 1-100

Texture (A-C-A)	Composition	
	Nannos	A
	Forams	A
	Recrystallized calcite	C
	Recrystallized silica	R
	Zeolites	R

Minor lithology is:
CHERT.
Fragments common. Brownish black (5YR 2/1) to olive black (5Y 2/1). Some fragments in CC very dark grayish brown (10YR 3/2) with a rim of light gray (10YR 6/1).

X-ray 5-100
Calc 100%
Amor 20.8%

Site 313 Hole Core 20 Cored Interval: 336.5-346.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
EARLY MAASTRICHTIAN	Tetralithus trifidus Globotruncana subcircumnodifer	N F R	A A F	P M P	0				
					1	0.5 – 1.0	VOID F		
					2		VOID F		★100
					3		F		
					Core Catcher		F		CC

LITHOLOGIC DESCRIPTION

FORAM NANNO CHALK.
Homogenized by drilling. White (N9).

Smear Slide at 2-100

Texture (A-C-A)	Composition	
	Nannos	A
	Forams	A
	Recrystallized calcite	C
	Rads	R
	Sponge spicules	R
	Recrystallized silica	R
	Zeolites	R

Minor lithologies are:
CHERT.
1-80: Fragment. Grayish olive green (5GY 4/2).
2-70: Fragment. Medium light gray (N6) with grayish brown inclusions.

CALCAREOUS PORCELLANITE
3-140: Fragments. Light gray (N7). Massive.

Site 313 Hole Core 21 Cored Interval: 374.5-384.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
EARLY MAASTRICHTIAN	Tetralithus trifidus Globotruncana subcircumnodifer	N F R	A F F	P P P	0				
					1	0.5 1.0	VOID		
					2		F		* 100
					3				
					4				
					5				
					Core Catcher		F		CC

LITHOLOGIC DESCRIPTION

FORAM NANNO CHALK.
White (N9) to bluish white (5B 9/1) in color. Completely disturbed by drilling.

Smear Slide at 2-100

Texture (A-C-A)	Composition	
	Nannos	D
	Forams	D
	Recrystallized calcite	C
	Recrystallized silica	C
	Zeolites	R

Minor lithologies are:
CALCAREOUS PORCELLANITE.
1-50: Light bluish gray (5B 8/1) showing faint banding and rare burrows. Dull luster.

CHERT.
As rock fragments. Medium light gray (N6) with lighter gray (N7) zones.

Site 313 Hole Core 22 Cored Interval: 397.0-400.0 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
EARLY MAASTRICHTIAN	Tetralithus trifidus Globotruncana subcircumnodifer				0				
					1	0.5 1.0			* 100
					2				* 120
		N F R	F R F	P P M	Core Catcher				CC

LITHOLOGIC DESCRIPTION

This core is completely disturbed by drilling and three lithologies are represented by equal amounts.

NANNO CHALK and NANNO LIMESTONE.
Mainly very light gray (N8), finely laminated (≤1 mm) with occasional burrows. Laminations and burrow fillings are medium light gray (N7).

Smear Slide at 1-100

Texture (C-C-D)	Composition	
	Nannos	D
	Recrystallized calcite	C
	Forams	R
	Recrystallized silica	R
	Zeolites	R

CHERT.
As fragments. Have sharp contact with partly silicified limestone in one fragment.

CALCAREOUS PORCELLANITE.
As fragments. Light gray (N7). Massive.

Carbon-Carbonate
2-120 (10.6-0-88)

X-ray 2-120

Calc	98.2%	Clin	1.5%
Quar	0.3%	Amor	22.9%

Site 313 Hole Core 23 Cored Interval: 400.0-409.5 m

AGE	NANNOS FORAMS RADS	FOSSIL CHARACTER: FOSSIL	ABUND.	PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO.SAMPLE
EARLY MAASTRICHTIAN	Tetralithus trifidus Globotruncana subcircumnodifer				0				
					1	0.5 1.0	VOID		
		N F R	C F F	P P P	Core Catcher		F		* CC CC

LITHOLOGIC DESCRIPTION

NANNO LIMESTONE.
Broken fragments. Gray (7.5YR 6/1) to lighter gray (7.5YR 7/1). Fine laminations and bioturbation common.

148 cm sharp horizontal contact.

VOLCANIC SANDSTONE.
Semilithified, dark gray (N3). Fine to medium sand.

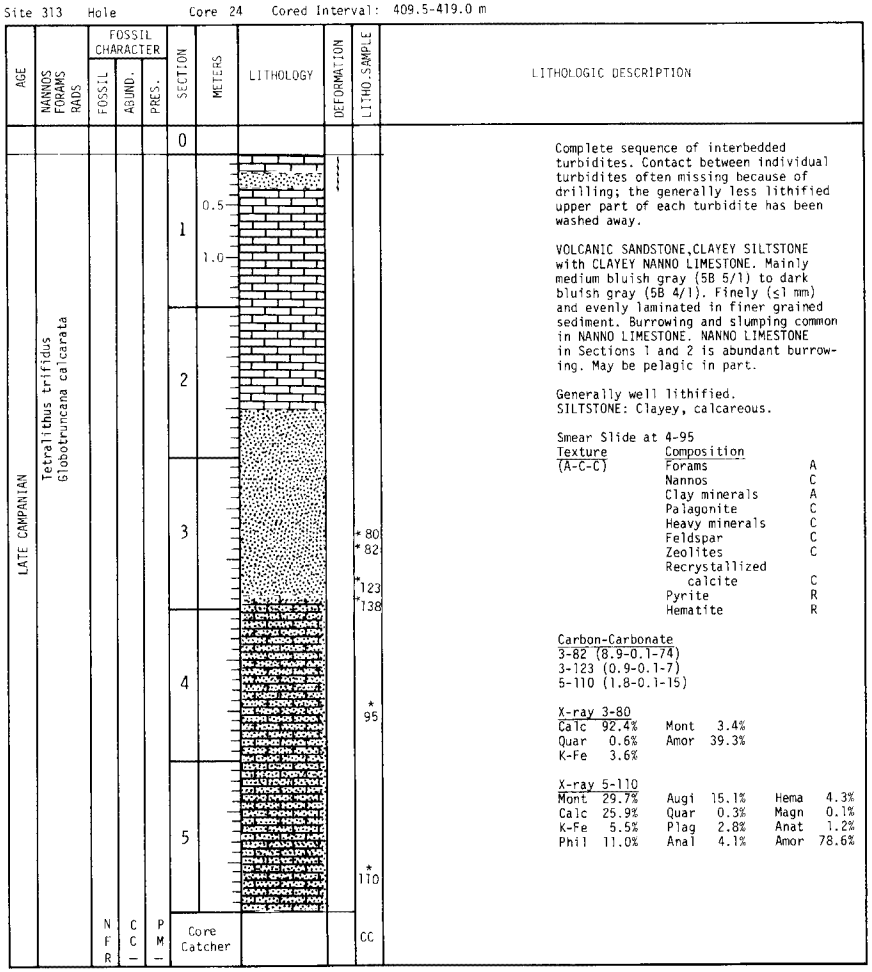
Smear Slide at CC

Texture (D-C-C)	Composition	
	Heavy minerals	A
	Palagonite	C
	Feldspar	R
	Zeolites	R
	Fe-oxide	R
	Forams	R
	Nannos	R

X-ray 1-150

Calc	87.3%	Plag	3.7%
Mont	5.7%	Quar	1.1%
Augi	2.2%	Amor	35.0%

Site 313 Hole Core 24 Cored Interval: 409.5-419.0 m



Complete sequence of interbedded turbidites. Contact between individual turbidites often missing because of drilling; the generally less lithified upper part of each turbidite has been washed away.

VOLCANIC SANDSTONE,CLAYEY SILTSTONE with CLAYEY NANNO LIMESTONE. Mainly medium bluish gray (5B 5/1) to dark bluish gray (5B 4/1). Finely (≤1 mm) and evenly laminated in finer grained sediment. Burrowing and slumping common in NANNO LIMESTONE. NANNO LIMESTONE in Sections 1 and 2 is abundant burrowing. May be pelagic in part.

Generally well lithified.
SILTSTONE: Clayey, calcareous.

