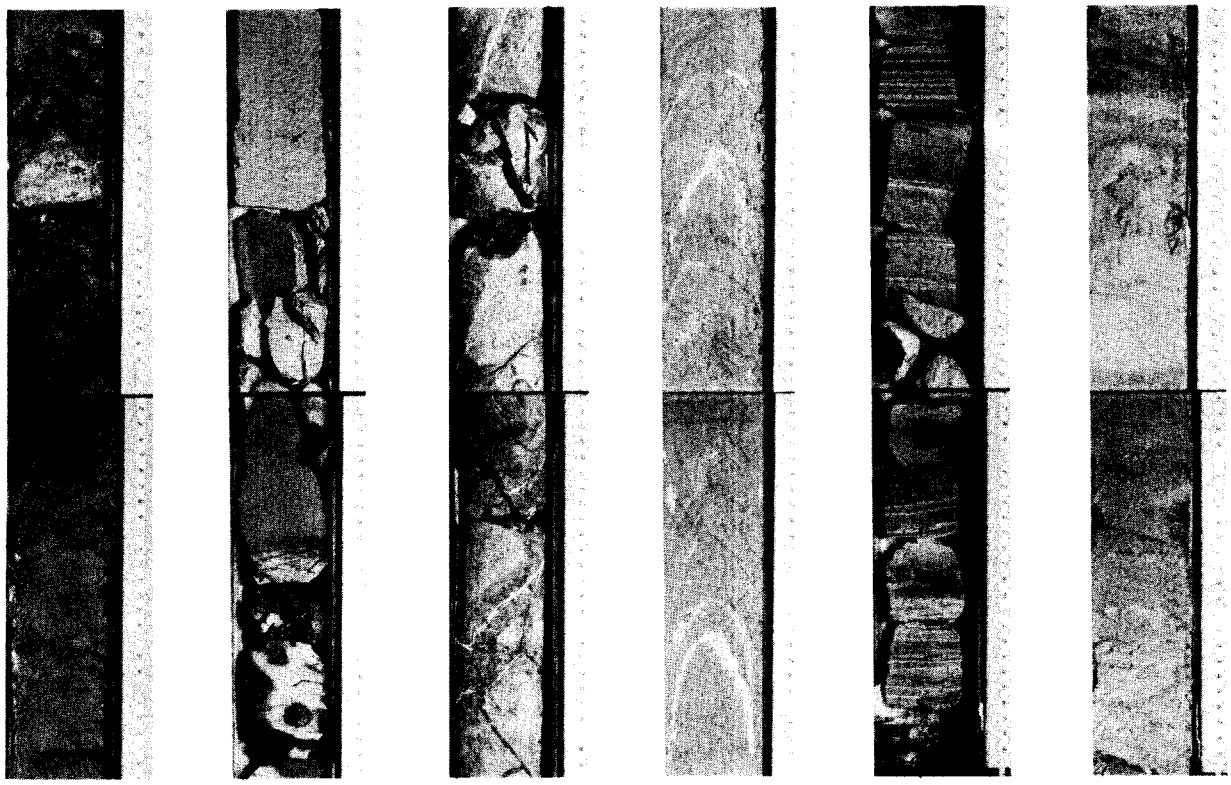
INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 35

SOUTHEAST PACIFIC BASIN



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

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Dear Colleague:

This document has been printed and distributed by the Deep Sea Drilling Project for the purpose of sample selection by interested earth scientists, sample requests 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

N. Terence Edgar
Chief Scientist
Deep Sea Drilling Project

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INITIAL CORE DESCRIPTIONS
DEEP SEA DRILLING PROJECT
LEG 35
Feb. 13, 1974 – March 30, 1974

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
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INITIAL CORE DESCRIPTIONS - LEG 35

INTRODUCTION

Leg 35 was the third DSDP cruise to undertake drilling in Antarctic waters and the first in the Southeast Pacific Basin.

The Southeast Pacific Basin is the least understood oceanic portion of the Antarctic periphery and scientific objectives of Leg 35 were established to provide an overall understanding of the geologic history of the area. Specific objectives were to determine a) the age and nature of oceanic basement in an attempt to better understand the pre-breakup configuration of Gondwanaland; b) the nature of pronounced reflecting horizons thought to record major geologic and oceanographic events in the area; c) sequence and effects of deep and surface paleocirculation as reflected in productivity and sedimentation events; d) history of continental glaciation of Antarctica; e) geochemical gradients in sedimentary pore waters in order to understand their relation to submarine alteration of basement rock, and f) to recover sediments containing high latitude fossil forms to establish an Antarctic biostratigraphic and paleogeographic framework.

GLOMAR CHALLENGER departed Lima, Peru on 13 February. Four holes were drilled at four sites; two sites (322, 323) lie on the Bellinshausen Abyssal Plain, and two (324, 325) on the Continental Rise of Antarctica (Fig. 1). The cruise terminated in Ushuaia, Argentina on 30 March 1974.

The principal scientific results are summarized at the beginning of each site in the Site Summary Section and coring results are

summarized in Table 1. For a more detailed account of the scientific results, see also GEOTIMES, August 1974 (v. 19, no. 8).

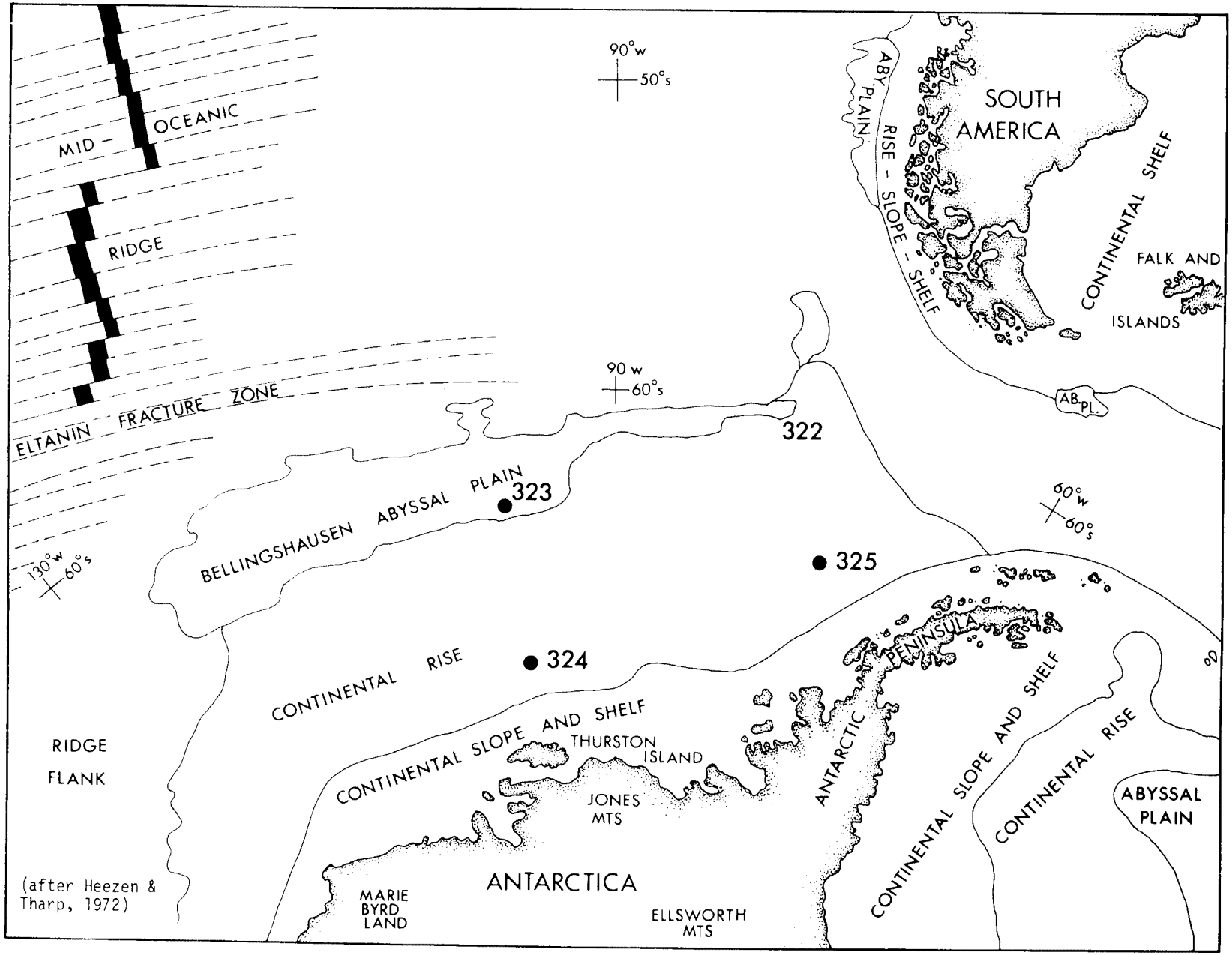

Figure 1. Location of sites drilled DSDP Leg 35.

TABLE 1. CORING SUMMARY, DSDP LEG 35

SITE NO.	DATES OCCUPIED	HOURS ON SITE	LATITUDE LONGITUDE	WATER DEPTH (m)	PENETRATION (m)	NO. OF CORES	METERS CORED	METERS RECOV.	PERCENT RECOV.	OLDEST SEDIMENT	DEEPEST UNIT
322	Feb. 27-Mar. 3	84	60°01.45'S 79°25.49'W	5026	544	14	125.5	34.4	27.5	?Oligocene to early Miocene	Basalt
323	Mar. 6-11	113	63°40.84'S 97°59.69'W	4993	731	21	199.5	76.4	38.3	Upper Cretaceous	Basalt
324	Mar. 13-15	52	69°03.21'S 98°47.20'W	4449	218	10	95.0	48.0	50.5	Pliocene	Sand
325	Mar. 21-25	103	65°02.79'S 73°40.40'W	3745	718	10	95.0	34.4	36.2	?Oligocene to early Miocene	Claystone
TOTALS											
4 Sites		352			2211	55	515.0	193.2	37.5		

EXPLANATORY NOTES

Introduction

Samples from Leg 35 become available for subsequent study[1] April 1, 1975. Persons wishing to obtain samples are directed to the DSDP-NSF sample distribution policy (see statement this volume). Sample requests must be submitted on standard DSDP Sample Request Forms which may be obtained from:

The Curator
Deep Sea Drilling Project
Scripps Institution of Oceanography
P. O. Box 1529
La Jolla, California 92037

Investigators are urged to make their requests as specifically as possible including indication of site, core, section, interval within a section, and volume of sample required.

The main purpose of the present volume is to present descriptions of cores recovered during DSDP Leg 35 to aid potential investigators in selection of samples. Inasmuch as shore-based investigation of Leg 35 materials is still in progress, the lithologic descriptions and biostratigraphy should be regarded as tentative and subject to minor modifications.

The following material is intended as an aid in understanding the terminology, labeling, and numbering conventions in use on board the GLOMAR CHALLENGER during DSDP Leg 35 and facilitate use of the Site Summary and Core Descriptions of this volume.

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[1] Investigations other than what is included in the Initial Reports of the Deep Sea Drilling Project.

Numbering of Sites, Holes, Cores, Samples

Drill site numbers run consecutively from the first site drilled by GLOMAR CHALLENGER in 1968. The site number is unique; thus, use of Leg number is not imperative, but is nonetheless useful for quick reference. A site refers to the hole or holes drilled from one acoustic positioning beacon. Several holes may be drilled at a single locality (site) by pulling the drill string above the sea floor ("mud line") and offsetting the ship some distance (usually 100 meters or more) from the previous hole. Holes drilled at a single site take the site number and are distinguished, with the exception of the first hole, by a letter suffix. However, because only one hole was drilled at each site during Leg 35, a single site number (e.g. Site 322) is used in place of the standard site-hole designation.

The cored interval is the interval in meters below the sea floor, measured from the point at which coring for a particular core was begun to the point at which it was terminated. This interval is generally 9.5 meters long (nominal length of a core barrel), but may be shorter if conditions dictate. Cored intervals need not be contiguous and may be separated by "drilled intervals." In soft sediments, the drill string can be "washed ahead" without recovering core by applying sufficiently high pump pressure to wash sediment out of the way of the bit and up the annulus between the drill pipe and wall of the hole. In hard rocks a center bit, which fills the opening in the bit face, can replace the core

barrel if drilling without core recovery is desired. Drilling or washing ahead are usually imposed by time limitations during drilling of thick, monotonous lithologies, and/or when a major objective of the hole is to reach and sample specific underlying units.

Cores are numbered sequentially from the top down. Full recovery comprises 9.28 meters of sediment or rock in a plastic liner (6.6 cm diameter) and a short sample ($\lesssim$20 cm) obtained from the core catcher (a multi-fingered device at the bottom of the core barrel which prevents cored materials from sliding out during core-barrel recovery). Cores are cut into 1.5 meter sections and numbered sequentially from top to bottom. Because the core barrel is 9.28 m rather than 9 m long, it is possible that in addition to six 1.5 m sections a segment of up to 28 cm may be recovered. When this occurs the segment is designated the "0-section" and comprises whatever is "left over" at the top of the core after six 1.5 m sections have been cut.

More frequently, recovery is less than 100%. In cases of partial recovery, if the sediment is contiguous the recovered material is placed in the top of the cored interval and sections are numbered sequentially (starting with Section 1 at the top) for as many 1.5 m sections as needed to accommodate the length of core recovered. Sections are cut starting at the base of the recovered core, hence the "void", which occurs when the recovered sediment is not evenly divisible by 1.5, falls at the top of

Section 1. Centimeter intervals in Section 1, however, are measured from the top of the section, rather than the top of the sediment. (In cases of partial recovery, it cannot be determined where in the cored interval the sediment was originally located and this convention is employed for the purpose of consistency and convenience in routine data handling.) If recovery is partial, core fragments are separated, and shipboard scientists believe the sediment was not contiguous, sections are numbered sequentially and the intervening sections are noted as "void." The core catcher sample is described in the visual core descriptions beneath the lowest section regardless of whether or not it is contiguous.

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

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

60-567-4-3, 122-124 cm (10cc) designates a 10cc sample taken at 122-124 cm from Section 3 of Core 5, from the first or only hole drilled at Site 567, Leg 60. The depth below the sea floor for this sample would then be the depth to the top of the cored interval plus 3 meters for Sections 1 and 2, plus 122 cm (depth below the top of Section 3). For example, if the top of the cored interval were 150 m, this would equal 154.2 meters. (Note, however, that sample requests should refer to a specific interval within a

core section rather than level below sea floor.) A sample from the core catcher of this core is designated 567-4-CC.

Core labeling is graphically depicted in Figure 2.