Smear Slide at 4-95

Texture (A-C-C)	Composition	
	Forams	A
	Nannos	C
	Clay minerals	A
	Palagonite	C
	Heavy minerals	C
	Feldspar	C
	Zeolites	C
	Recrystallized calcite	C
	Pyrite	R
	Hematite	R

Carbon-Carbonate
3-82 (8.9-0.1-74)
3-123 (0.9-0.1-7)
5-110 (1.8-0.1-15)

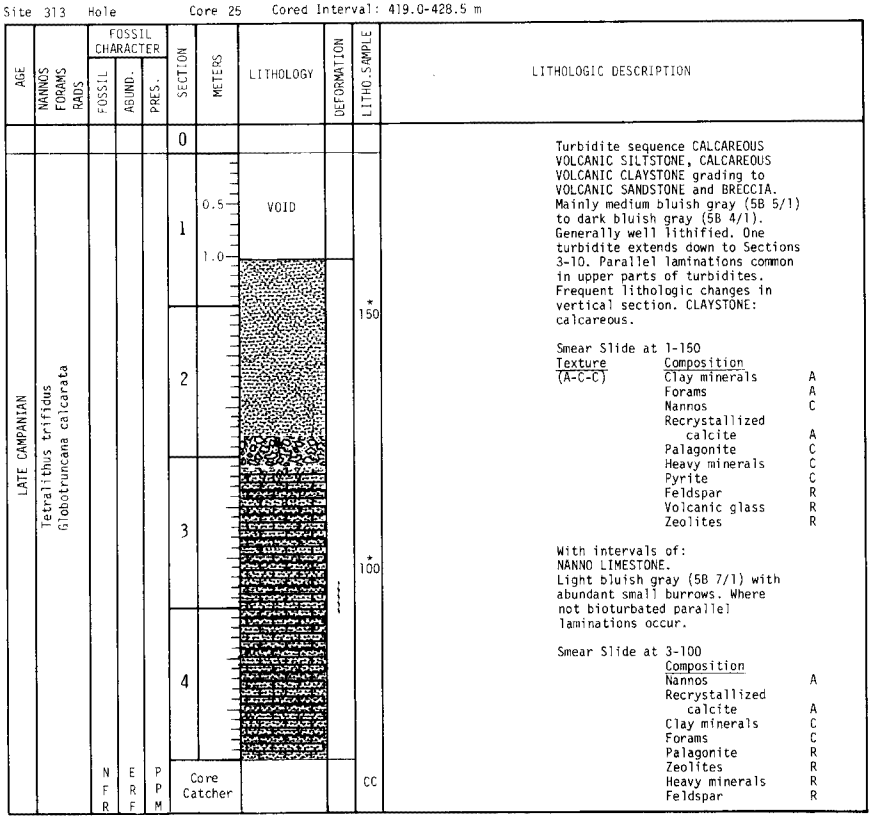
X-ray 3-80

Calc	92.4%	Mont	3.4%		
Quar	0.6%	Amor	39.3%		
K-Fe	3.6%				

X-ray 5-110

Mont	29.7%	Augi	15.1%	Hema	4.3%
Calc	25.9%	Quar	0.3%	Magn	0.1%
K-Fe	5.5%	Plag	2.8%	Anat	1.2%
Phil	11.0%	Anal	4.1%	Amor	78.6%

Site 313 Hole Core 25 Cored Interval: 419.0-428.5 m



Turbidite sequence CALCAREOUS VOLCANIC SILTSTONE, CALCAREOUS VOLCANIC CLAYSTONE grading to VOLCANIC SANDSTONE and BRECCIA. Mainly medium bluish gray (5B 5/1) to dark bluish gray (5B 4/1). Generally well lithified. One turbidite extends down to Sections 3-10. Parallel laminations common in upper parts of turbidites. Frequent lithologic changes in vertical section. CLAYSTONE: calcareous.

Smear Slide at 1-150

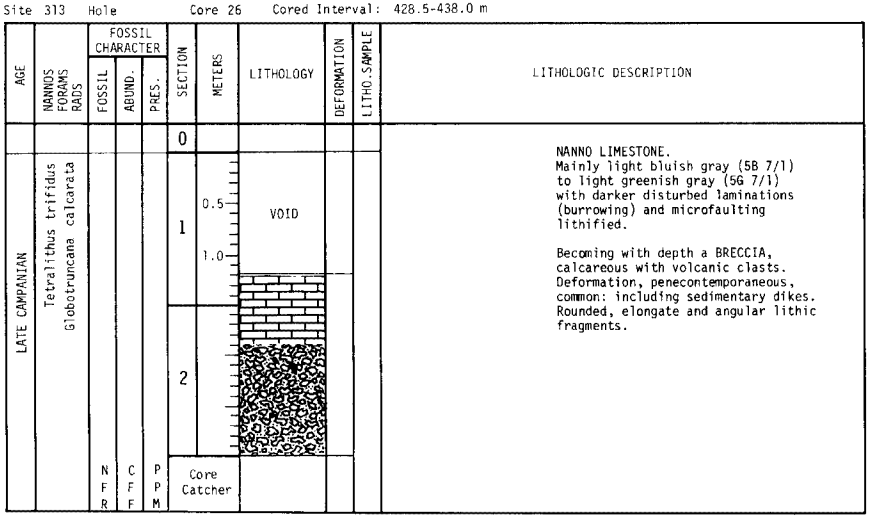
Texture (A-C-C)	Composition	
	Clay minerals	A
	Forams	A
	Nannos	C
	Recrystallized calcite	A
	Palagonite	C
	Heavy minerals	C
	Pyrite	C
	Feldspar	R
	Volcanic glass	R
	Zeolites	R

With intervals of:
NANNO LIMESTONE.
Light bluish gray (5B 7/1) with abundant small burrows. Where not bioturbated parallel laminations occur.

Smear Slide at 3-100

Composition	
Nannos	A
Recrystallized calcite	A
Clay minerals	C
Forams	C
Palagonite	R
Zeolites	R
Heavy minerals	R
Feldspar	R

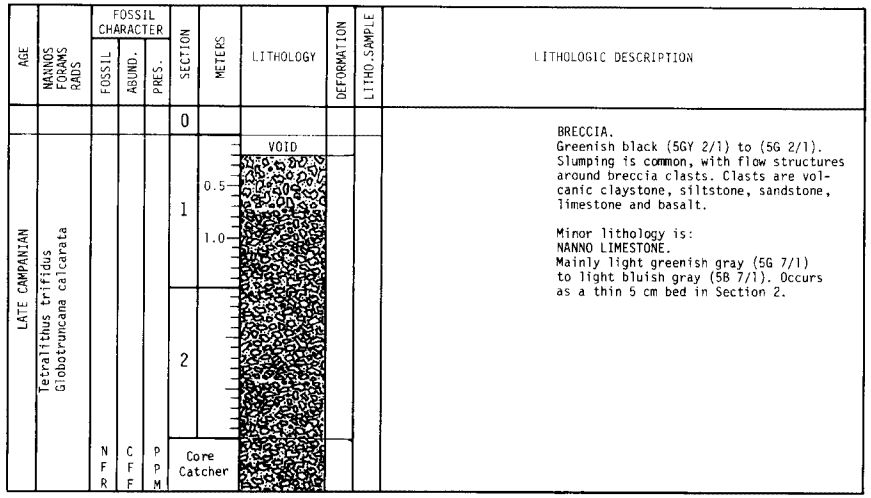
Site 313 Hole Core 26 Cored Interval: 428.5-438.0 m



NANNO LIMESTONE.
Mainly light bluish gray (5B 7/1) to light greenish gray (5G 7/1) with darker disturbed laminations (burrowing) and microfaulting lithified.

Becoming with depth a BRECCIA, calcareous with volcanic clasts. Deformation, penecontemporaneous, common: including sedimentary dikes. Rounded, elongate and angular lithic fragments.

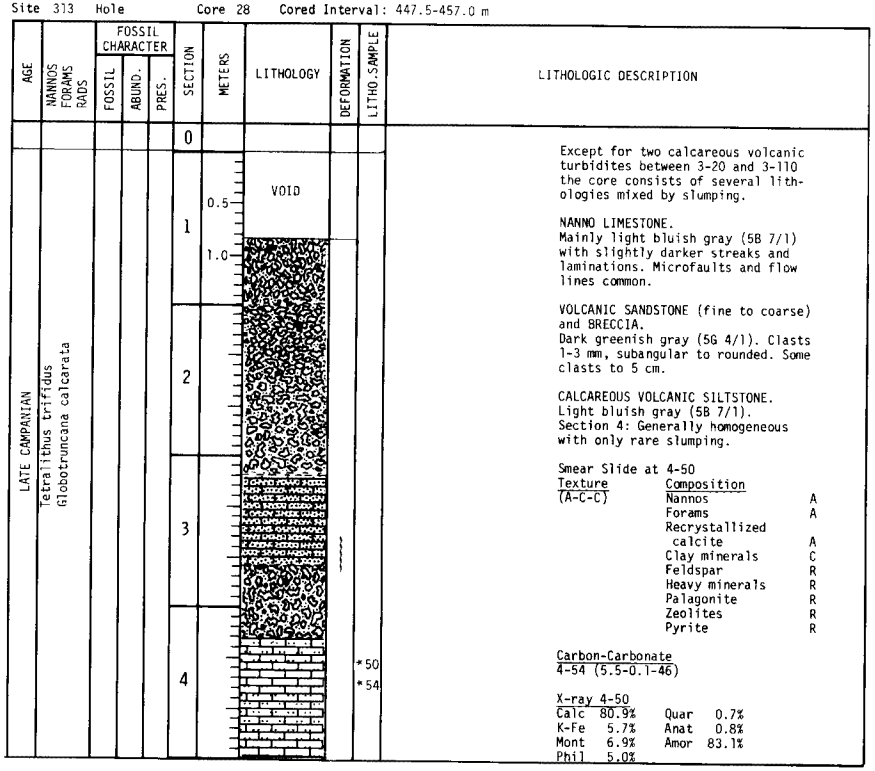
Site 313 Hole Core 27 Cored Interval: 438.0-447.5 m



BRECCIA.
Greenish black (5GY 2/1) to (5G 2/1). Slumping is common, with flow structures around breccia clasts. Clasts are volcanic claystone, siltstone, sandstone, limestone and basalt.

Minor lithology is:
NANNO LIMESTONE.
Mainly light greenish gray (5G 7/1) to light bluish gray (5B 7/1). Occurs as a thin 5 cm bed in Section 2.

Site 313 Hole Core 28 Cored Interval: 447.5-457.0 m



Except for two calcareous volcanic turbidites between 3-20 and 3-110 the core consists of several lithologies mixed by slumping.

NANNO LIMESTONE.
Mainly light bluish gray (5B 7/1) with slightly darker streaks and laminations. Microfaults and flow lines common.

VOLCANIC SANDSTONE (fine to coarse) and BRECCIA.
Dark greenish gray (5G 4/1). Clasts 1-3 mm, subangular to rounded. Some clasts to 5 cm.

CALCAREOUS VOLCANIC SILTSTONE.
Light bluish gray (5B 7/1).
Section 4: Generally homogeneous with only rare slumping.

Smear Slide at 4-50

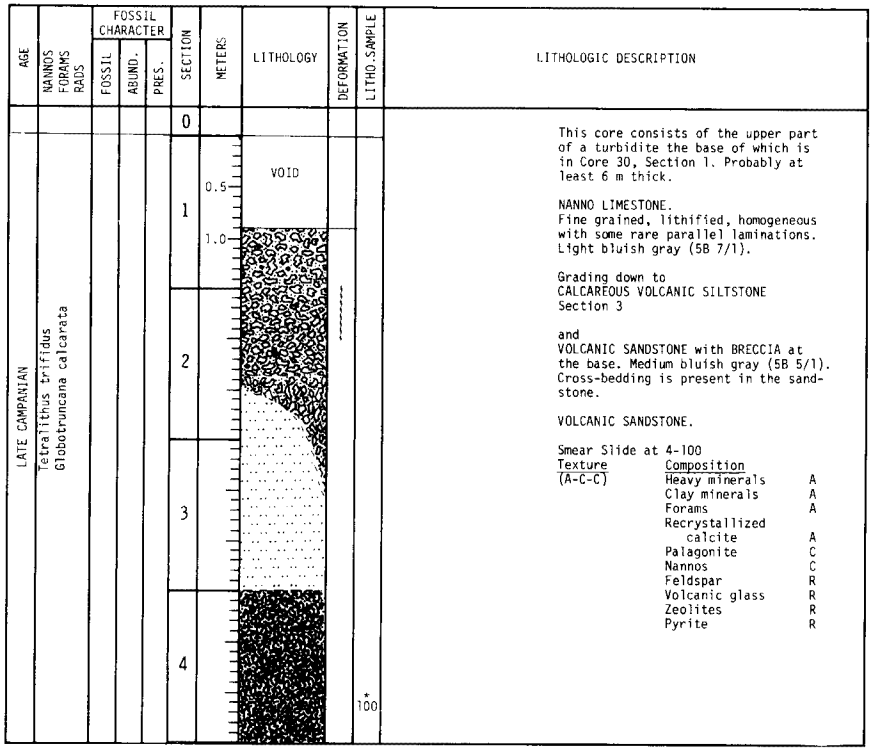
Texture (A-C-C)	Composition	
	Nannos	A
	Forams	A
	Recrystallized calcite	A
	Clay minerals	C
	Feldspar	R
	Heavy minerals	R
	Palagonite	R
	Zeolites	R
	Pyrite	R

Carbon-Carbonate
4-54 (5.5-0.1-46)

X-ray 4-50

Calc	80.9%	Quar	0.7%
K-Fe	5.7%	Anat	0.8%
Mont	6.9%	Amor	83.1%
Phil	5.0%		

Site 313 Hole Core 29 Cored Interval: 457.0-466.0 m



This core consists of the upper part of a turbidite the base of which is in Core 30, Section 1. Probably at least 6 m thick.

NANNO LIMESTONE.
Fine grained, lithified, homogeneous with some rare parallel laminations. Light bluish gray (5B 7/1).

Grading down to
CALCAREOUS VOLCANIC SILTSTONE
Section 3

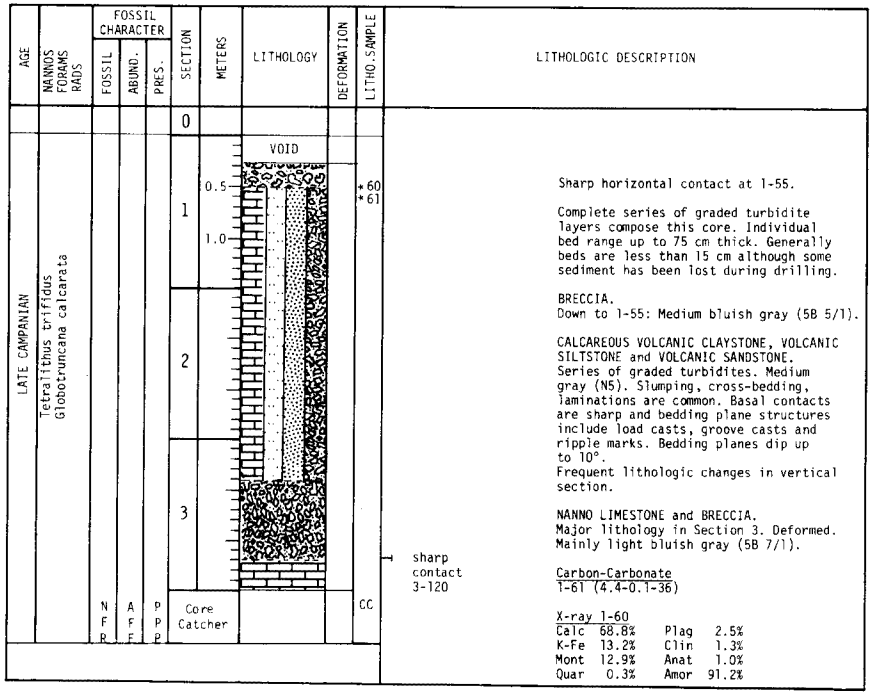
and
VOLCANIC SANDSTONE with BRECCIA at the base. Medium bluish gray (5B 5/1). Cross-bedding is present in the sandstone.

VOLCANIC SANDSTONE.

Smear Slide at 4-100

Texture (A-C-C)	Composition	
	Heavy minerals	A
	Clay minerals	A
	Forams	A
	Recrystallized calcite	A
	Palagonite	C
	Nannos	C
	Feldspar	R
	Volcanic glass	R
	Zeolites	R
	Pyrite	R

Site 313 Hole Core 30 Cored Interval: 466.0-475.5 m



Sharp horizontal contact at 1-55.

Complete series of graded turbidite layers compose this core. Individual bed range up to 75 cm thick. Generally beds are less than 15 cm although some sediment has been lost during drilling.

BRECCIA.
Down to 1-55: Medium bluish gray (5B 5/1).

CALCAREOUS VOLCANIC CLAYSTONE, VOLCANIC SILTSTONE and VOLCANIC SANDSTONE.
Series of graded turbidites. Medium gray (N5). Slumping, cross-bedding, laminations are common. Basal contacts are sharp and bedding plane structures include load casts, groove casts and ripple marks. Bedding planes dip up to 10°.
Frequent lithologic changes in vertical section.