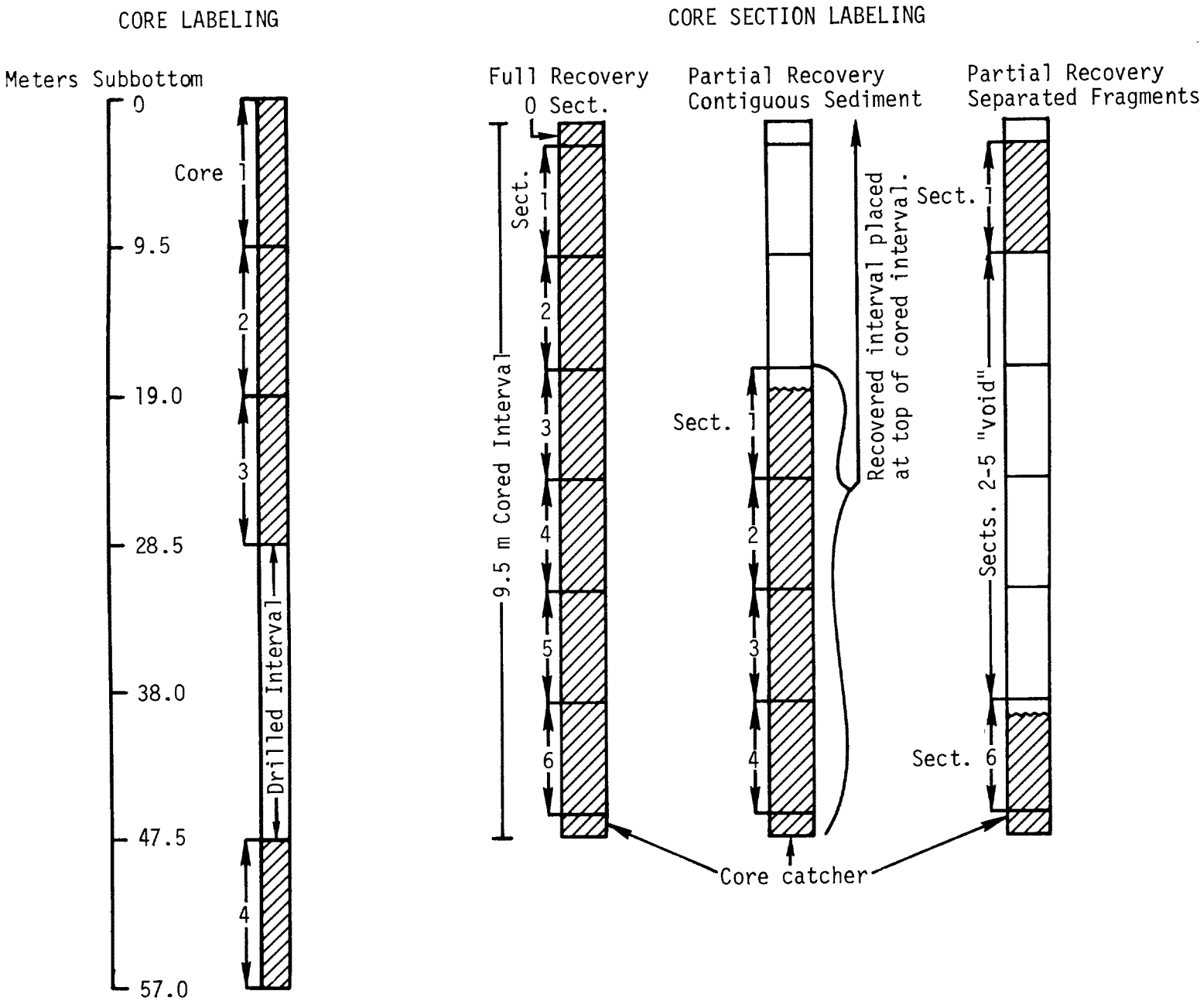


Figure 2. Core and core section labeling.

Handling of Cores

After a core has been sectioned, sealed and labeled, it is brought into the core laboratory for processing. The following determinations are made while the core is "in the round" prior to longitudinal splitting:

1) Weight of core section for mean bulk density measurement;
2) GRAPE analysis for bulk density and porosity;
3) Sonic velocity determination, using a Hamilton Frame.

The cores are then split longitudinally into "work" and "archive" halves; samples, including those for grain size, X-ray mineralogy, water content, carbon/carbonate, geochemical and paleontological determinations, are extracted from the "work" half. Smear slides are prepared and examined microscopically from each unit and the archive half is described (and subsequently photographed) with color, texture, structure and composition of the various lithologic units noted on standard core description sheets.

The core descriptions and smear slide descriptions (obtained on board ship) and grain size, carbon/carbonate, X-ray mineralogy determinations (obtained from shore-based labs) serve as the basis for the visual core descriptions presented in this volume.

After sediment cores have been sampled and described they are maintained in cold storage until transferal to the DSDP Repository; "hard rock" cores are maintained in dry, unrefrigerated storage. All Leg 35 cores are presently stored at the DSDP East Coast Repository, Lamont-Doherty Geological Observatory, Palisades, New York.

Visual Core Descriptions

Lithology

The basic lithologic data contained on the visual core descriptions are as follows:

Graphic Lithology
Key to symbols used to denote lithology is presented in Figure 3.

Sediment Name
Classification and nomenclatural rules applied during Leg 35 are presented at the end of this chapter.

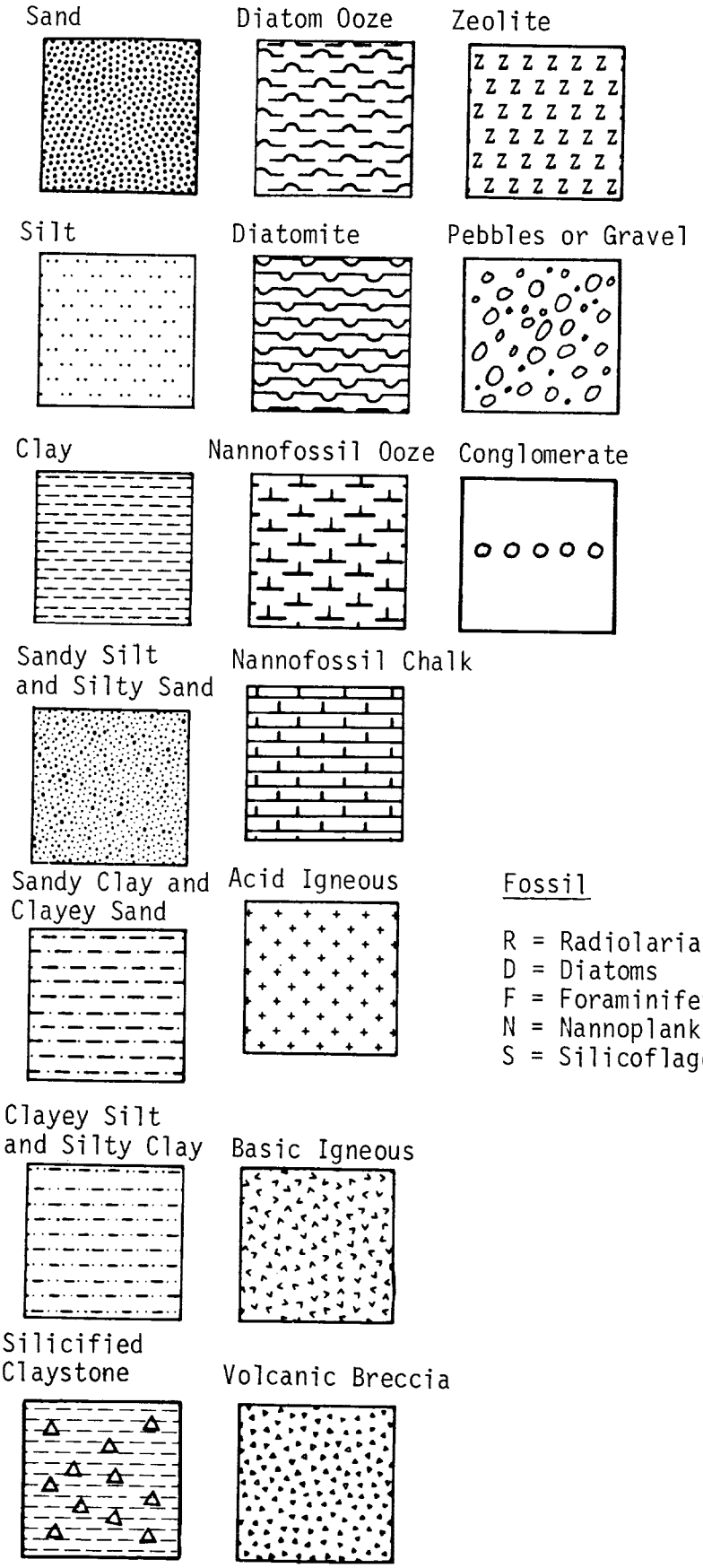
Color
Color notations are based on the standard Munsell or GSA color charts. Colors recorded in core barrel summaries were determined during shipboard examination immediately after splitting core sections. Experience with carbonate sediments shows that many of the colors will fade or disappear with time 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
Smear slides are the basic means of mineral identification on board ship and determinations are listed under "Composition" on the visual core descriptions. Smear slide estimates of mineral abundances were based on area of the smear slide covered by each component. Past experience has shown that accuracy may approach a percent or so for very distinctive minor constituents; for major constituents, accuracy of ±10 to 20% is considered very good.

Biostratigraphy

As of this writing biostratigraphic studies of Leg 35 cores are still in progress. Consequently, biostratigraphic boundaries given in this report are necessarily tentative. Although no major changes in age assignments are anticipated, adjustments of some

LITHOLOGIC SYMBOLS



LITHO. SAMPLE SYMBOLS

* = Smear slide
X = X-ray mineralogy
Z = Grain size
€ = Carbon/carbonate
\+ = Thin-section
GC = Geochemistry

FOSSIL CHARACTER SYMBOLS

Fossil	Abundance	Preservation
R = Radiolarians	A = Abundant	G = Good
D = Diatoms	C = Common	M = Moderate
F = Foraminifers	F = Frequent	P = Poor
N = Nannoplankton	R = Rare	- = Absent
S = Silicoflagellates	- = Absent	

Figure 3. Key to lithologic and biostratigraphic symbols used on visual core descriptions.

boundaries are likely to be made prior to publication of the Initial Reports for Leg 35.

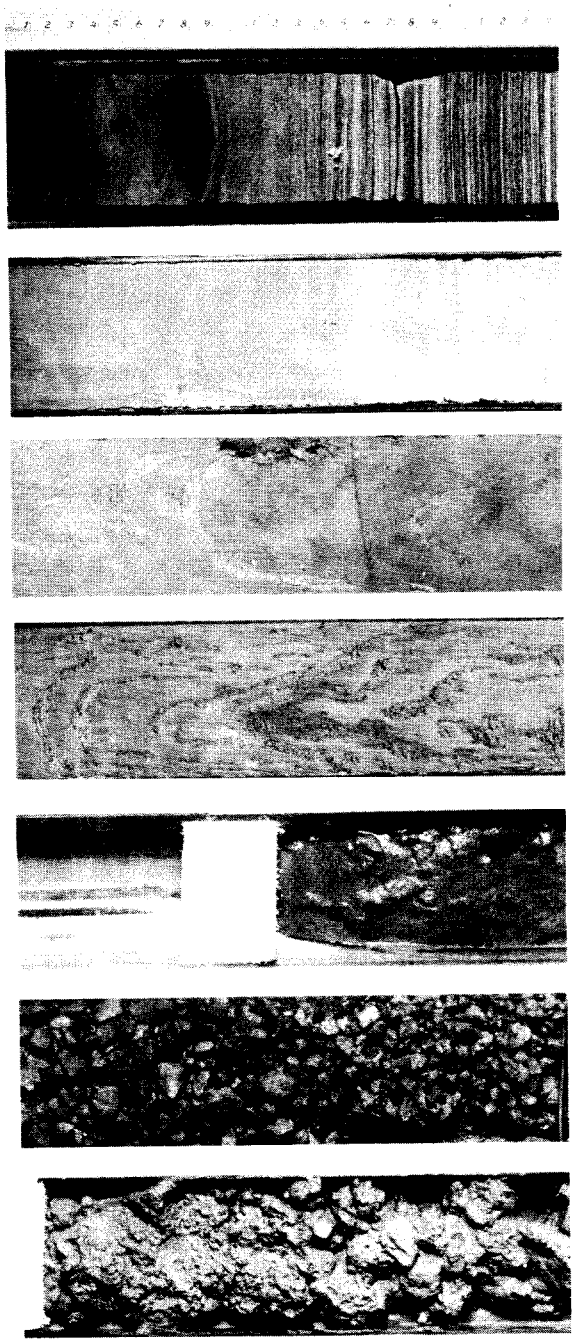
Core Disturbance and Downhole Contamination

The rotary drill-coring technique quite often results in varying degrees of disturbance of the cored sediments. Cores may exhibit slight bending of bedding contacts (slightly deformed) to extensive bending resulting in near vertical bedding planes (highly deformed). And in extreme cases, bedding may be completely disrupted to produce a "drilling slurry" or "drilling breccia." Symbols used to denote the varying types and degree of drilling disturbance are shown on Figure 4.

Downhole contamination results when manganese nodules, chert, lithic fragments, and pebbles are washed or dragged downhole. Fragments may become incorporated into cores at levels far below their proper stratigraphic position. Displaced manganese nodules can usually be recognized; displaced chert, lithic fragments, and pebbles, however, are more difficult to recognize. The presence of known downhole contaminants is recorded on the core forms.

X-ray Mineralogy

Semiquantitative determinations of the mineral compostion in bulk samples, 2 to 20μm, and <2μm 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 20μm and <2μm fractions



Core catcher

No drilling disturbance

Slightly disturbed

Moderately-highly disturbed

Drilling slurry - highly mixed, may be considerably displaced.

Brecciated (by drilling) - may contain displaced drilling breccia or unit may be in place, but highly brecciated.

Intensely disturbed - contains fragments and slurry.

Mixed core-catcher sample - Unless the core is very firm, the core-catcher sample is mixed during removal from the core-catcher.

Figure 4. Key to drilling deformation symbols used on visual core descriptions.

are performed on $CaCO_3$-free residues.

Determinations of the bulk samples are tabulated on the core logs (this volume). In each listing the percentage of "amorphous scattering" (noncrystalline, unidentifiable material) is shown in addition to percentage of the crystalline, identified fraction. The percentage of identified minerals are based only on the crystalline component and sum up to 100%.

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)

A lengend for understanding presentation of the carbon/carbonate data is given on the sample core form (Fig. 5).

Grain Size

Sand-silt-clay distribution is determined from 10cc 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 62.5μm, 62.5 to 3.91μm, and less than 3.91μm, respectively.

Standard sieve and pipette methods were used to determine the grain size distribution. The sand-size fraction is removed by wet sieving using 63μm 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).

A legend for understanding presentation of the grain size data is given on the sample core form (Fig. 5).