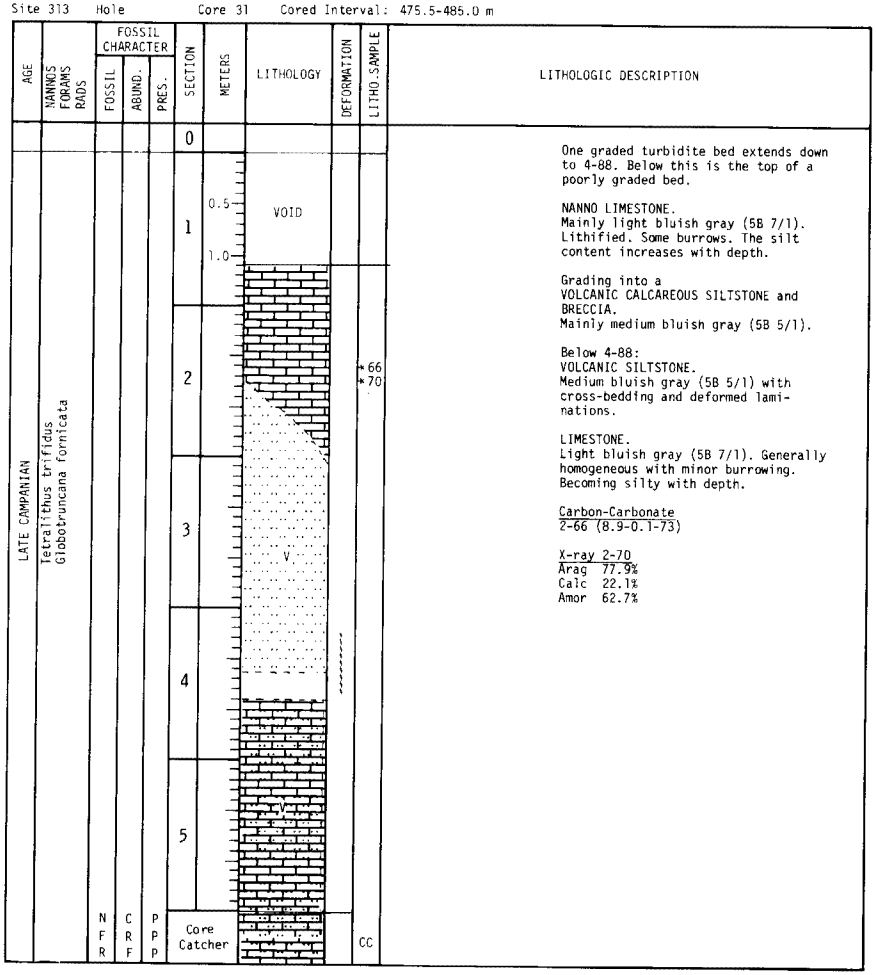
NANNO LIMESTONE and BRECCIA.
Major lithology in Section 3. Deformed.
Mainly light bluish gray (5B 7/1).

Carbon-Carbonate
1-61 (4.4-0.1-36)

X-ray 1-60

Calc	68.8%	Plag	2.5%
K-Fe	13.2%	Clin	1.3%
Mont	12.9%	Anat	1.0%
Quar	0.3%	Amor	91.2%

Site 313 Hole Core 31 Cored Interval: 475.5-485.0 m



One graded turbidite bed extends down to 4-88. Below this is the top of a poorly graded bed.

NANNO LIMESTONE.
Mainly light bluish gray (5B 7/1). Lithified. Some burrows. The silt content increases with depth.

Grading into a
VOLCANIC CALCAREOUS SILTSTONE and BRECCIA.
Mainly medium bluish gray (5B 5/1).

Below 4-88:
VOLCANIC SILTSTONE.
Medium bluish gray (5B 5/1) with cross-bedding and deformed laminations.

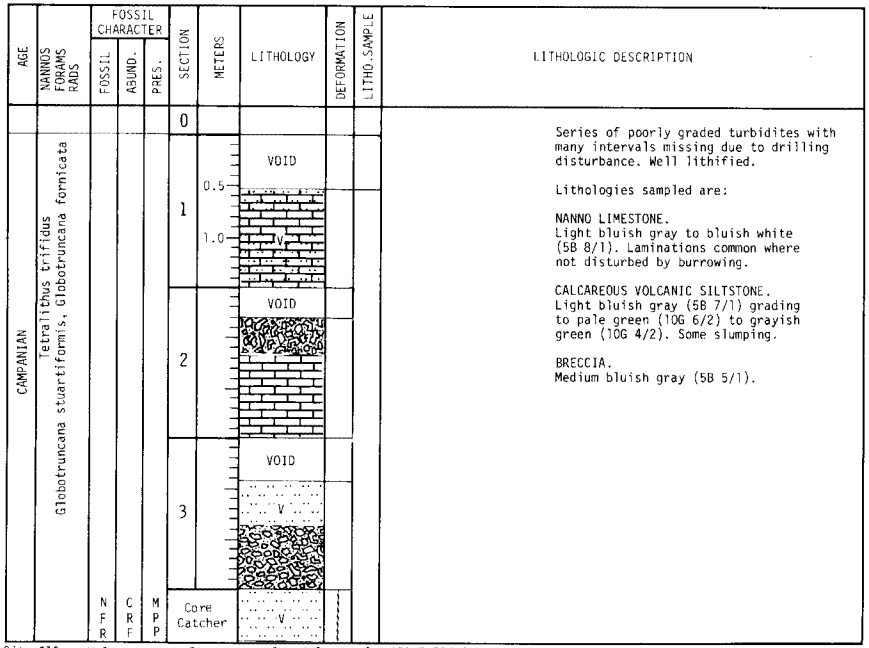
LIMESTONE.
Light bluish gray (5B 7/1). Generally homogeneous with minor burrowing. Becoming silty with depth.

Carbon-Carbonate
2-66 (8.9-0.1-73)

X-ray 2-70

Arag	77.9%
Calc	22.1%
Amor	62.7%

Site 313 Hole Core 32 Cored Interval: 485.0-494.5 m



LITHOLOGIC DESCRIPTION

Series of poorly graded turbidites with many intervals missing due to drilling disturbance. Well lithified.

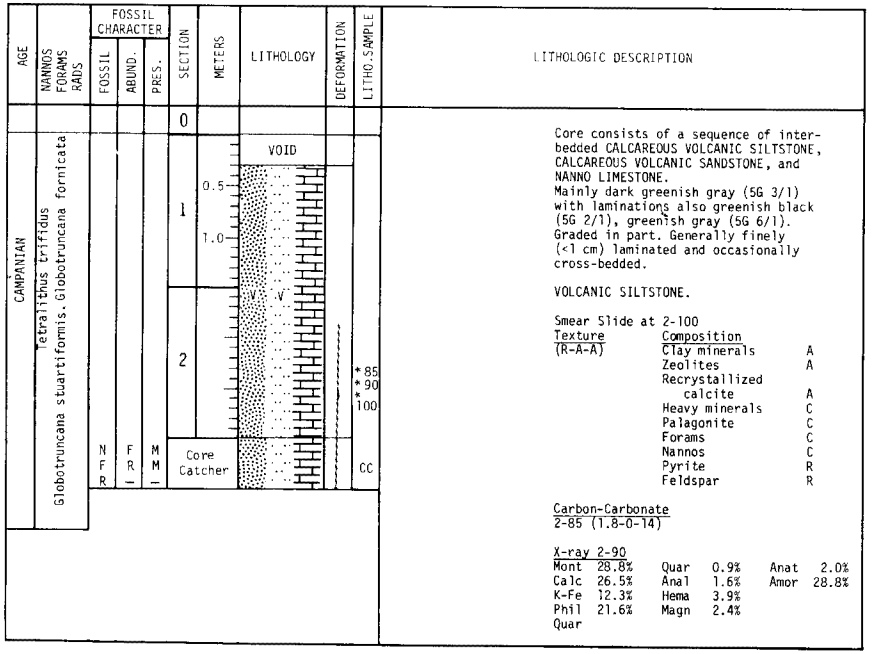
Lithologies sampled are:

NANNO LIMESTONE.
Light bluish gray to bluish white (5B 8/1). Laminations common where not disturbed by burrowing.

CALCAREOUS VOLCANIC SILTSTONE.
Light bluish gray (5B 7/1) grading to pale green (10G 6/2) to grayish green (10G 4/2). Some slumping.

BRECCIA.
Medium bluish gray (5B 5/1).

Site 313 Hole Core 33 Cored Interval: 494.5-504.0 m



LITHOLOGIC DESCRIPTION

Core consists of a sequence of interbedded CALCAREOUS VOLCANIC SILTSTONE, CALCAREOUS VOLCANIC SANDSTONE, and NANNO LIMESTONE.
Mainly dark greenish gray (5G 3/1) with laminations also greenish black (5G 2/1), greenish gray (5G 6/1). Graded in part. Generally finely (<1 cm) laminated and occasionally cross-bedded.

VOLCANIC SILTSTONE.

Smear Slide at 2-100

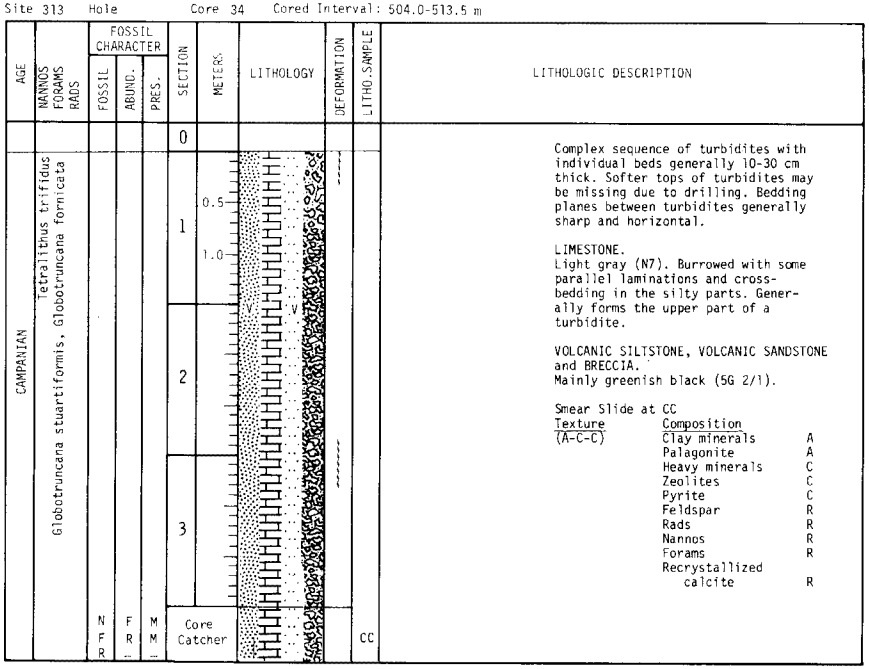
Texture	Composition	
(R-A-A)	Clay minerals	A
	Zeolites	A
	Recrystallized calcite	A
	Heavy minerals	C
	Palagonite	C
	Forams	C
	Nannos	C
	Pyrite	R
	Feldspar	R

Carbon-Carbonate
2-85 (1.8-0-14)

X-ray 2-90

Mont	28.8%	Quar	0.9%	Anat	2.0%
Calc	26.5%	Anal	1.6%	Amor	28.8%
K-Fe	12.3%	Hema	3.9%		
Phil	21.6%	Magn	2.4%		
Quar					

Site 313 Hole Core 34 Cored Interval: 504.0-513.5 m



LITHOLOGIC DESCRIPTION

Complex sequence of turbidites with individual beds generally 10-30 cm thick. Softer tops of turbidites may be missing due to drilling. Bedding planes between turbidites generally sharp and horizontal.

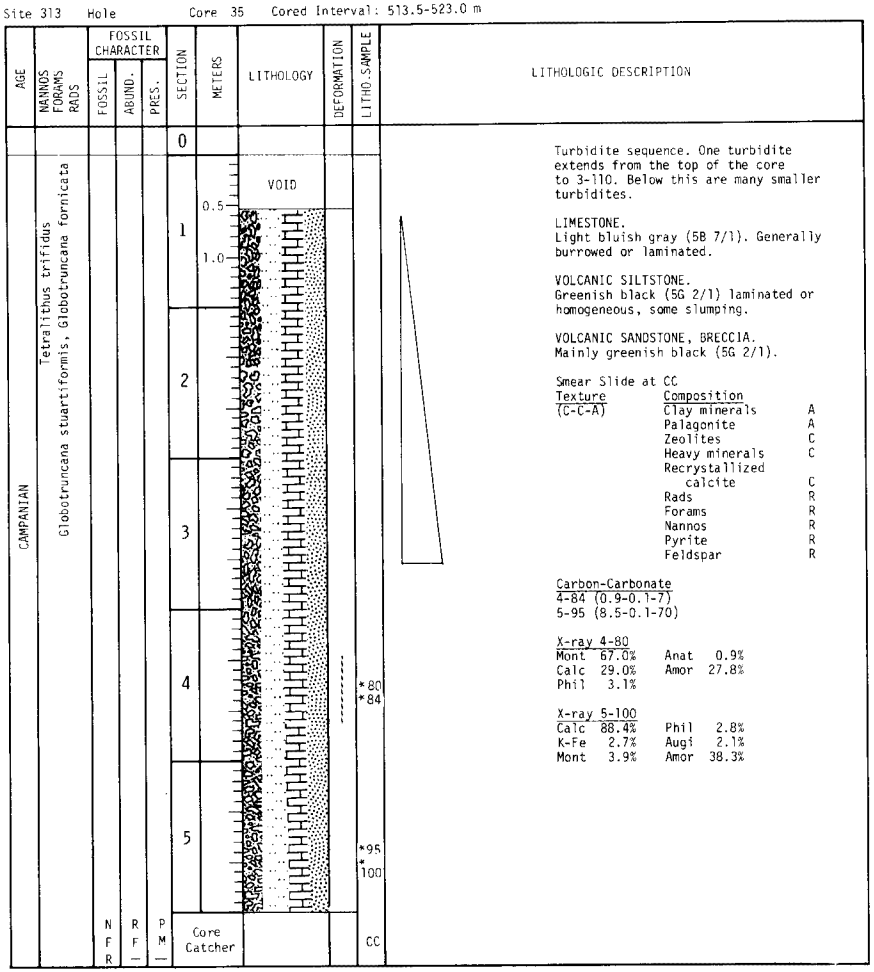
LIMESTONE.
Light gray (N7). Burrowed with some parallel laminations and cross-bedding in the silty parts. Generally forms the upper part of a turbidite.

VOLCANIC SILTSTONE, VOLCANIC SANDSTONE and BRECCIA.
Mainly greenish black (5G 2/1).

Smear Slide at CC

Texture	Composition	
(A-C-C)	Clay minerals	A
	Palagonite	A
	Heavy minerals	C
	Zeolites	C
	Pyrite	C
	Feldspar	R
	Rads	R
	Nannos	R
	Forams	R
	Recrystallized calcite	R

Site 313 Hole Core 35 Cored Interval: 513.5-523.0 m



Turbidite sequence. One turbidite extends from the top of the core to 3-110. Below this are many smaller turbidites.

LIMESTONE.
Light bluish gray (5B 7/1). Generally burrowed or laminated.

VOLCANIC SILTSTONE.
Greenish black (5G 2/1) laminated or homogeneous, some slumping.

VOLCANIC SANDSTONE, BRECCIA.
Mainly greenish black (5G 2/1).

Smear Slide at CC

Texture (C-C-A)	Composition	
	Clay minerals	A
	Palagonite	A
	Zeolites	C
	Heavy minerals	C
	Recrystallized calcite	C
	Rads	R
	Forams	R
	Nannos	R
	Pyrite	R
	Feldspar	R

Carbon-Carbonate
4-84 (0.9-0.1-7)
5-95 (8.5-0.1-70)

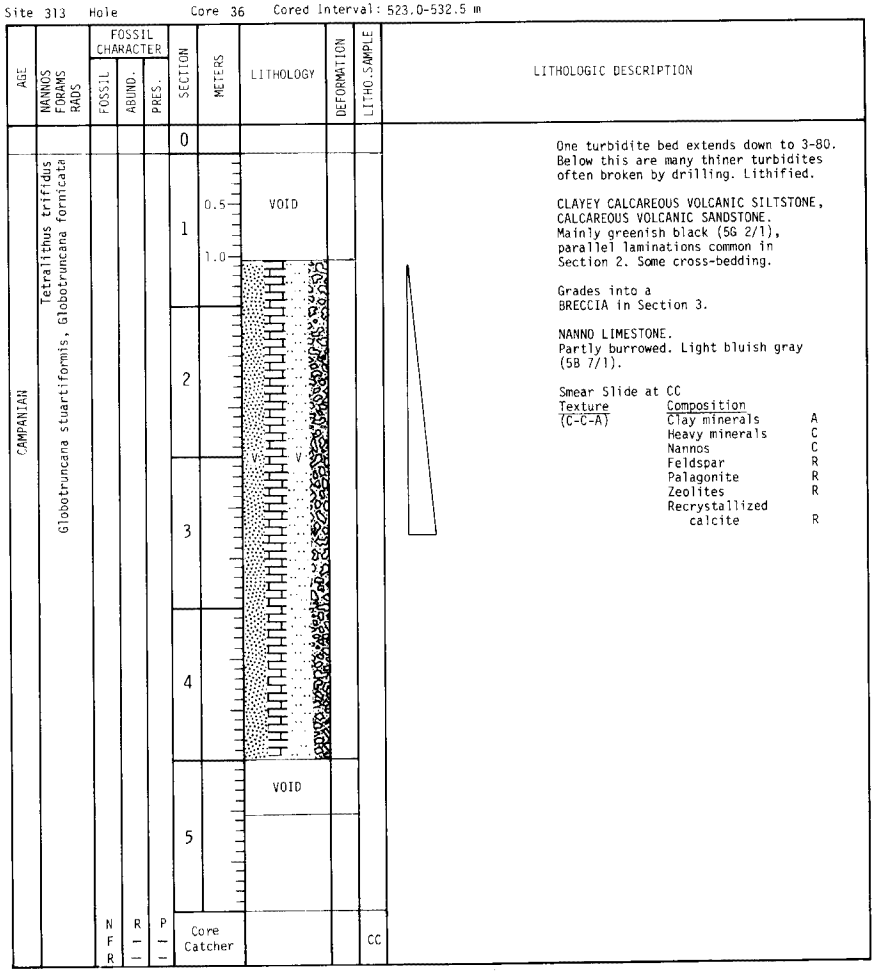
X-ray 4-80

Mont	67.0%	Anat	0.9%
Calc	29.0%	Amor	27.8%
Phil	3.1%		

X-ray 5-100

Calc	88.4%	Phil	2.8%
K-Fe	2.7%	Augi	2.1%
Mont	3.9%	Amor	38.3%

Site 313 Hole Core 36 Cored Interval: 523.0-532.5 m



One turbidite bed extends down to 3-80. Below this are many thiner turbidites often broken by drilling. Lithified.

CLAYEY CALCAREOUS VOLCANIC SILTSTONE, CALCAREOUS VOLCANIC SANDSTONE.
Mainly greenish black (5G 2/1), parallel laminations common in Section 2. Some cross-bedding.