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 IA3.
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 25% intervals, thusly: 0-25, 25-50, 50-75, 75-100.
   Example illustrating rules IA and IB and the resulting sediment names:

% Clay	% Nannos		
0-25	75-100	=	Nanno ooze
25-50	50-75	=	Clayey nanno ooze
50-75	25-50	=	Nanno clay
75-100	0-25	=	Clay

B. Minor constituents

1. At the discretion of the geologist, constituents present in amounts of 10-25% may be prefixed to the sediment name by the term **rich.**
   Example: 50% nannofossils, 30% radiolarians, 20% zeolites would be called a **zeolite-rich rad nanno ooze.**
2. At the discretion of the geologist, constituents present in amounts of 2-10% may be prefixed to the sediment name by the term **bearing.**
   Example: 50% nannofossils, 40% radiolarians, 10% zeolites would be called a **zeolite-bearing rad nanno ooze.**

C. Trace constituents. Constituents present in amounts of < 2% may follow the sediment name with addition of the word **trace.** This again is at the discretion of the geologist.

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, diatoms, 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.

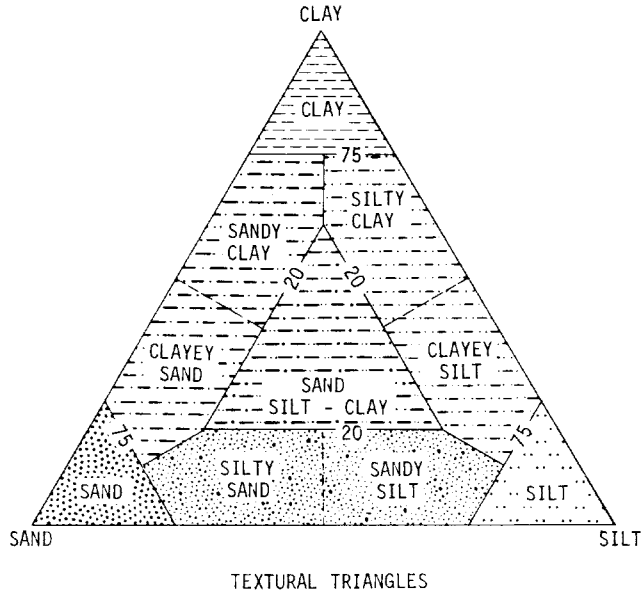
D. Abbreviations, as nanno for nannofossil, rad for radiolarian, etc., may be used in the sediment name.

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 used 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[2] grains are the sole clastic constituents of a sediment, a simple textural term suffices for its name. The appropriate term is derived from Shepard's triangle diagram. The textural term can be preceded by a mineralogical term when this seems warranted. Such mineralogical terms are applied as per rules IA and B.



Textural classification of clastic sediments, after Shepard (1954).

B. When the tests of a fossil biocoenosis or authigenic and detrital grains occur together, the fossil or authigenic material is not given a textural designation (as per rule IIC). However, the detrital material is classified texturally by recalculating its size components to 100%. With the presence of other constituents in the sediment, the detrital fraction now requires a compositional term.

C. 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).

D. 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.**

B. Authigenic constituents

1. Authigenic minerals enter the sediment name in a fashion similar to that outlined under rules IA 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.

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

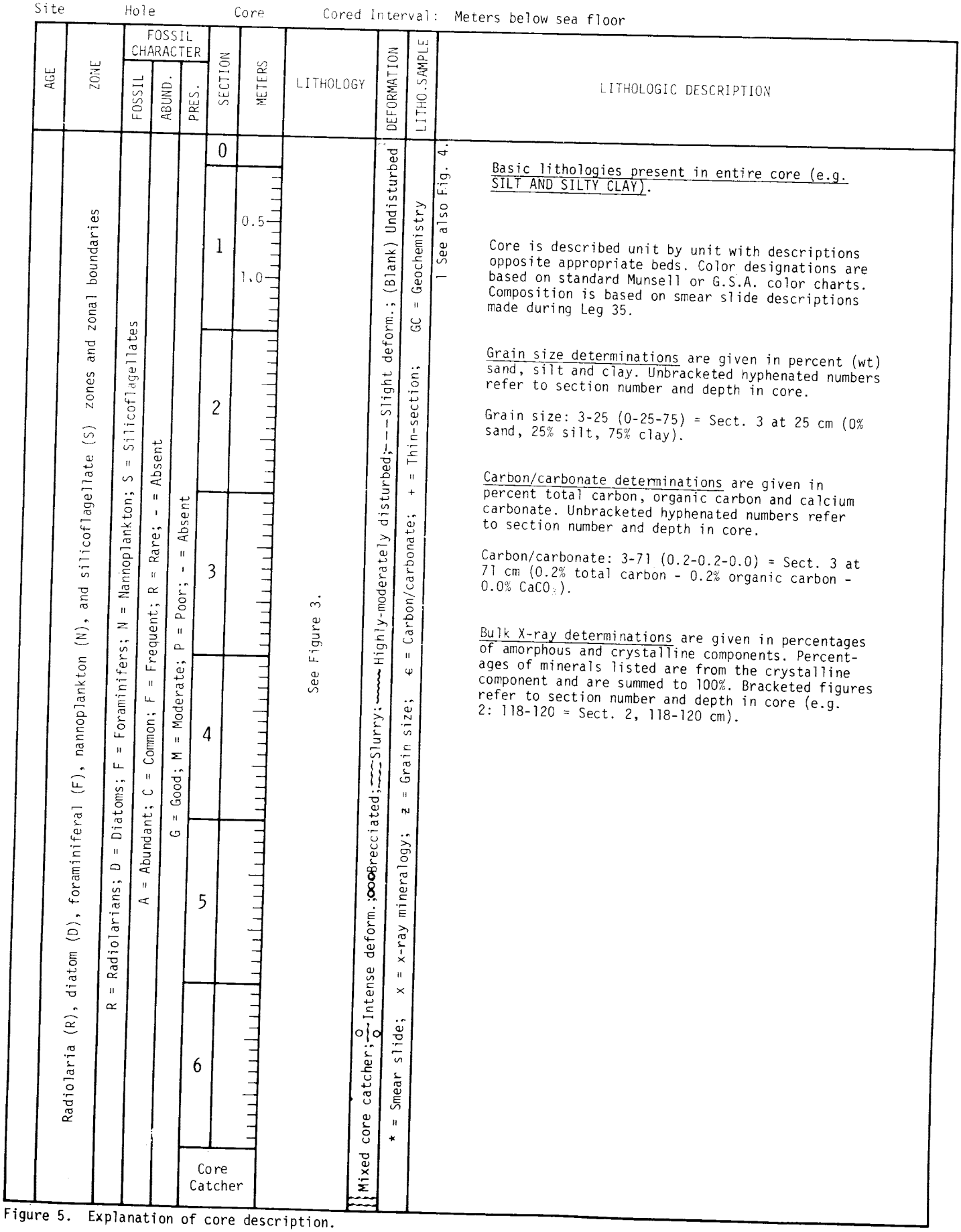


Figure 5. Explanation of core description.

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 Coordinating Staff Geologist 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.)

DEEP SEA DRILLING PROJECT

LEG 35 SITE 322

SITE SUMMARY SHEET

POSITION: Latitude: 60°01.45'S Longitude: 79°25.49'W
(Eastern end of Bellingshausen Abyssal Plain)

WATER DEPTH: 5026 corrected meters, echo sounding
5026 meters, drill pipe measurement

NUMBER OF HOLES: 1 NUMBER OF CORES: 14

PENETRATION: 544 meters TOTAL LENGTH OF CORED SECTION: 125.5 meters

TOTAL CORE RECOVERED: 34.4 meters PERCENTAGE CORE RECOVERED: 27.4%

OLDEST SEDIMENT CORED:

DEPTH SUBBOTTOM: 514.0 meters NATURE: Brown clay

AGE: ?Oligocene to early Miocene VELOCITY: 2 km/sec

BASEMENT:

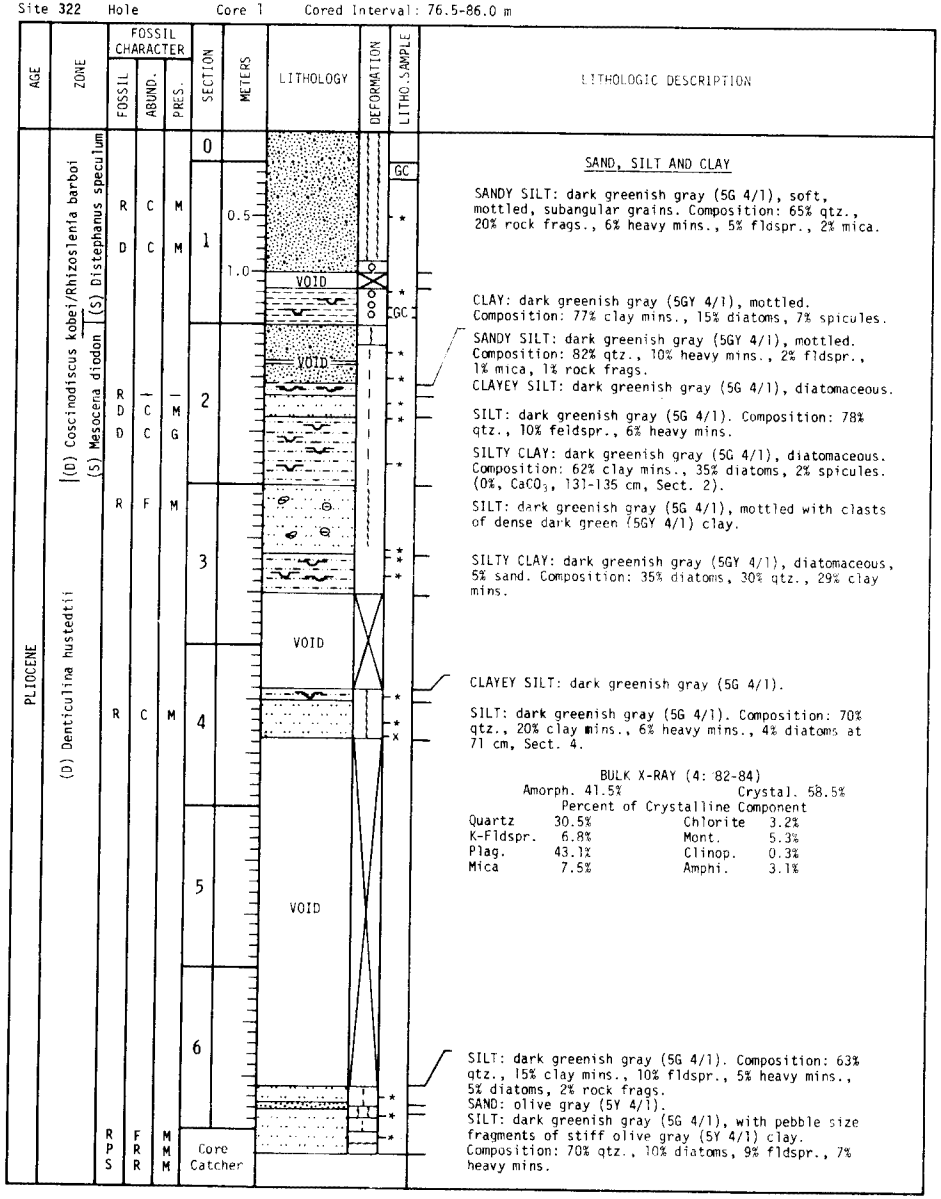
DEPTH SUBBOTTOM: 514.0 meters PENETRATION: 30.0 meters

NATURE: Altered igneous rock VELOCITY: 5 km/sec

PRINCIPAL RESULTS:

Thirty-four meters of terrigenous clay, silt and sand, and one meter of basalt were recovered from 544 meters drilled into a NW-SE trending fracture zone beneath the eastern end of the Bellingshausen Abyssal Plain. The detrital and terrigenous sediments range in age from Pliocene to early Miocene; the oldest sediment is one meter of pelagic brown clay recovered from just above basalt; it is early Miocene to (?) Oligocene in age. All of the sediment appears to have been deposited beneath the depth of carbonate compensation. No ice-rafted detritus was recognized at this site. The basalt (1 m recovered from 30 meter penetration) is similar to mid-ocean ridge extrusives with glassy veins and hyaloclastite breccia. Seismic profiles at this site show gently undulating, and locally discontinuous lenticular reflectors that become less intense with increasing depth. Acoustic basement cannot be recognized except as a region devoid of reflecting horizons. Frequently good size sorting of clastic material and the lenticular, discontinuous, attitudes of most reflecting horizons suggest that the sediment was originally deposited as distal turbidites and reworked by bottom currents.

Site 322 Hole Core 1 Cored Interval: 76.5-86.0 m



SAND, SILT AND CLAY

SANDY SILT: dark greenish gray (5G 4/1), soft, mottled, subangular grains. Composition: 65% qtz., 20% rock frags., 6% heavy mins., 5% fldspr., 2% mica.

CLAY: dark greenish gray (5GY 4/1), mottled. Composition: 77% clay mins., 15% diatoms, 7% spicules.

SANDY SILT: dark greenish gray (5GY 4/1), mottled. Composition: 82% qtz., 10% heavy mins., 2% fldspr., 1% mica, 1% rock frags.

CLAYEY SILT: dark greenish gray (5G 4/1), diatomaceous.

SILT: dark greenish gray (5G 4/1). Composition: 78% qtz., 10% feldspr., 6% heavy mins.

SILTY CLAY: dark greenish gray (5G 4/1), diatomaceous. Composition: 62% clay mins., 35% diatoms, 2% spicules. (0% $CaCO_3$, 131-135 cm, Sect. 2).

SILT: dark greenish gray (5G 4/1), mottled with clasts of dense dark green (5GY 4/1) clay.

SILTY CLAY: dark greenish gray (5GY 4/1), diatomaceous, 5% sand. Composition: 35% diatoms, 30% qtz., 29% clay mins.

CLAYEY SILT: dark greenish gray (5G 4/1).

SILT: dark greenish gray (5G 4/1). Composition: 70% qtz., 20% clay mins., 6% heavy mins., 4% diatoms at 71 cm, Sect. 4.