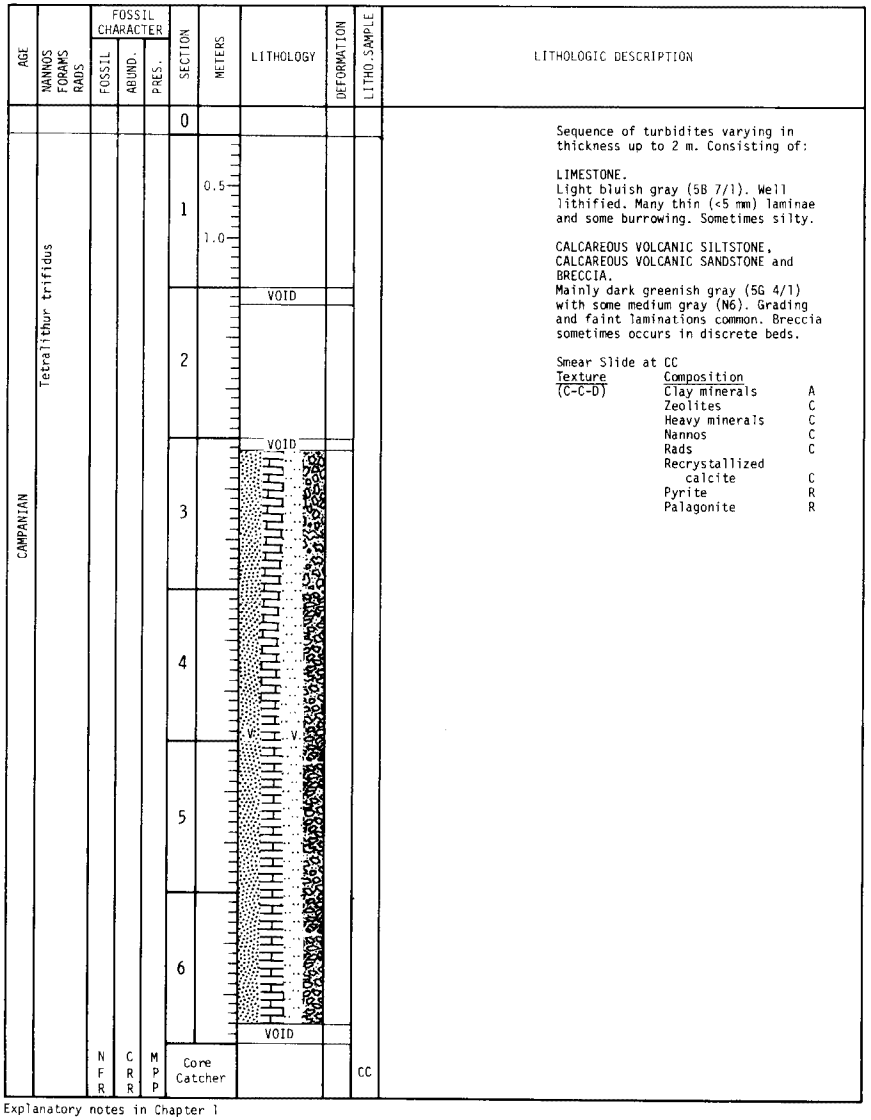
Grades into a BRECCIA in Section 3.

NANNO LIMESTONE.
Partly burrowed. Light bluish gray (5B 7/1).

Smear Slide at CC

Texture (C-C-A)	Composition	
	Clay minerals	A
	Heavy minerals	C
	Nannos	C
	Feldspar	R
	Palagonite	R
	Zeolites	R
	Recrystallized calcite	R

Site 313 Hole Core 37 Cored Interval: 532.5-542.0 m



Sequence of turbidites varying in thickness up to 2 m. Consisting of:

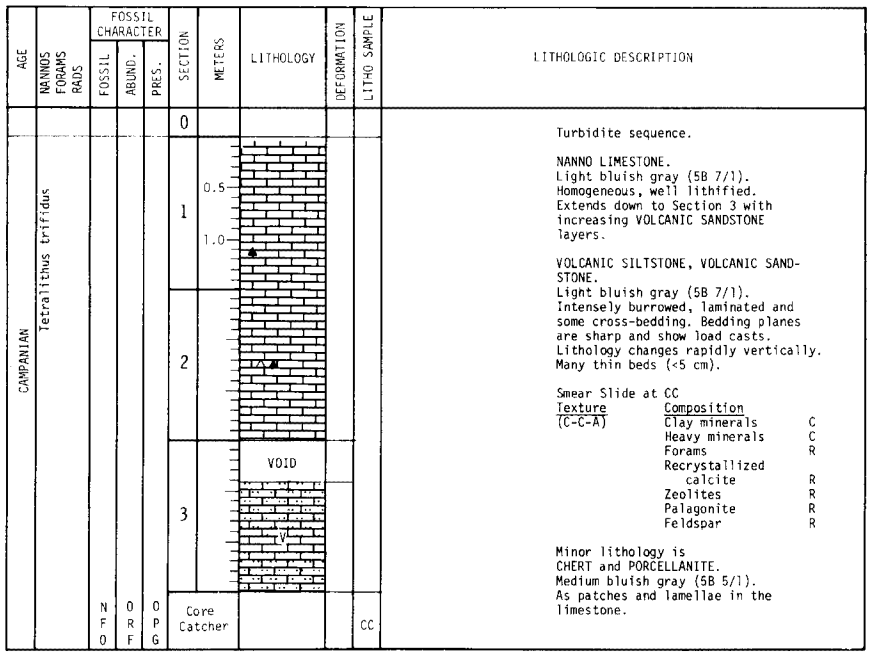
LIMESTONE.
Light bluish gray (5B 7/1). Well lithified. Many thin (<5 mm) laminae and some burrowing. Sometimes silty.

CALCAREOUS VOLCANIC SILTSTONE, CALCAREOUS VOLCANIC SANDSTONE and BRECCIA.
Mainly dark greenish gray (5G 4/1) with some medium gray (N6). Grading and faint laminations common. Breccia sometimes occurs in discrete beds.

Smear Slide at CC

Texture	Composition	
(C-C-D)	Clay minerals	A
	Zeolites	C
	Heavy minerals	C
	Nannos	C
	Rads	C
	Recrystallized calcite	C
	Pyrite	R
	Palagonite	R

Site 313 Hole Core 38 Cored Interval: 542.0-551.0 m



Turbidite sequence.

NANNO LIMESTONE.
Light bluish gray (5B 7/1).
Homogeneous, well lithified.
Extends down to Section 3 with increasing VOLCANIC SANDSTONE layers.

VOLCANIC SILTSTONE, VOLCANIC SANDSTONE.
Light bluish gray (5B 7/1).
Intensely burrowed, laminated and some cross-bedding. Bedding planes are sharp and show load casts.
Lithology changes rapidly vertically.
Many thin beds (<5 cm).

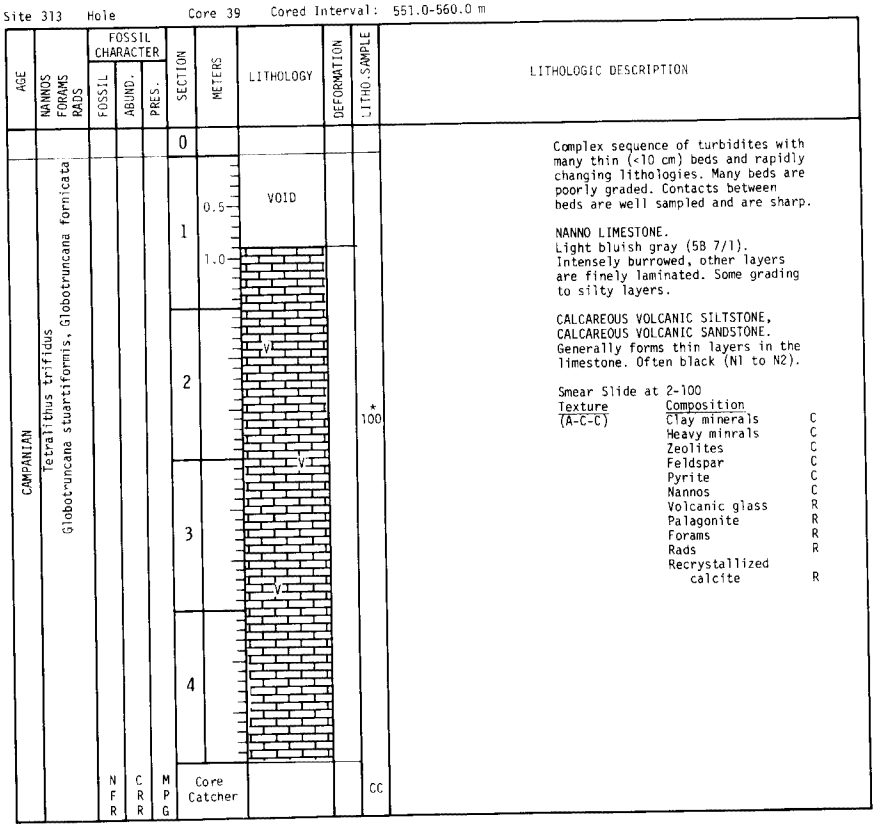
Smear Slide at CC

Texture	Composition	
(C-C-A)	Clay minerals	C
	Heavy minerals	C
	Forams	R
	Recrystallized calcite	R
	Zeolites	R
	Palagonite	R
	Feldspar	R

Minor lithology is CHERT and PORCELLANITE.
Medium bluish gray (5B 5/1).
As patches and lamellae in the limestone.