BULK X-RAY (4: 82-84)

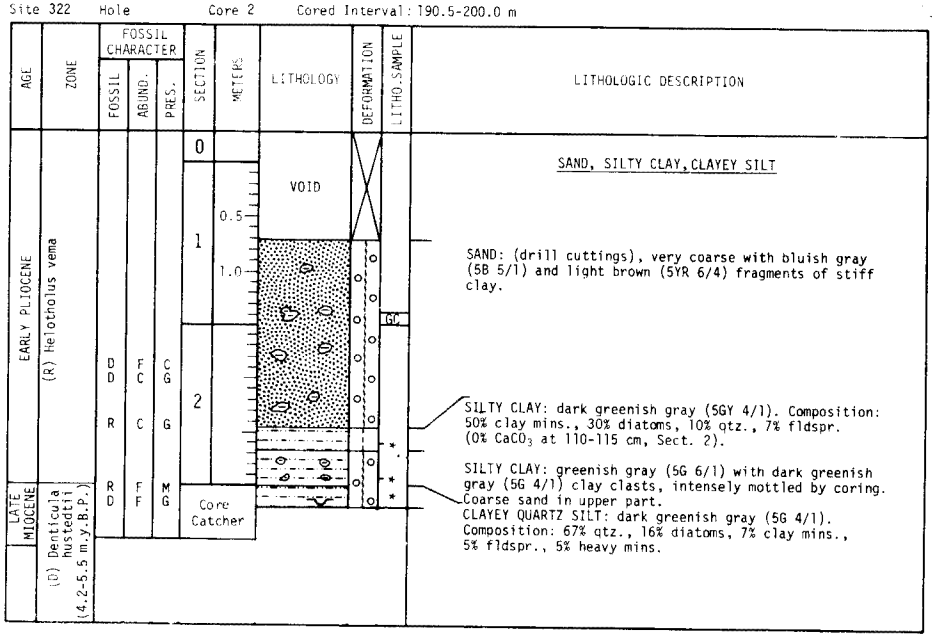
Amorph. 41.5% Crystal. 58.5%

Percent of Crystalline Component

Quartz	30.5%	Chlorite	3.2%
K-Fldspr.	6.8%	Mont.	5.3%
Plag.	43.1%	Clinop.	0.3%
Mica	7.5%	Amphi.	3.1%

SILT: dark greenish gray (5G 4/1). Composition: 63% qtz., 15% clay mins., 10% fldspr., 5% heavy mins., 5% diatoms, 2% rock frags.
SAND: olive gray (5Y 4/1).
SILT: dark greenish gray (5G 4/1), with pebble size fragments of stiff olive gray (5Y 4/1) clay.
Composition: 70% qtz., 10% diatoms, 9% fldspr., 7% heavy mins.

Site 322 Hole Core 2 Cored Interval: 190.5-200.0 m



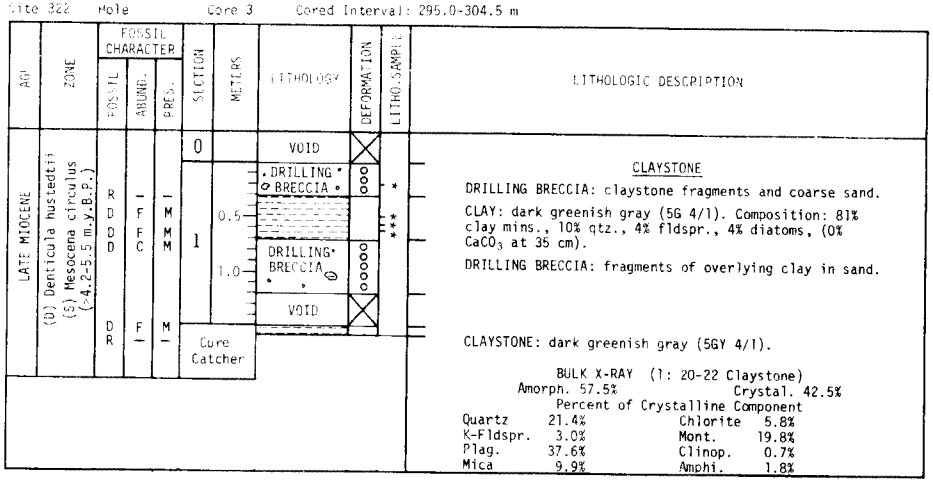
SAND, SILTY CLAY, CLAYEY SILT

SAND: (drill cuttings), very coarse with bluish gray (5B 5/1) and light brown (5YR 6/4) fragments of stiff clay.

SILTY CLAY: dark greenish gray (5GY 4/1). Composition: 50% clay mins., 30% diatoms, 10% qtz., 7% fldspr. (0% $CaCO_3$ at 110-115 cm, Sect. 2).

SILTY CLAY: greenish gray (5G 6/1) with dark greenish gray (5G 4/1) clay clasts, intensely mottled by coring. Coarse sand in upper part.
CLAYEY QUARTZ SILT: dark greenish gray (5G 4/1). Composition: 67% qtz., 16% diatoms, 7% clay mins., 5% fldspr., 5% heavy mins.

Site 322 Hole Core 3 Cored Interval: 295.0-304.5 m



CLAYSTONE

DRILLING BRECCIA: claystone fragments and coarse sand.

CLAY: dark greenish gray (5G 4/1). Composition: 81% clay mins., 10% qtz., 4% fldspr., 4% diatoms, (0% $CaCO_3$ at 35 cm).

DRILLING BRECCIA: fragments of overlying clay in sand.

CLAYSTONE: dark greenish gray (5GY 4/1).

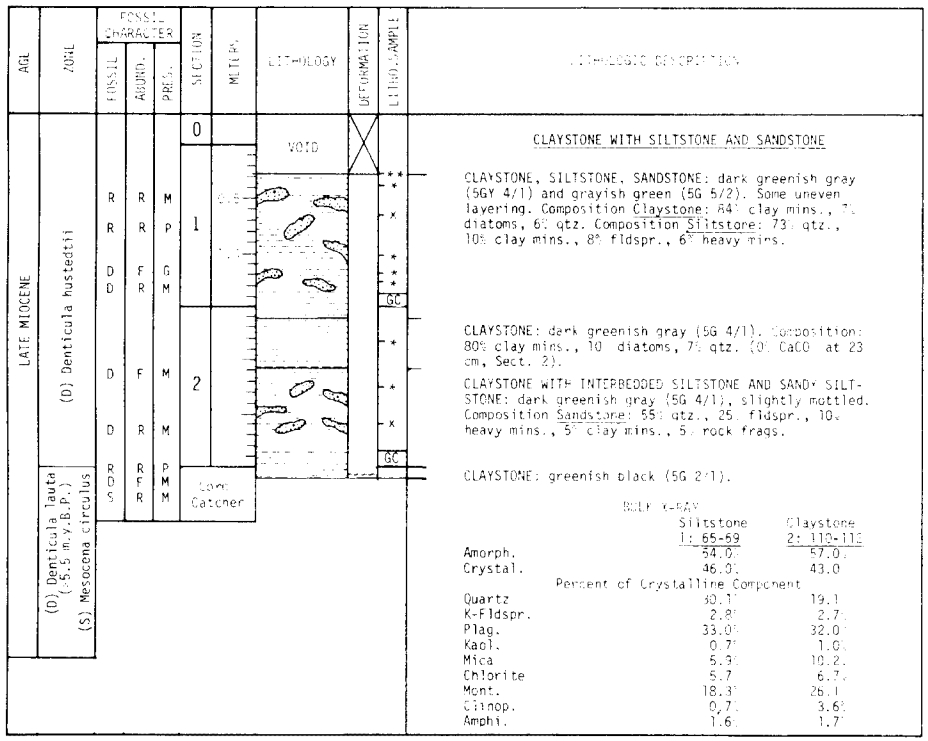
BULK X-RAY (1: 20-22 Claystone)

Amorph. 57.5% Crystal. 42.5%

Percent of Crystalline Component

Quartz	21.4%	Chlorite	5.8%
K-Fldspr.	3.0%	Mont.	19.8%
Plag.	37.6%	Clinop.	0.7%
Mica	9.9%	Amphi.	1.8%

Site 322 Hole Core 4 Cored Interval: 352.0-361.5 m



CLAYSTONE WITH SILTSTONE AND SANDSTONE

CLAYSTONE, SILTSTONE, SANDSTONE: dark greenish gray (5GY 4/1) and grayish green (5G 5/2). Some uneven layering. Composition Claystone: 84% clay mins., 7% diatoms, 6% qtz. Composition Siltstone: 73% qtz., 10% clay mins., 8% fldspr., 6% heavy mins.

CLAYSTONE: dark greenish gray (5G 4/1). Composition: 80% clay mins., 10% diatoms, 7% qtz. (0% CaCO3 at 23 cm, Sect. 2).

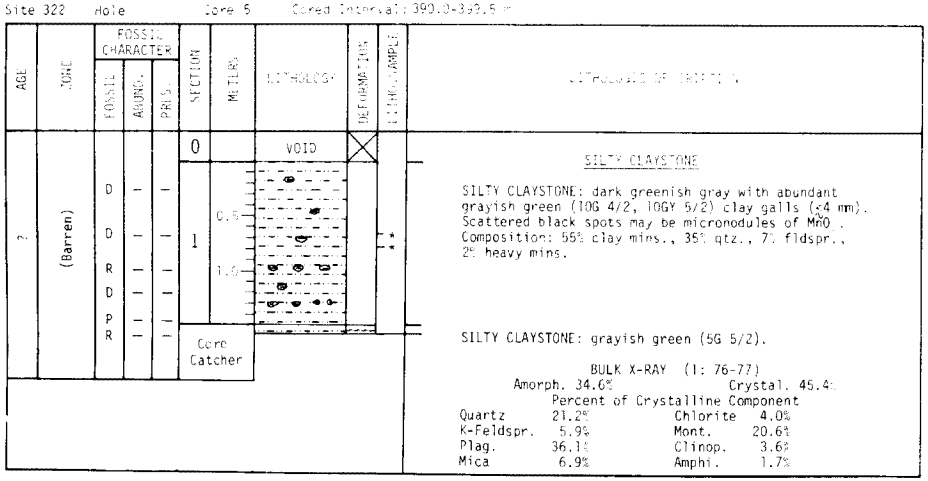
CLAYSTONE WITH INTERBEDDED SILTSTONE AND SANDY SILTSTONE: dark greenish gray (5G 4/1), slightly mottled. Composition Sandstone: 55% qtz., 25% fldspr., 10% heavy mins., 5% clay mins., 5% rock frags.

CLAYSTONE: greenish black (5G 2/1).

BULK X-RAY

	Siltstone 1: 65-69	Claystone 2: 110-116
Amorph.	54.0%	57.0%
Crystal.	46.0%	43.0%
Percent of Crystalline Component		
Quartz	30.1%	19.1%
K-Fldspr.	2.8%	2.7%
Plag.	33.0%	32.0%
Kaol.	0.7%	1.0%
Mica	5.9%	10.2%
Chlorite	5.7%	6.7%
Mont.	18.3%	26.1%
Clinop.	0.7%	3.6%
Amphi.	1.6%	1.7%

Site 322 Hole Core 5 Cored Interval: 390.0-399.5 m



SILTY CLAYSTONE

SILTY CLAYSTONE: dark greenish gray with abundant grayish green (10G 4/2, 10GY 5/2) clay galls (<4 mm). Scattered black spots may be micronodules of MnO2. Composition: 55% clay mins., 35% qtz., 7% fldspr., 2% heavy mins.

SILTY CLAYSTONE: grayish green (5G 5/2).

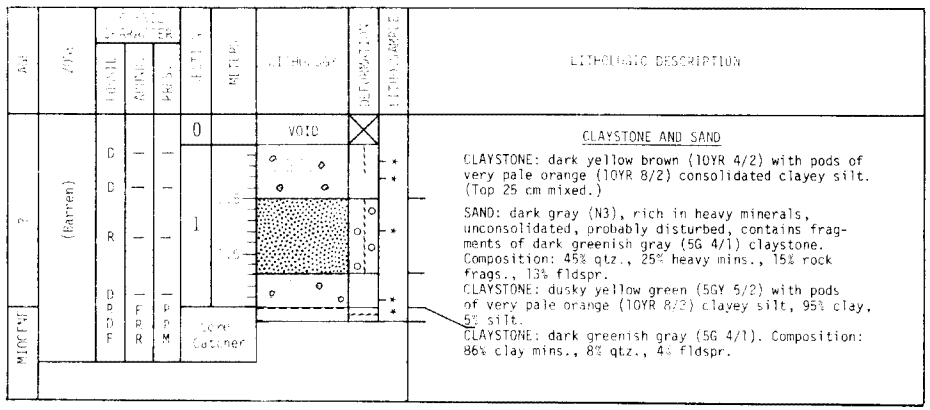
BULK X-RAY (1: 76-77)

Amorph. 34.6% Crystal. 45.4%

Percent of Crystalline Component

Quartz	21.2%	Chlorite	4.0%
K-Feldspr.	5.9%	Mont.	20.6%
Plag.	36.1%	Clinop.	3.6%
Mica	6.9%	Amphi.	1.7%

Site 322 Hole Core 6 Cored Interval: 437.5-447.0 m



CLAYSTONE AND SAND

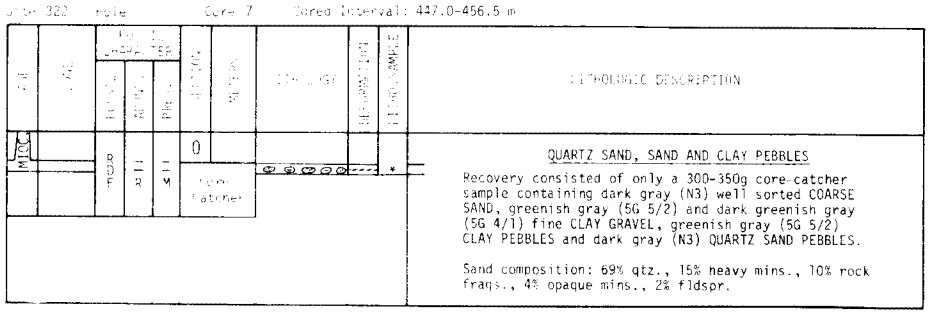
CLAYSTONE: dark yellow brown (10YR 4/2) with pods of very pale orange (10YR 8/2) consolidated clayey silt. (Top 25 cm mixed.)

SAND: dark gray (N3), rich in heavy minerals, unconsolidated, probably disturbed, contains fragments of dark greenish gray (5G 4/1) claystone. Composition: 45% qtz., 25% heavy mins., 15% rock frags., 13% fldspr.

CLAYSTONE: dusky yellow green (5GY 5/2) with pods of very pale orange (10YR 8/2) clayey silt, 95% clay, 5% silt.

CLAYSTONE: dark greenish gray (5G 4/1). Composition: 86% clay mins., 8% qtz., 4% fldspr.

Site 322 Hole Core 7 Cored Interval: 447.0-456.5 m

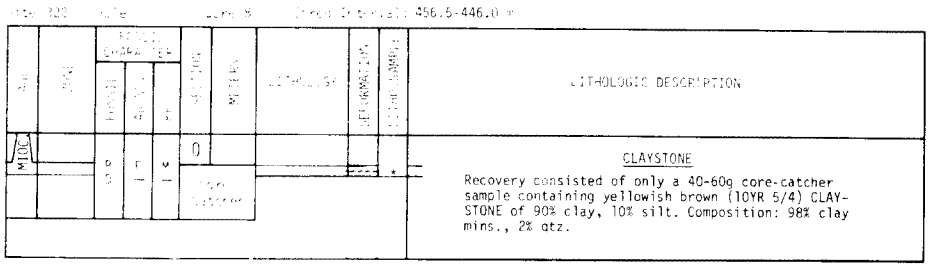


QUARTZ SAND, SAND AND CLAY PEBBLES

Recovery consisted of only a 300-350g core-catcher sample containing dark gray (N3) well sorted COARSE SAND, greenish gray (5G 5/2) and dark greenish gray (5G 4/1) fine CLAY GRAVEL, greenish gray (5G 5/2) CLAY PEBBLES and dark gray (N3) QUARTZ SAND PEBBLES.