Explanatory notes in Chapter 1

Site 313 Hole Core 39 Cored Interval: 551.0-560.0 m



Complex sequence of turbidites with many thin (<10 cm) beds and rapidly changing lithologies. Many beds are poorly graded. Contacts between beds are well sampled and are sharp.

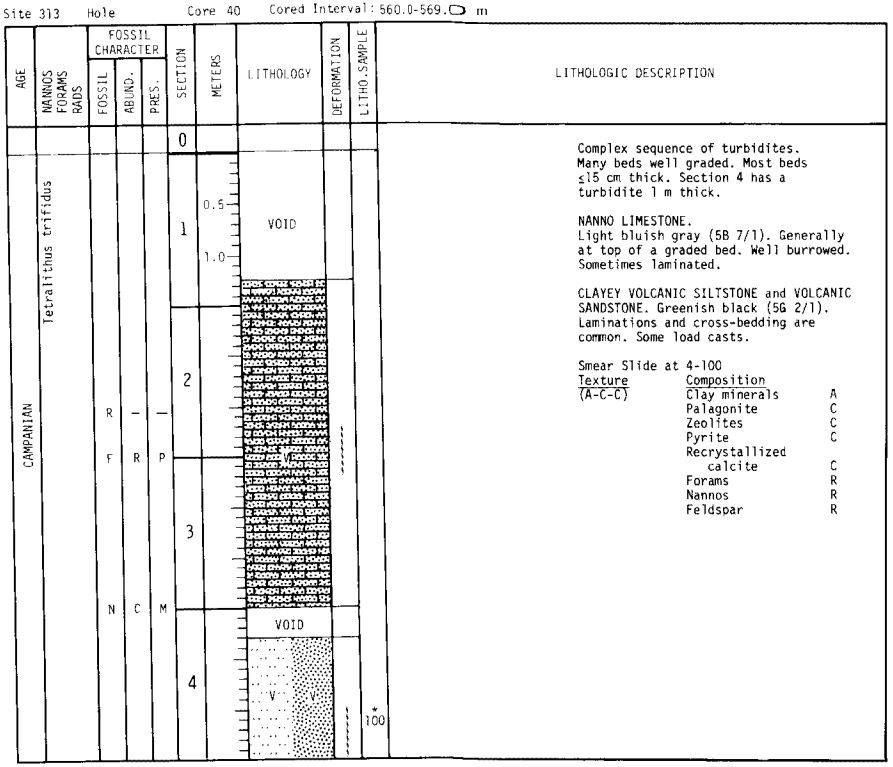
NANNO LIMESTONE.
Light bluish gray (5B 7/1). Intensely burrowed, other layers are finely laminated. Some grading to silty layers.

CALCAREOUS VOLCANIC SILTSTONE, CALCAREOUS VOLCANIC SANDSTONE. Generally forms thin layers in the limestone. Often black (N1 to N2).

Smear Slide at 2-100

Texture (A-C-C)	Composition	
	Clay minerals	C
	Heavy minrals	C
	Zeolites	C
	Feldspar	C
	Pyrite	C
	Nannos	C
	Volcanic glass	R
	Palagonite	R
	Forams	R
	Rads	R
	Recrystallized calcite	R

Site 313 Hole Core 40 Cored Interval: 560.0-569.□ m



Complex sequence of turbidites. Many beds well graded. Most beds ≤15 cm thick. Section 4 has a turbidite 1 m thick.

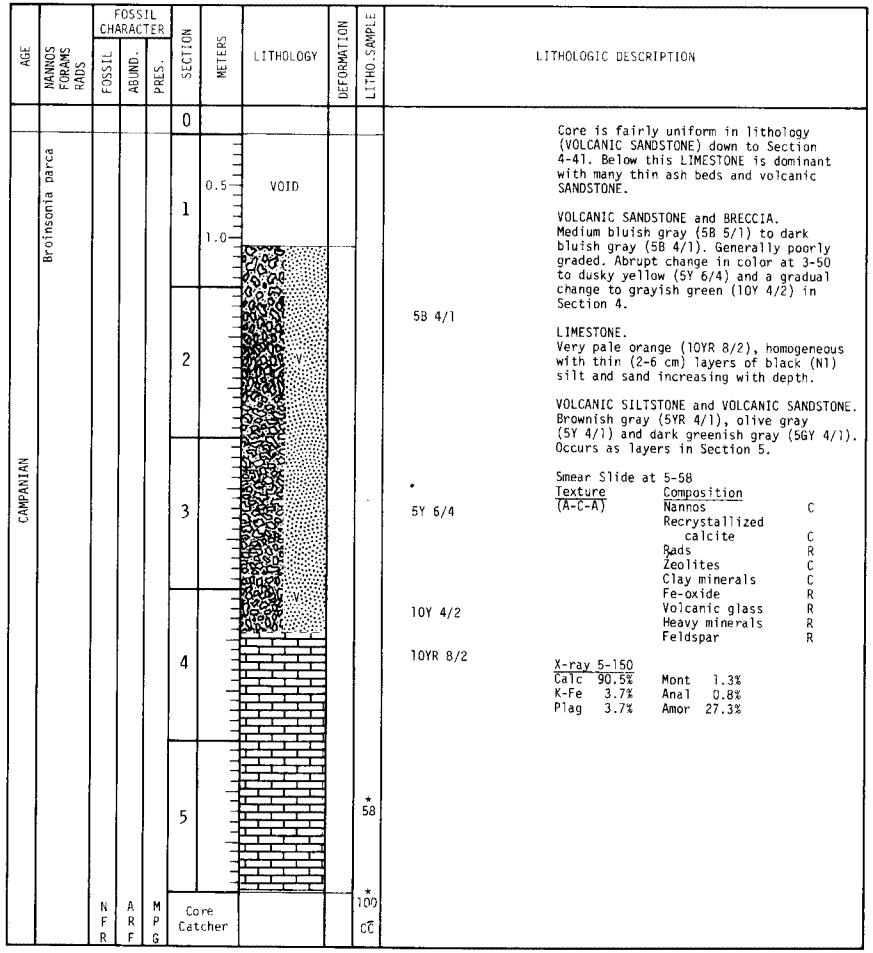
NANNO LIMESTONE.
Light bluish gray (5B 7/1). Generally at top of a graded bed. Well burrowed. Sometimes laminated.

CLAYEY VOLCANIC SILTSTONE and VOLCANIC SANDSTONE. Greenish black (5G 2/1). Laminations and cross-bedding are common. Some load casts.

Smear Slide at 4-100

Texture (A-C-C)	Composition	
	Clay minerals	A
	Palagonite	C
	Zeolites	C
	Pyrite	C
	Recrystallized calcite	C
	Forams	R
	Nannos	R
	Feldspar	R

Site 313 Hole Core 41 Cored Interval: 569.0-578.5 m



Core is fairly uniform in lithology (VOLCANIC SANDSTONE) down to Section 4-41. Below this LIMESTONE is dominant with many thin ash beds and volcanic SANDSTONE.

VOLCANIC SANDSTONE and BRECCIA.
Medium bluish gray (5B 5/1) to dark bluish gray (5B 4/1). Generally poorly graded. Abrupt change in color at 3-50 to dusky yellow (5Y 6/4) and a gradual change to grayish green (10Y 4/2) in Section 4.

LIMESTONE.
Very pale orange (10YR 8/2), homogeneous with thin (2-6 cm) layers of black (N1) silt and sand increasing with depth.

VOLCANIC SILTSTONE and VOLCANIC SANDSTONE.
Brownish gray (5YR 4/1), olive gray (5Y 4/1) and dark greenish gray (5GY 4/1). Occurs as layers in Section 5.