Sand composition: 69% qtz., 15% heavy mins., 10% rock frags., 4% opaque mins., 2% fldspr.

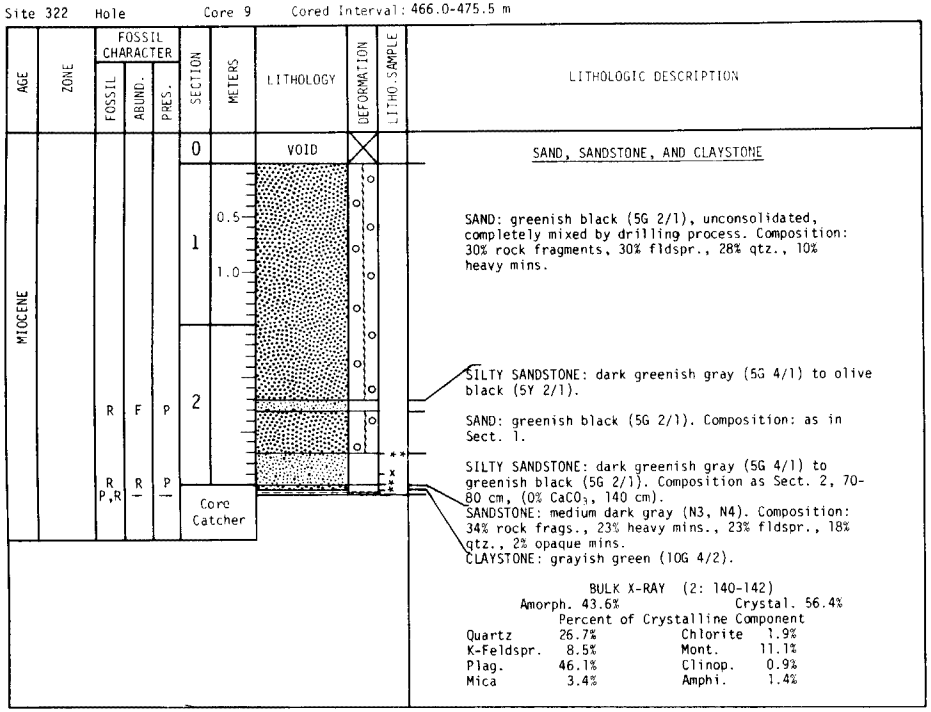
Site 322 Hole Core 8 Cored Interval: 456.5-466.0 m



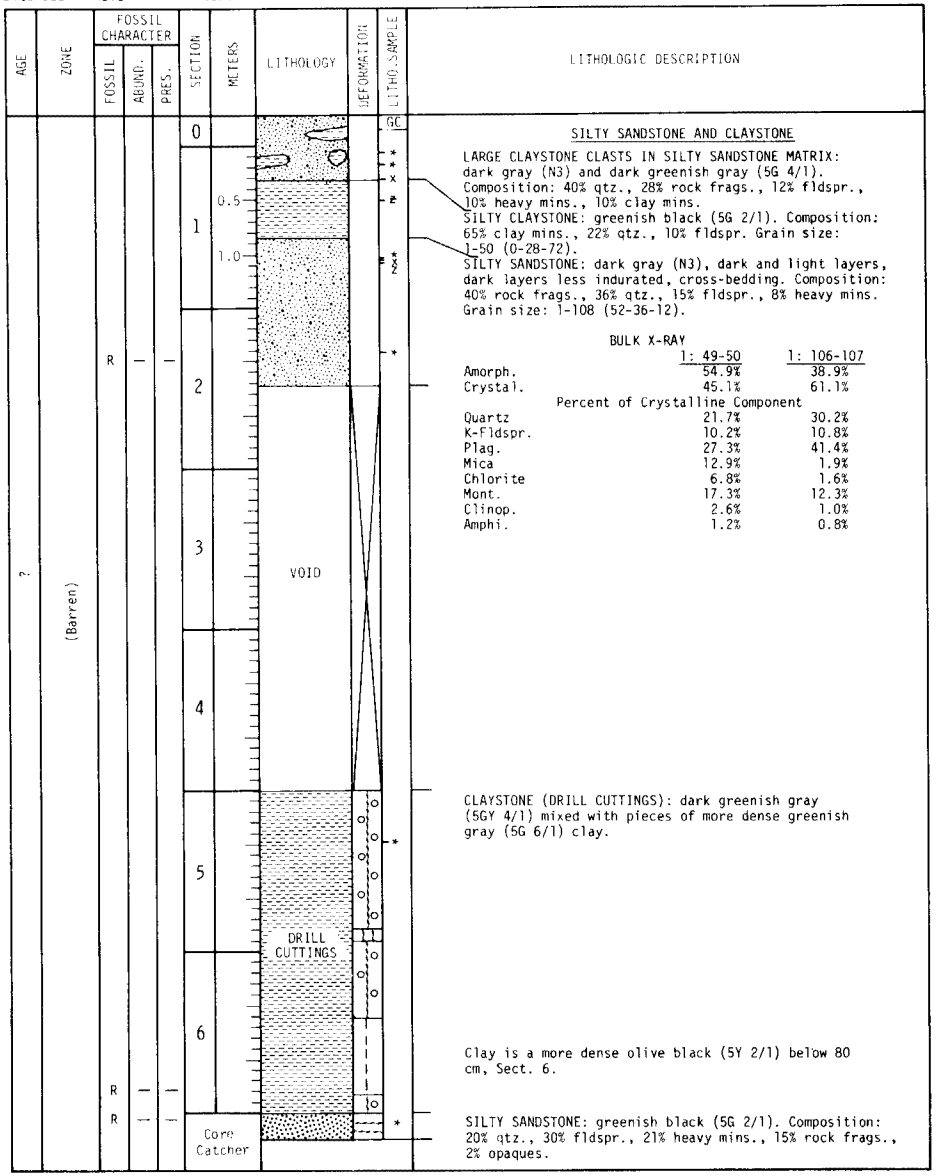
CLAYSTONE

Recovery consisted of only a 40-60g core-catcher sample containing yellowish brown (10YR 5/4) CLAYSTONE of 90% clay, 10% silt. Composition: 98% clay mins., 2% qtz.

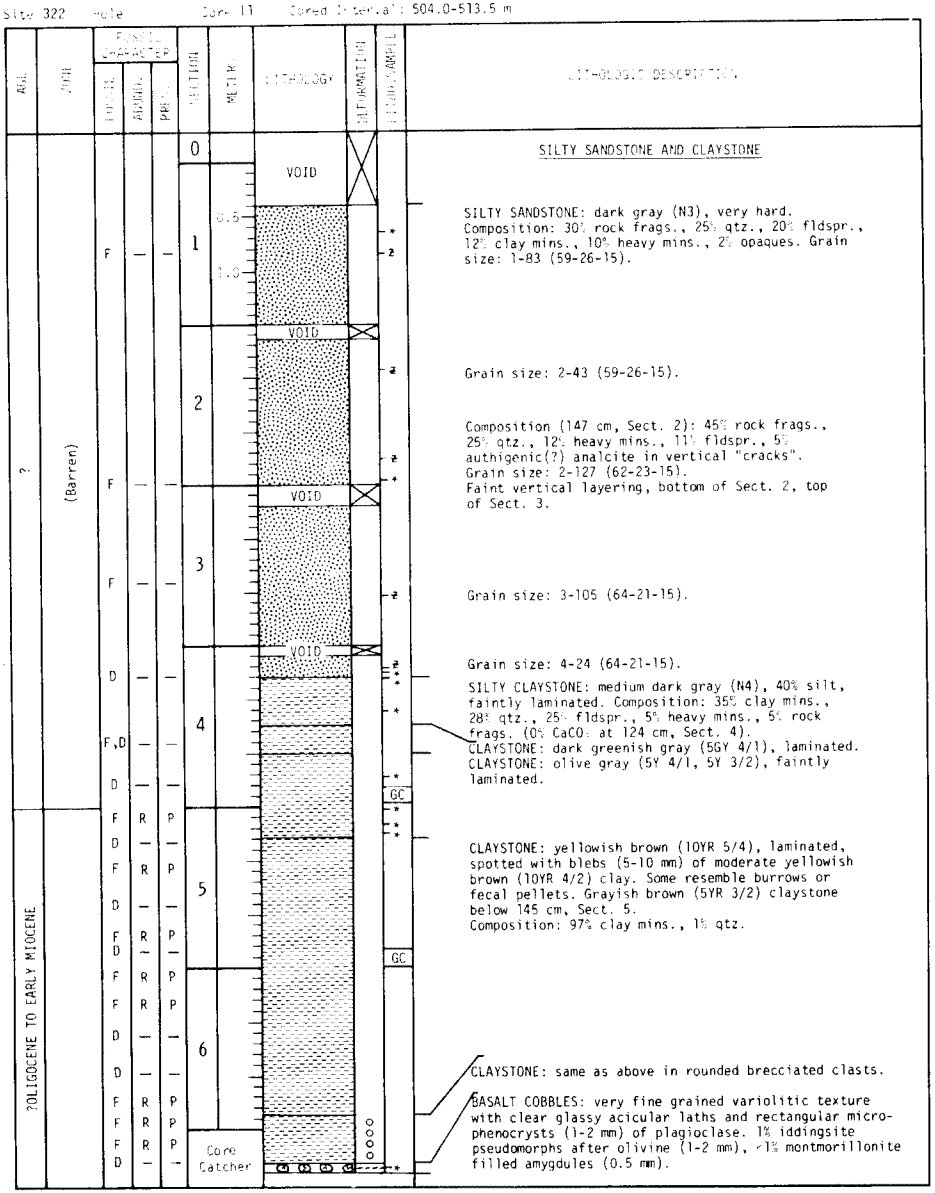
Site 322 Hole Core 9 Cored Interval: 466.0-475.5 m



Site 322 Hole Core 10 Cored Interval: 485.0-494.5 m



Site 322 Hole Core 11 Cored Interval: 504.0-513.5 m



SILTY SANDSTONE AND CLAYSTONE

SILTY SANDSTONE: dark gray (N3), very hard. Composition: 30% rock frags., 25% qtz., 20% fldspr., 12% clay mins., 10% heavy mins., 2% opaques. Grain size: 1-83 (59-26-15).

Grain size: 2-43 (59-26-15).

Composition (147 cm, Sect. 2): 45% rock frags., 25% qtz., 12% heavy mins., 11% fldspr., 5% authigenic(?) analcite in vertical "cracks". Grain size: 2-127 (62-23-15). Faint vertical layering, bottom of Sect. 2, top of Sect. 3.

Grain size: 3-105 (64-21-15).

Grain size: 4-24 (64-21-15).

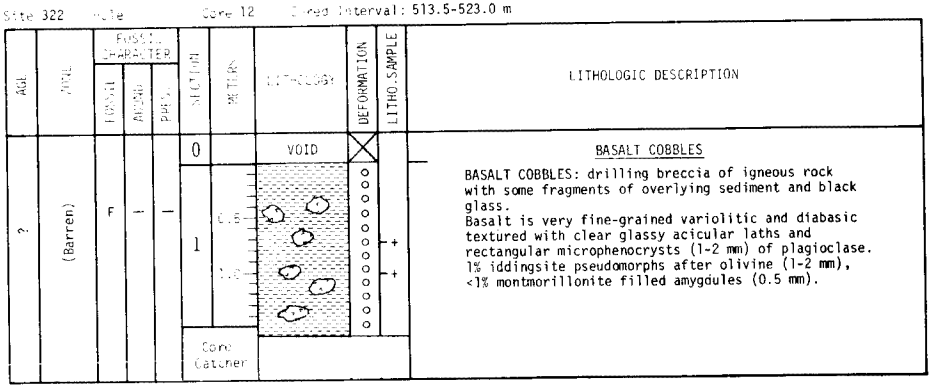
SILTY CLAYSTONE: medium dark gray (N4), 40% silt, faintly laminated. Composition: 35% clay mins., 28% qtz., 25% fldspr., 5% heavy mins., 5% rock frags. (0% $CaCO_3$ at 124 cm, Sect. 4).
CLAYSTONE: dark greenish gray (5GY 4/1), laminated.
CLAYSTONE: olive gray (5Y 4/1, 5Y 3/2), faintly laminated.

CLAYSTONE: yellowish brown (10YR 5/4), laminated, spotted with blebs (5-10 mm) of moderate yellowish brown (10YR 4/2) clay. Some resemble burrows or fecal pellets. Grayish brown (5YR 3/2) claystone below 145 cm, Sect. 5.
Composition: 97% clay mins., 1% qtz.

CLAYSTONE: same as above in rounded brecciated clasts.

BASALT COBBLES: very fine grained variolitic texture with clear glassy acicular laths and rectangular microphenocrysts (1-2 mm) of plagioclase. 1% iddingsite pseudomorphs after olivine (1-2 mm), <1% montmorillonite filled amygdules (0.5 mm).

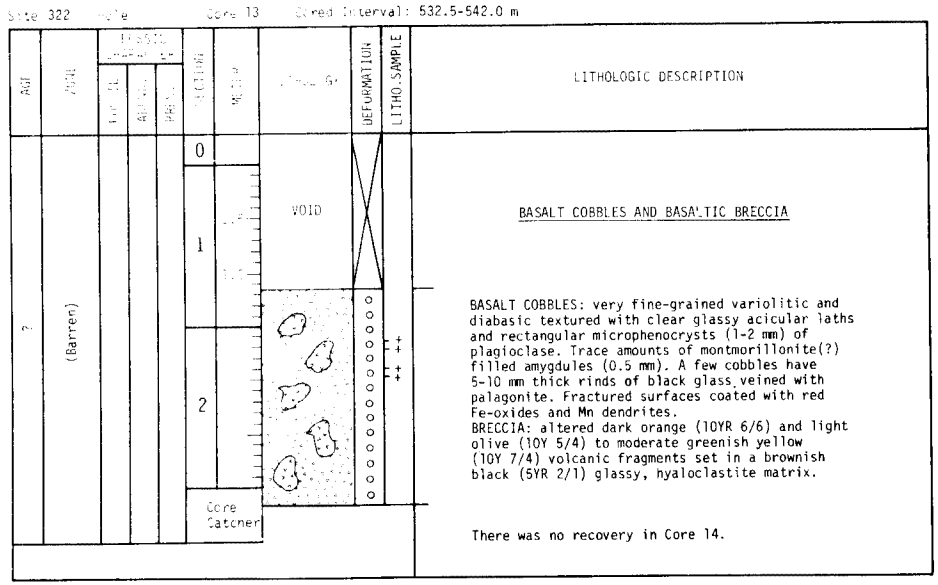
Site 322 Hole Core 12 Cored Interval: 513.5-523.0 m



BASALT COBBLES

BASALT COBBLES: drilling breccia of igneous rock with some fragments of overlying sediment and black glass.
Basalt is very fine-grained variolitic and diabasic textured with clear glassy acicular laths and rectangular microphenocrysts (1-2 mm) of plagioclase. 1% iddingsite pseudomorphs after olivine (1-2 mm), <1% montmorillonite filled amygdules (0.5 mm).

Site 322 Hole Core 13 Cored Interval: 532.5-542.0 m



BASALT COBBLES AND BASALTIC BRECCIA

BASALT COBBLES: very fine-grained variolitic and diabasic textured with clear glassy acicular laths and rectangular microphenocrysts (1-2 mm) of plagioclase. Trace amounts of montmorillonite(?) filled amygdules (0.5 mm). A few cobbles have 5-10 mm thick rinds of black glass veined with palagonite. Fractured surfaces coated with red Fe-oxides and Mn dendrites.
BRECCIA: altered dark orange (10YR 6/6) and light olive (10Y 5/4) to moderate greenish yellow (10Y 7/4) volcanic fragments set in a brownish black (5YR 2/1) glassy, hyaloclastite matrix.

There was no recovery in Core 14.

DEEP SEA DRILLING PROJECT

LEG 35 SITE 323

SITE SUMMARY SHEET

POSITION: Latitude: 63°40.84'S Longitude: 97°59.69'W
(Bellingshausen Abyssal Plain)

WATER DEPTH: 5004 corrected meters, echo sounding
4993 meters, drill pipe measurement

NUMBER OF HOLES: 1 NUMBER OF CORES: 21

PENETRATION: 731 meters TOTAL LENGTH OF CORED SECTION: 199.5 meters

TOTAL CORE RECOVERED: 76.43 meters PERCENTAGE CORE RECOVERED: 38%

OLDEST SEDIMENT CORED:

DEPTH SUBBOTTOM: 701.0 meters NATURE: Brown clay

AGE: Late Cretaceous VELOCITY: 1.85 ±.04 km/sec

BASEMENT:

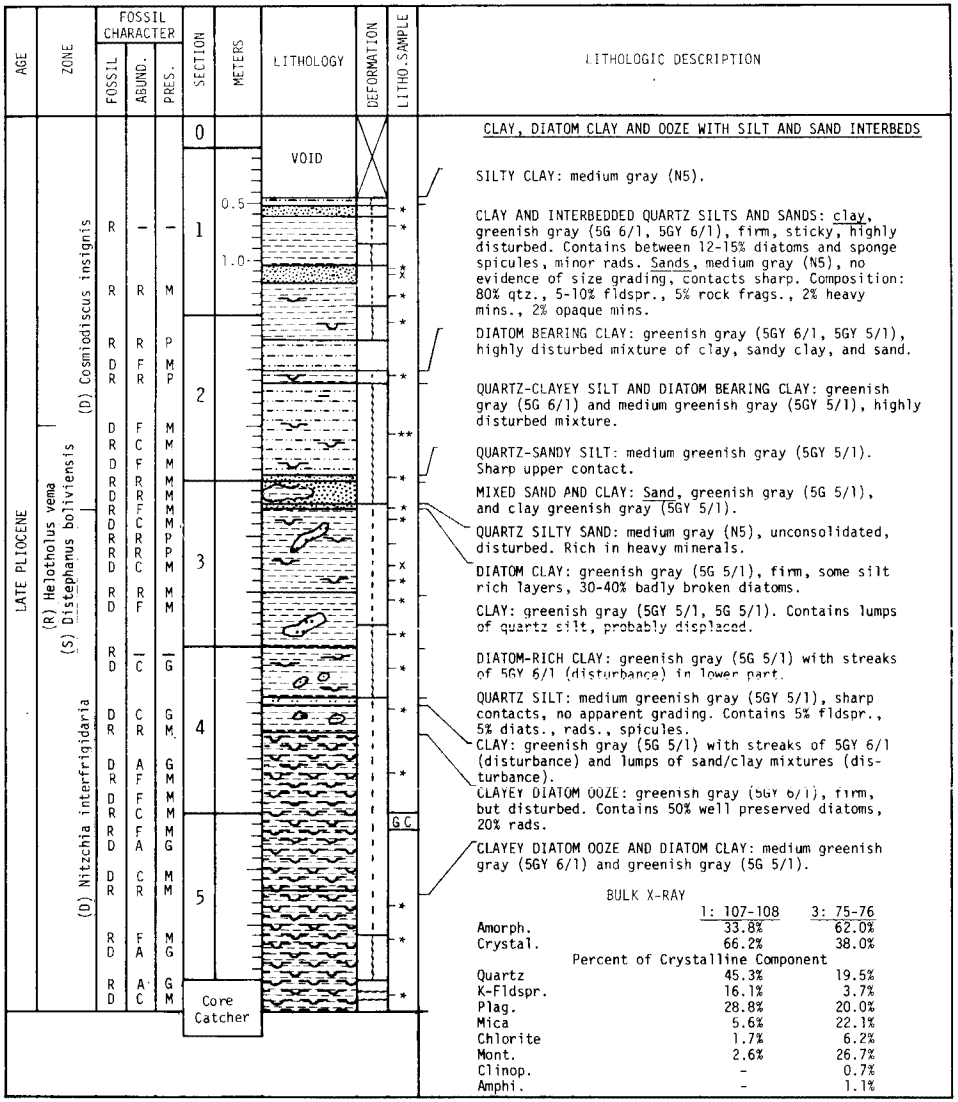
DEPTH SUBBOTTOM: 701.0 meters PENETRATION: 30.0 meters

NATURE: Basalt VELOCITY: 3.65-4.80 km/sec

PRINCIPAL RESULTS:

A single hole was drilled into the Bellingshausen Abyssal Plain just south of the Eltanin Fracture Zone and 76 meters of claystone and 10 meters of basalt were recovered from 731 meters of penetration. The upper 500 meters (Miocene and Pliocene) penetrated is diatomaceous clay and claystone; a single ice-rafted granite cobble was found at about 360 meters in mid-Miocene claystone. Between about 500 and 640 meters (late Oligocene to early Miocene) the claystone lacks biogenic silica. Below this (640-700 m) lies iron-rich and, near the bottom, nannofossil-rich brown claystone of Late Cretaceous age. This overlies aphanitic aphyric basalt rich in iron and titanium, and low in magnesium oxide. This evidence of 1) anomalous fractionation, 2) the absence of glass, palagonite or hyaloclastite and 3) the low hummocky relief of acoustic basement suggests that the basalt may represent one or more sills. However the Maastrichtian age (70 m.y.) determined from fossils in the sediments overlying the basalt is close to the 81 m.y. age suggested by the nearest magnetic anomaly (?33).

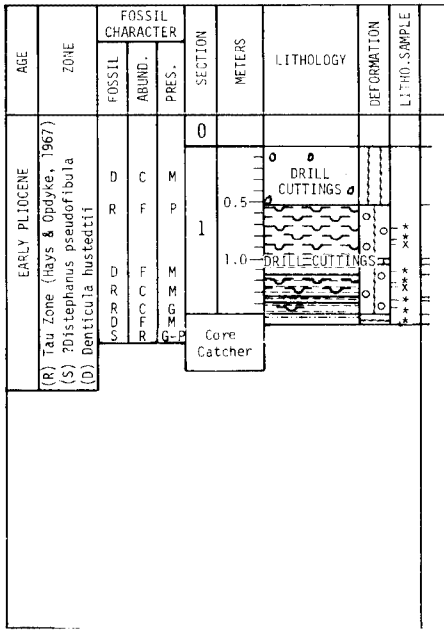
Site 323 Hole Core 1 Cored Interval: 75.5-85.0 m



BULK X-RAY

	1: 107-108	3: 75-76
Amorph.	33.8%	62.0%
Crystal.	66.2%	38.0%
Percent of Crystalline Component		
Quartz	45.3%	19.5%
K-Fldspr.	16.1%	3.7%
Plag.	28.8%	20.0%
Mica	5.6%	22.1%
Chlorite	1.7%	6.2%
Mont.	2.6%	26.7%
Clinop.	-	0.7%
Amphi.	-	1.1%

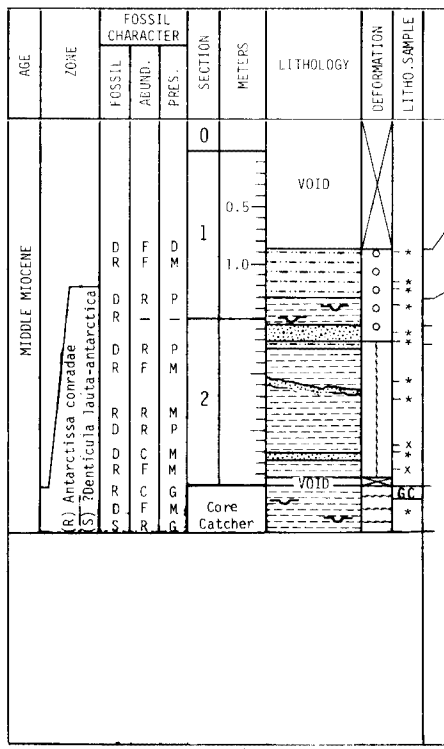
Site 323 Hole Core 2 Cored Interval: 161.0-170.5 m



BULK X-RAY

	1: 83-84	1: 119-120
Amorph.	66.0%	54.2%
Crystal.	34.0%	45.8%
Percent of Crystalline Component		
Quartz	16.0%	16.9%
K-Fldspr.	9.7%	5.7%
Plag.	14.3%	15.9%
Kaol.	0.8%	0.9%
Mica	24.9%	15.9%
Chlorite	1.3%	0.6%
Mont.	31.7%	42.5%
Clinop.	0.3%	0.6%
Amphi.	0.9%	0.9%

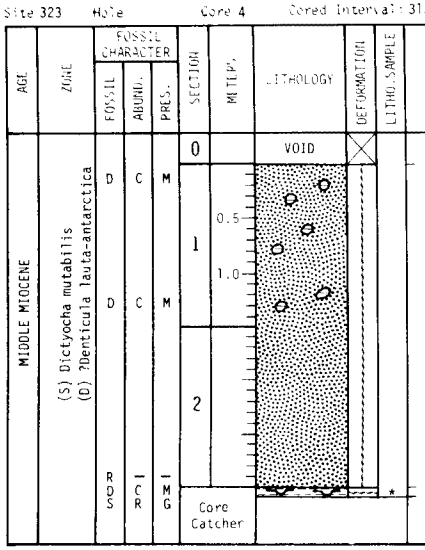
Site 323 Hole Core 3 Cored Interval: 256.0-265.5 m



BULK X-RAY

	2: 119-120	2: 136-137
Amorph.	32.2%	46.9%
Crystal.	67.8%	53.1%
Percent of Crystalline Component		
Quartz	42.7%	13.2%
K-Fldspr.	13.2%	7.7%
Plag.	35.7%	15.1%
Mica	2.6%	11.7%
Chlorite	1.5%	-
Mont.	2.5%	51.1%
Clinop.	0.7%	0.5%
Amphi.	1.1%	0.7%

Site 323 Hole Core 4 Cored Interval: 313.0-322.5 m



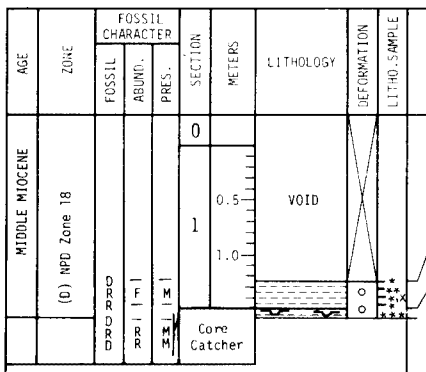
LITHOLOGIC DESCRIPTION

SAND

SAND: totally disturbed and unconsolidated. Very coarse, but well sorted to size. Composed predominantly of rock fragments of great variety. Some clay fragments in Section 1. Although disturbed, size sorting suggests material is from sand bed rather than drill cuttings.

DIATOM BEARING CLAY: Composition: 83% clay mins., 7% qtz., 7% diatoms., 3% opaque mins.

Site 323 Hole Core 5 Cored Interval: 332.0-341.5 m



LITHOLOGIC DESCRIPTION

CLAYSTONE

CLAYSTONE: pieces of yellowish gray (5Y 6/2), greenish gray (5GY 5/1), light olive gray (5Y 5/2), medium dark gray (N4), and moderate yellowish brown (10YR 5/4). Vein of 100% authigenic carbonate at 135 cm. Trace-5% micronodules.

CLAYSTONE: olive gray (5Y 5/2), black specks, hard. Composition: 90-98% clay mins., 5-8% diatoms, traces rads., sponge spicules, calc. nannos.

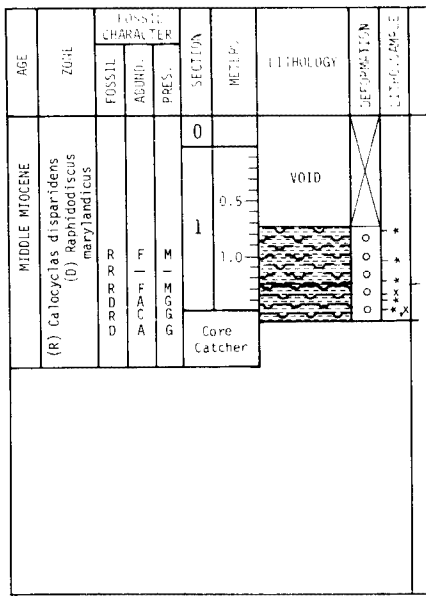
BULK X-RAY (1: 140-141)

Amorph. 57.8% Crystal. 42.2%

Percent of Crystalline Component

Quartz	15.6%	Chlorite	0.6%
K-Fldspr.	2.3%	Mont.	40.0%
Plag.	19.0%	Clinop.	0.8%
Kaol.	0.4%	Amphi.	0.9%
Mica	20.4%		

Site 323 Hole Core 6 Cored Interval: 341.5-351.0 m



LITHOLOGIC DESCRIPTION

DIATOM CLAYSTONE AND CLAYEY DIATOMITE

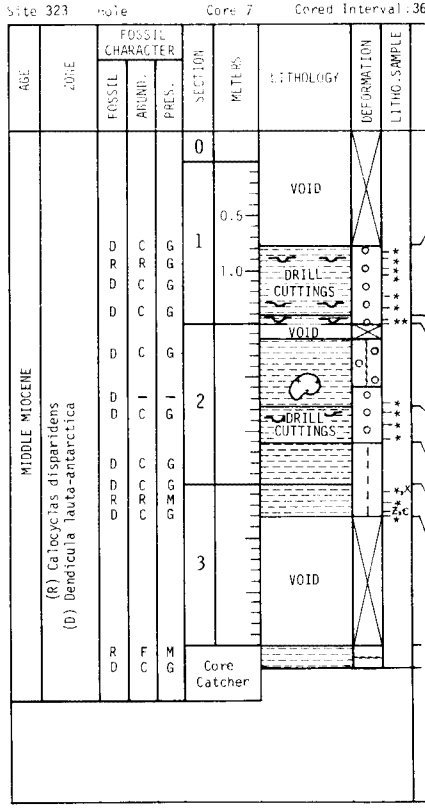
DIATOM CLAYSTONE: fragments washed from drill cuttings. Fresh broken surfaces indicate that fragments are from cored interval, but are not in stratigraphic order. Primary lithologies are: a) diatom-bearing claystone, moderate and dark yellowish brown (10YR 5/4, 10YR 4/2) and greenish gray (5G 5/1), b) diatom-rich claystone, yellowish brown (10YR 5/2), and c) clayey diatomite, moderate greenish gray (5GY 5/1).