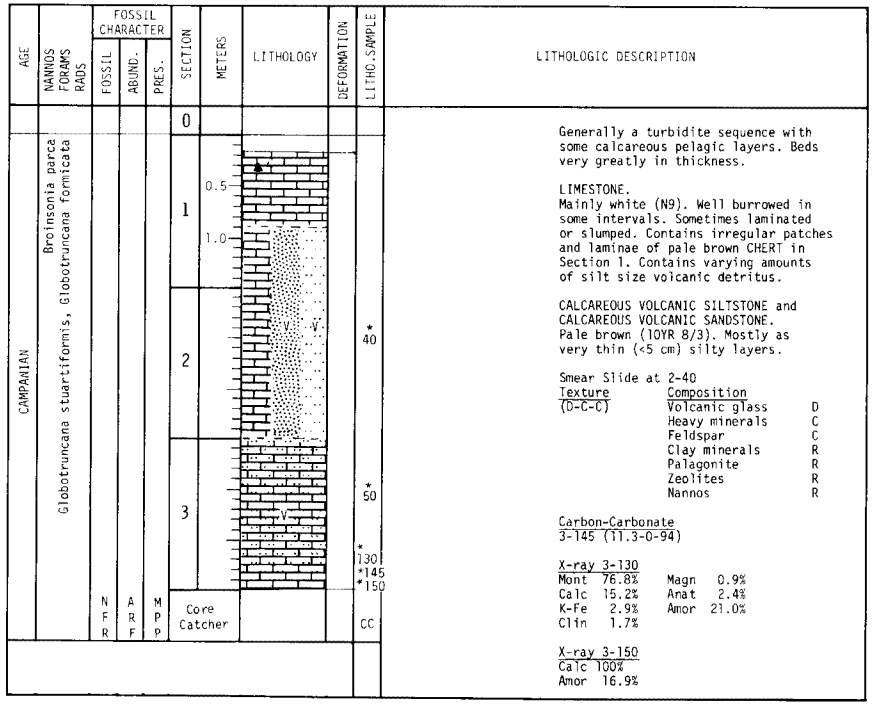
Smear Slide at 5-58

Texture (A-C-A)	Composition	
	Nannos	C
	Recrystallized calcite	C
	Rads	R
	Zeolites	C
	Clay minerals	C
	Fe-oxide	R
	Volcanic glass	R
	Heavy minerals	R
	Feldspar	R

X-ray 5-150

Calc	90.5%	Mont	1.3%
K-Fe	3.7%	Anal	0.8%
Plag	3.7%	Amor	27.3%

Site 313 Hole Core 42 Cored Interval: 578.5-588.0 m



Generally a turbidite sequence with some calcareous pelagic layers. Beds very greatly in thickness.

LIMESTONE.
Mainly white (N9). Well burrowed in some intervals. Sometimes laminated or slumped. Contains irregular patches and laminae of pale brown CHERT in Section 1. Contains varying amounts of silt size volcanic detritus.

CALCAREOUS VOLCANIC SILTSTONE and CALCAREOUS VOLCANIC SANDSTONE.
Pale brown (10YR 8/3). Mostly as very thin (<5 cm) silty layers.

Smear Slide at 2-40

Texture (D-C-C)	Composition	
	Volcanic glass	D
	Heavy minerals	C
	Feldspar	C
	Clay minerals	R
	Palagonite	R
	Zeolites	R
	Nannos	R

Carbon-Carbonate
3-145 (11.3-0-94)

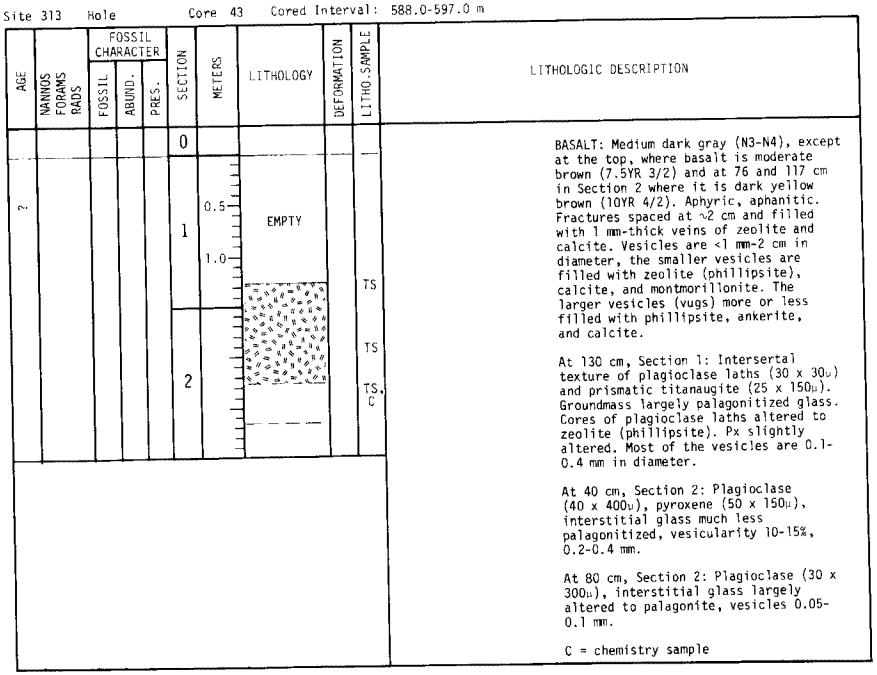
X-ray 3-130

Mont	76.8%	Magn	0.9%
Calc	15.2%	Anat	2.4%
K-Fe	2.9%	Amor	21.0%
Clin	1.7%		

X-ray 3-150

Calc	100%
Amor	16.9%

Site 313 Hole Core 43 Cored Interval: 588.0-597.0 m



BASALT: Medium dark gray (N3-N4), except at the top, where basalt is moderate brown (7.5YR 3/2) and at 76 and 117 cm in Section 2 where it is dark yellow brown (10YR 4/2). Aphyric, aphanitic. Fractures spaced at ~2 cm and filled with 1 mm-thick veins of zeolite and calcite. Vesicles are <1 mm-2 cm in diameter, the smaller vesicles are filled with zeolite (phillipsite), calcite, and montmorillonite. The larger vesicles (vugs) more or less filled with phillipsite, ankerite, and calcite.

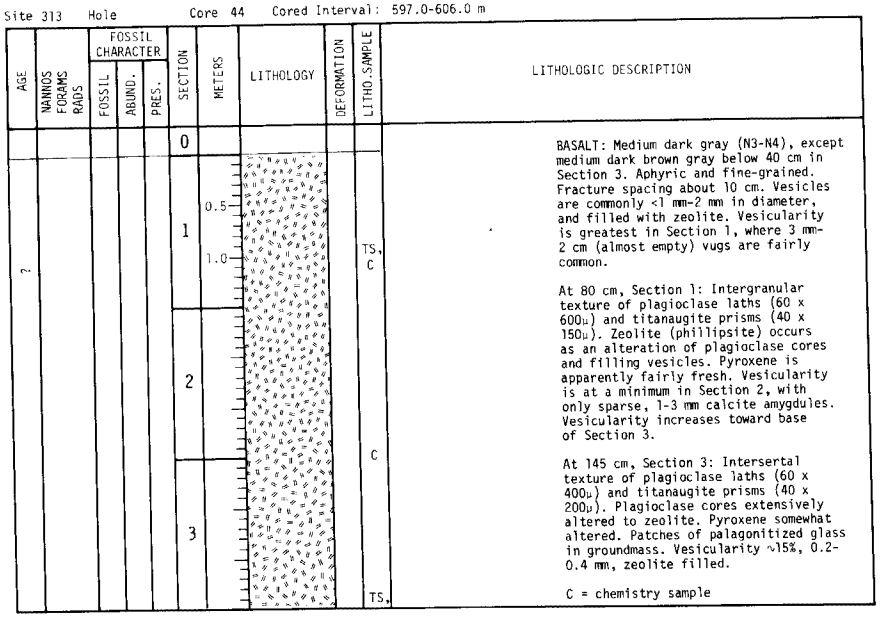
At 130 cm, Section 1: Intersertal texture of plagioclase laths (30 x 30μ) and prismatic titanaugite (25 x 150μ). Groundmass largely palagonitized glass. Cores of plagioclase laths altered to zeolite (phillipsite). Px slightly altered. Most of the vesicles are 0.1-0.4 mm in diameter.

At 40 cm, Section 2: Plagioclase (40 x 400μ), pyroxene (50 x 150μ), interstitial glass much less palagonitized, vesicularity 10-15%, 0.2-0.4 mm.

At 80 cm, Section 2: Plagioclase (30 x 300μ), interstitial glass largely altered to palagonite, vesicles 0.05-0.1 mm.

C = chemistry sample

Site 313 Hole Core 44 Cored Interval: 597.0-606.0 m



BASALT: Medium dark gray (N3-N4), except medium dark brown gray below 40 cm in Section 3. Aphyric and fine-grained. Fracture spacing about 10 cm. Vesicles are commonly <1 mm-2 mm in diameter, and filled with zeolite. Vesicularity is greatest in Section 1, where 3 mm-2 cm (almost empty) vugs are fairly common.

At 80 cm, Section 1: Intergranular texture of plagioclase laths (60 x 600μ) and titanaugite prisms (40 x 150μ). Zeolite (phillipsite) occurs as an alteration of plagioclase cores and filling vesicles. Pyroxene is apparently fairly fresh. Vesicularity is at a minimum in Section 2, with only sparse, 1-3 mm calcite amygdules. Vesicularity increases toward base of Section 3.

At 145 cm, Section 3: Intersertal texture of plagioclase laths (60 x 400μ) and titanaugite prisms (40 x 200μ). Plagioclase cores extensively altered to zeolite. Pyroxene somewhat altered. Patches of palagonitized glass in groundmass. Vesicularity ~15%, 0.2-0.4 mm, zeolite filled.

C = chemistry sample