CLAYEY DIATOMITE: greenish gray (5GY 6/1), structureless. Composition: 50-55% diatoms (20% of which are well preserved), 45-50% clay mins.

BULK X-RAY

	1: 135-147	1: 47-48
Amorph.	60.5%	62.6%
Crystal.	39.5%	37.4%
Percent of Crystalline Component		
Quartz	13.0%	14.6%
K-Fldspr.	8.1%	4.5%
Plag.	13.6%	15.1%
Kaol.	0.7%	0.8%
Mica	19.7%	19.9%
Chlorite	0.2%	-
Mont.	43.8%	43.9%
Clinop.	0.2%	0.3%
Gibb.	-	-
Amphi.	0.8%	0.9%

Site 323 Hole Core 7 Cored Interval: 360.5-370.0 m



LITHOLOGIC DESCRIPTION

CLAY AND DIATOM-RICH CLAYSTONE

DIATOM-RICH CLAYSTONE AND CLAYSTONE: fragments washed from drill cuttings. Fresh broken surfaces indicate that fragments are from cored inerval, but they have been artifically grouped by color and are not in stratigraphic order. Lithologies include: claystone, dusky yellow brown (10YR 2/2), and greenish gray (5G 5/1) and dark greenish gray (5GY 4/1), diatom claystone, yellow brown (10YR 5/4, 10YR 4/2), quartz sand with auth. carb., medium olive gray (5Y 5/1), diatom rich claystone, medium olive gray (5Y 5/1).

DIATOM-RICH CLAYSTONE: dark greenish gray (5GY 4/1) and moderate and dark yellowish brown (10YR 5/4, 10YR 4/2), structureless. Composition: 75-88% clay mins., 7-20% diatoms, 0-5% qtz., traces fldspr., heavy mins., rads., sponge spicules.

CLAY: Totally disturbed drilling hash. Contains varying colored clays and diatom clay. Granite cobble, Sect. 2, 60 cm.

DIATOM-RICH CLAY AND CLAYSTONE: fragments washed from drill cuttings as in Sect. 1. Lithologies include: diatom claystone, moderate and dark yellowish brown (10YR 5/4, 10YR 4/2) and dark greenish gray (5GY 4/1), diatom clay, greenish gray (5GY 5/1) and clay, greenish gray (5G 5/1).

CLAY: totally disturbed drilling hash. Contains varying colored clays and diatom clays.

CLAY: dark greenish gray (5GY 4/1). Featureless except for two sand pods containing up to 30% rock fragments, 15% heavy mins., 5% fldspr. Grain size: 3-25: (0-25-75). C/CO_3: 3-23 (0.1-0.1-0.0).

CLAY: dark greenish gray (5GY 4/1), faintly mottled, minor small sand pods and ice-rafted gravel.

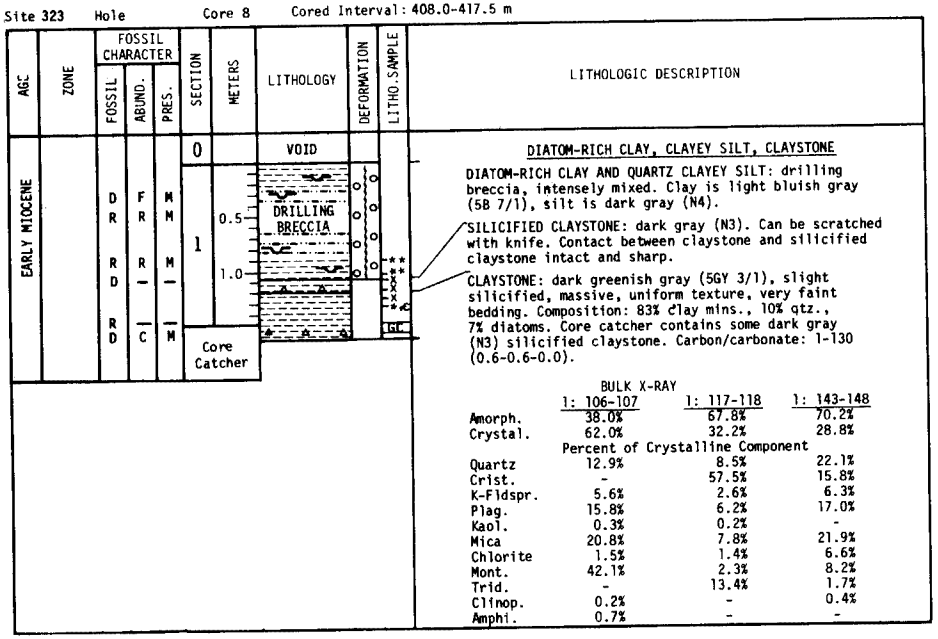
BULK X-RAY (3: 5-6)

Amorph. 48.6% Crystal. 51.4%

Percent of Crystalline Component

Quartz	16.2%	Chlorite	2.2%
K-Fldspr.	8.5%	Mont.	38.2%
Plag.	17.1%	Clinop.	0.3%
Kaol.	0.4%	Amphi.	0.9%
Mica	16.2%		

Site 323 Hole Core 8 Cored Interval: 408.0-417.5 m



LITHOLOGIC DESCRIPTION

DIATOM-RICH CLAY, CLAYEY SILT, CLAYSTONE

DIATOM-RICH CLAY AND QUARTZ CLAYEY SILT: drilling breccia, intensely mixed. Clay is light bluish gray (5B 7/1), silt is dark gray (N4).

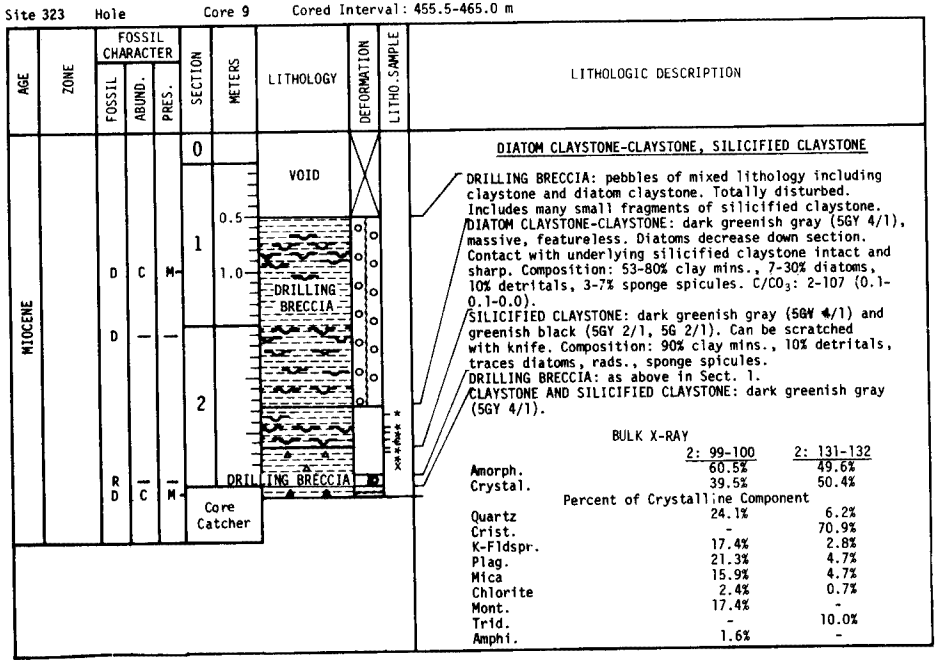
SILICIFIED CLAYSTONE: dark gray (N3). Can be scratched with knife. Contact between claystone and silicified claystone intact and sharp.

CLAYSTONE: dark greenish gray (5GY 3/1), slight silicified, massive, uniform texture, very faint bedding. Composition: 83% clay mins., 10% qtz., 7% diatoms. Core catcher contains some dark gray (N3) silicified claystone. Carbon/carbonate: 1-130 (0.6-0.6-0.0).

BULK X-RAY

	1: 106-107	1: 117-118	1: 143-148
Amorph.	38.0%	67.8%	70.2%
Crystal.	62.0%	32.2%	28.8%
Percent of Crystalline Component			
Quartz	12.9%	8.5%	22.1%
Crist.	-	57.5%	15.8%
K-Fldspr.	5.6%	2.6%	6.3%
Plag.	15.8%	6.2%	17.0%
Kaol.	0.3%	0.2%	-
Mica	20.8%	7.8%	21.9%
Chlorite	1.5%	1.4%	6.6%
Mont.	42.1%	2.3%	8.2%
Trid.	-	13.4%	1.7%
Clinop.	0.2%	-	0.4%
Amphi.	0.7%	-	-

Site 323 Hole Core 9 Cored Interval: 455.5-465.0 m



LITHOLOGIC DESCRIPTION

DIATOM CLAYSTONE-CLAYSTONE, SILICIFIED CLAYSTONE

DRILLING BRECCIA: pebbles of mixed lithology including claystone and diatom claystone. Totally disturbed. Includes many small fragments of silicified claystone.

DIATOM CLAYSTONE-CLAYSTONE: dark greenish gray (5GY 4/1), massive, featureless. Diatoms decrease down section. Contact with underlying silicified claystone intact and sharp. Composition: 53-80% clay mins., 7-30% diatoms, 10% detritals, 3-7% sponge spicules. C/CO_3: 2-107 (0.1-0.1-0.0).

SILICIFIED CLAYSTONE: dark greenish gray (5GY 4/1) and greenish black (5GY 2/1, 5G 2/1). Can be scratched with knife. Composition: 90% clay mins., 10% detritals, traces diatoms, rads., sponge spicules.

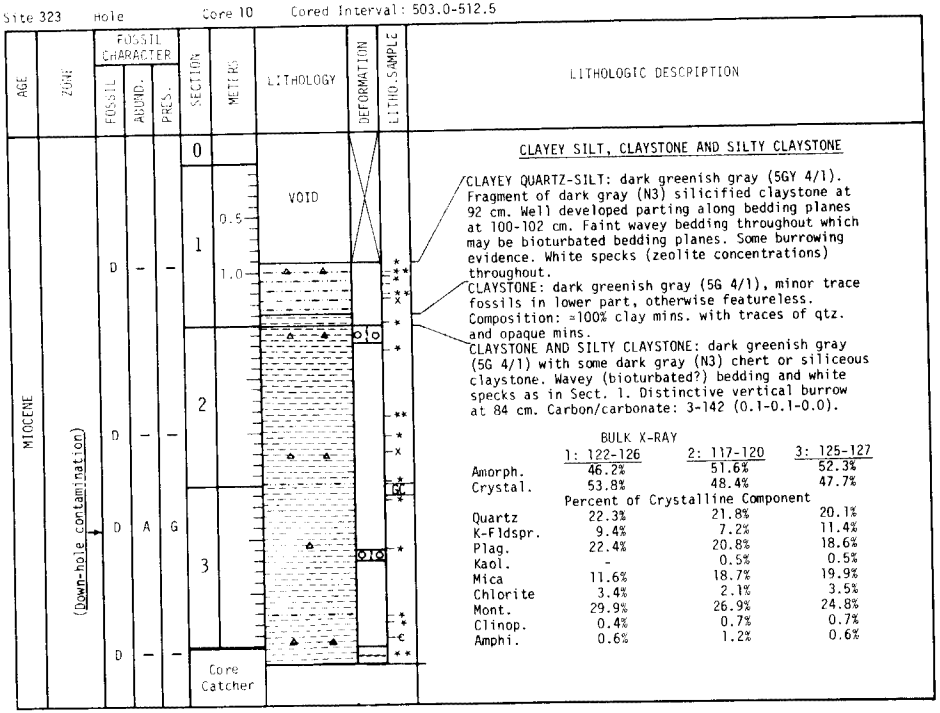
DRILLING BRECCIA: as above in Sect. 1.

CLAYSTONE AND SILICIFIED CLAYSTONE: dark greenish gray (5GY 4/1).

BULK X-RAY

	2: 99-100	2: 131-132
Amorph.	60.5%	49.6%
Crystal.	39.5%	50.4%
Percent of Crystalline Component		
Quartz	24.1%	6.2%
Crist.	-	70.9%
K-Fldspr.	17.4%	2.8%
Plag.	21.3%	4.7%
Mica	15.9%	4.7%
Chlorite	2.4%	0.7%
Mont.	17.4%	-
Trid.	-	10.0%
Amphi.	1.6%	-

Site 323 Hole Core 10 Cored Interval: 503.0-512.5



LITHOLOGIC DESCRIPTION

CLAYEY SILT, CLAYSTONE AND SILTY CLAYSTONE

CLAYEY QUARTZ-SILT: dark greenish gray (5GY 4/1). Fragment of dark gray (N3) silicified claystone at 92 cm. Well developed parting along bedding planes at 100-102 cm. Faint wavey bedding throughout which may be bioturbated bedding planes. Some burrowing evidence. White specks (zeolite concentrations) throughout.

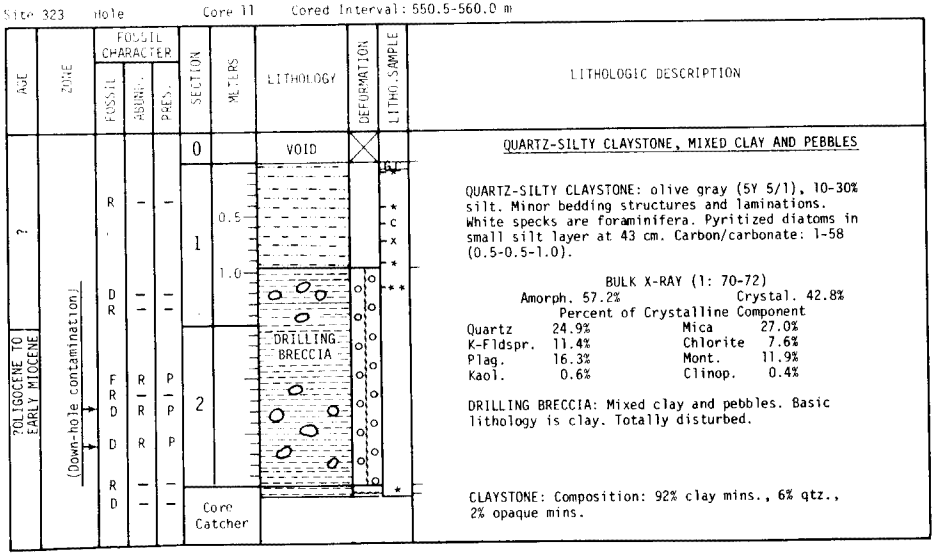
CLAYSTONE: dark greenish gray (5G 4/1), minor trace fossils in lower part, otherwise featureless. Composition: ≈100% clay mins. with traces of qtz. and opaque mins.

CLAYSTONE AND SILTY CLAYSTONE: dark greenish gray (5G 4/1) with some dark gray (N3) chert or siliceous claystone. Wavey (bioturbated?) bedding and white specks as in Sect. 1. Distinctive vertical burrow at 84 cm. Carbon/carbonate: 3-142 (0.1-0.1-0.0).

BULK X-RAY

	1: 122-126	2: 117-120	3: 125-127
Amorph.	46.2%	51.6%	52.3%
Crystal.	53.8%	48.4%	47.7%
Percent of Crystalline Component			
Quartz	22.3%	21.8%	20.1%
K-Fldspr.	9.4%	7.2%	11.4%
Plag.	22.4%	20.8%	18.6%
Kaol.	-	0.5%	0.5%
Mica	11.6%	18.7%	19.9%
Chlorite	3.4%	2.1%	3.5%
Mont.	29.9%	26.9%	24.8%
Clinop.	0.4%	0.7%	0.7%
Amphi.	0.6%	1.2%	0.6%

Site 323 Hole Core 11 Cored Interval: 550.5-560.0 m



LITHOLOGIC DESCRIPTION

QUARTZ-SILTY CLAYSTONE, MIXED CLAY AND PEBBLES

QUARTZ-SILTY CLAYSTONE: olive gray (5Y 5/1), 10-30% silt. Minor bedding structures and laminations. White specks are foraminifera. Pyritized diatoms in small silt layer at 43 cm. Carbon/carbonate: 1-58 (0.5-0.5-1.0).

BULK X-RAY (1: 70-72)

Amorph. 57.2% Crystal. 42.8%

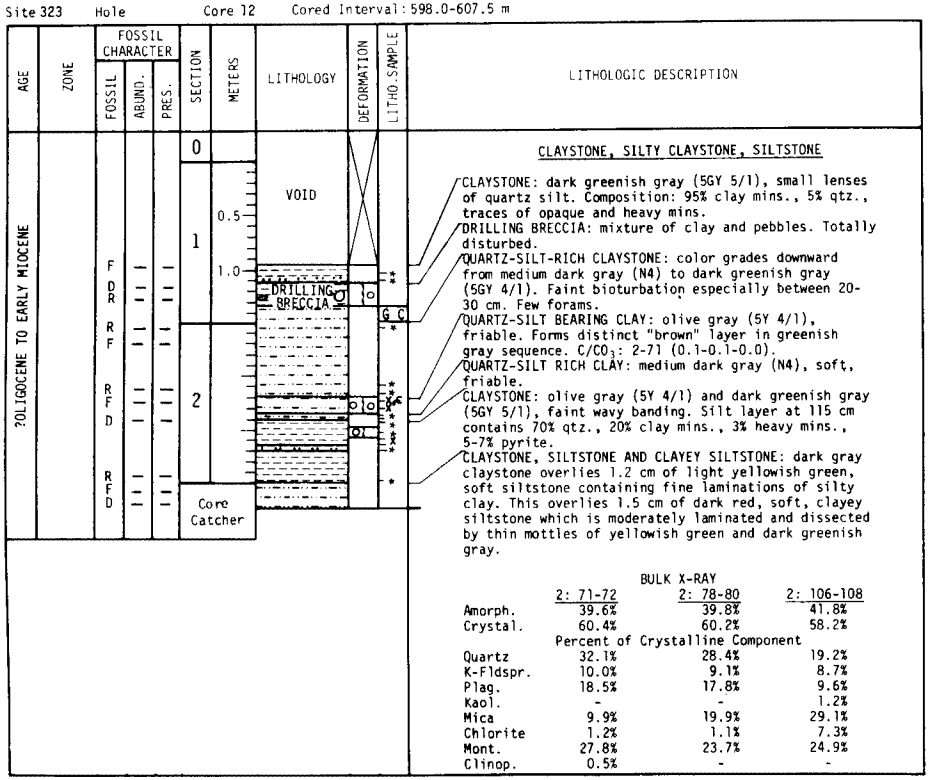
Percent of Crystalline Component

Quartz	24.9%	Mica	27.0%
K-Fldspr.	11.4%	Chlorite	7.6%
Plag.	16.3%	Mont.	11.9%
Kaol.	0.6%	Clinop.	0.4%

DRILLING BRECCIA: Mixed clay and pebbles. Basic lithology is clay. Totally disturbed.

CLAYSTONE: Composition: 92% clay mins., 6% qtz., 2% opaque mins.

Site 323 Hole Core 12 Cored Interval: 598.0-607.5 m



CLAYSTONE, SILTY CLAYSTONE, SILTSTONE

CLAYSTONE: dark greenish gray (5GY 5/1), small lenses of quartz silt. Composition: 95% clay mins., 5% qtz., traces of opaque and heavy mins.

DRILLING BRECCIA: mixture of clay and pebbles. Totally disturbed.

QUARTZ-SILT-RICH CLAYSTONE: color grades downward from medium dark gray (N4) to dark greenish gray (5GY 4/1). Faint bioturbation especially between 20-30 cm. Few forams.

QUARTZ-SILT BEARING CLAY: olive gray (5Y 4/1), friable. Forms distinct "brown" layer in greenish gray sequence. C/CO_3: 2-71 (0.1-0.1-0.0).

QUARTZ-SILT RICH CLAY: medium dark gray (N4), soft, friable.

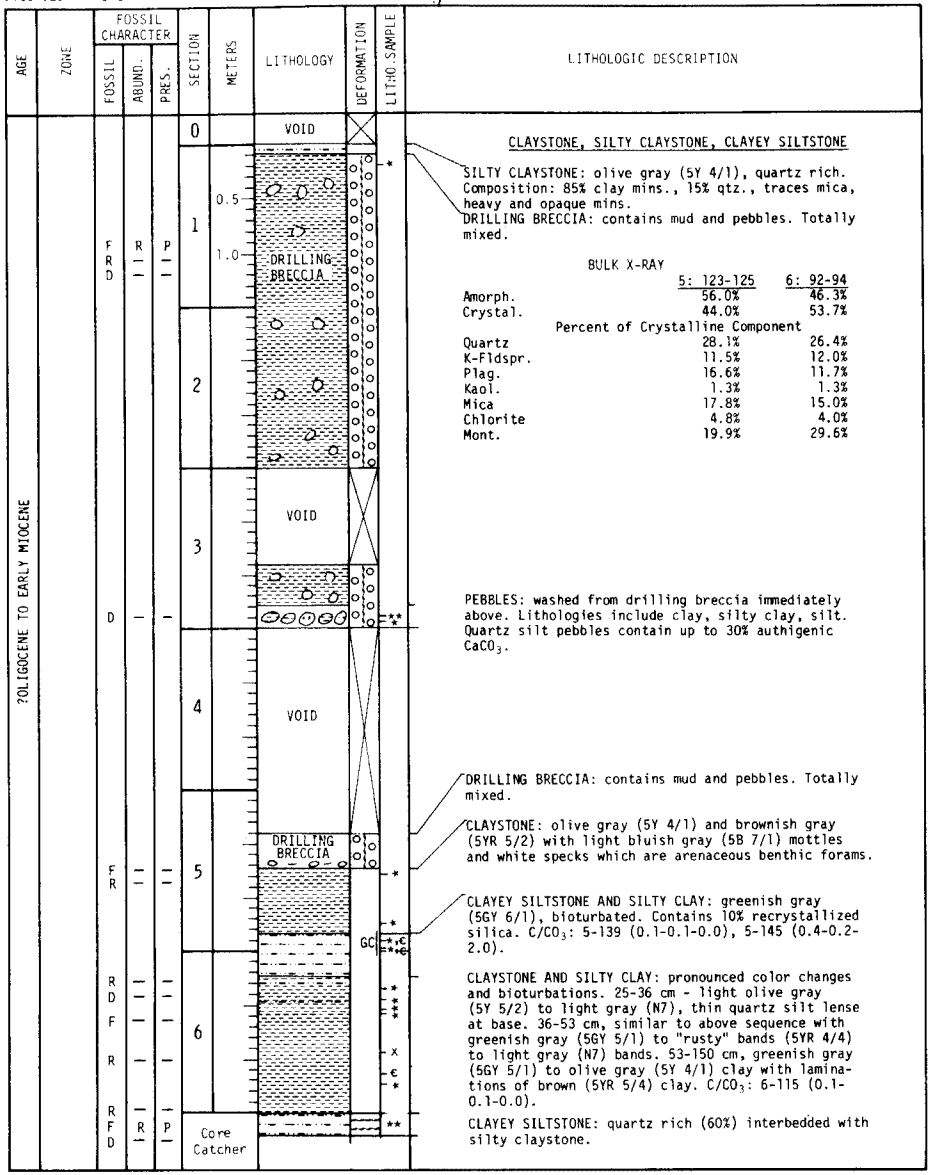
CLAYSTONE: olive gray (5Y 4/1) and dark greenish gray (5GY 5/1), faint wavy banding. Silt layer at 115 cm contains 70% qtz., 20% clay mins., 3% heavy mins., 5-7% pyrite.

CLAYSTONE, SILTSTONE AND CLAYEY SILTSTONE: dark gray claystone overlies 1.2 cm of light yellowish green, soft siltstone containing fine laminations of silty clay. This overlies 1.5 cm of dark red, soft, clayey siltstone which is moderately laminated and dissected by thin mottles of yellowish green and dark greenish gray.

BULK X-RAY

	2: 71-72	2: 78-80	2: 106-108
Amorph.	39.6%	39.8%	41.8%
Crystal.	60.4%	60.2%	58.2%
Percent of Crystalline Component			
Quartz	32.1%	28.4%	19.2%
K-Fldspr.	10.0%	9.1%	8.7%
Plag.	18.5%	17.8%	9.6%
Kaol.	-	-	1.2%
Mica	9.9%	19.9%	29.1%
Chlorite	1.2%	1.1%	7.3%
Mont.	27.8%	23.7%	24.9%
Clinop.	0.5%	-	-

Site 323 Hole Core 13 Cored Interval: 617.0-626.5 m



CLAYSTONE, SILTY CLAYSTONE, CLAYEY SILTSTONE

SILTY CLAYSTONE: olive gray (5Y 4/1), quartz rich. Composition: 85% clay mins., 15% qtz., traces mica, heavy and opaque mins.

DRILLING BRECCIA: contains mud and pebbles. Totally mixed.

BULK X-RAY

	5: 123-125	6: 92-94
Amorph.	56.0%	46.3%
Crystal.	44.0%	53.7%
Percent of Crystalline Component		
Quartz	28.1%	26.4%
K-Fldspr.	11.5%	12.0%
Plag.	16.6%	11.7%
Kaol.	1.3%	1.3%
Mica	17.8%	15.0%
Chlorite	4.8%	4.0%
Mont.	19.9%	29.6%

PEBBLES: washed from drilling breccia immediately above. Lithologies include clay, silty clay, silt. Quartz silt pebbles contain up to 30% authigenic $CaCO_3$.

DRILLING BRECCIA: contains mud and pebbles. Totally mixed.

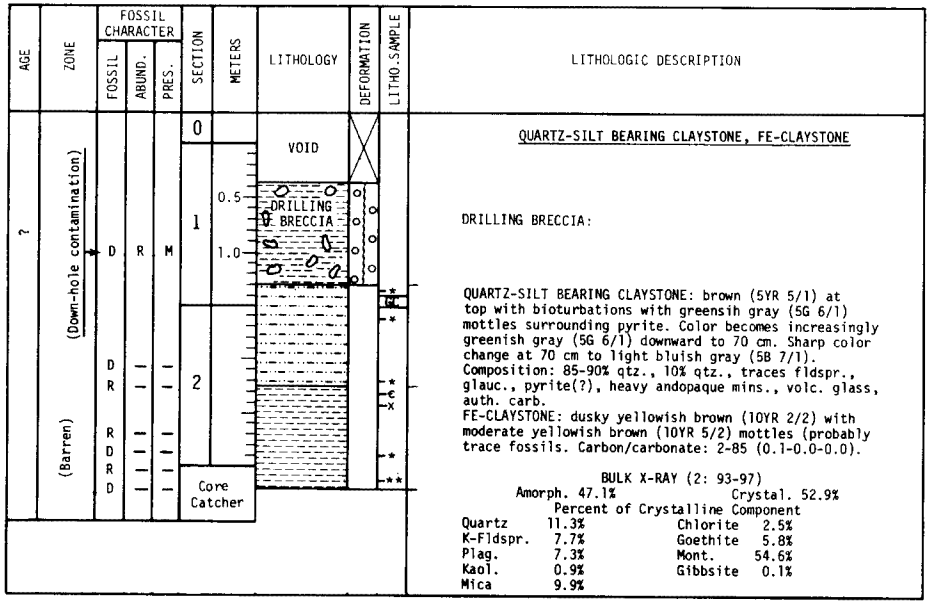
CLAYSTONE: olive gray (5Y 4/1) and brownish gray (5YR 5/2) with light bluish gray (5B 7/1) mottles and white specks which are arenaceous benthic forams.

CLAYEY SILTSTONE AND SILTY CLAY: greenish gray (5GY 6/1), bioturbated. Contains 10% recrystallized silica. C/CO_3: 5-139 (0.1-0.1-0.0), 5-145 (0.4-0.2-2.0).

CLAYSTONE AND SILTY CLAY: pronounced color changes and bioturbations. 25-36 cm - light olive gray (5Y 5/2) to light gray (N7), thin quartz silt lense at base. 36-53 cm, similar to above sequence with greenish gray (5GY 5/1) to "rusty" bands (5YR 4/4) to light gray (N7) bands. 53-150 cm, greenish gray (5GY 5/1) to olive gray (5Y 4/1) clay with laminations of brown (5YR 5/4) clay. C/CO_3: 6-115 (0.1-0.1-0.0).

CLAYEY SILTSTONE: quartz rich (60%) interbedded with silty claystone.

Site 323 Hole Core 14 Cored Interval: 636.0-645.5 m



QUARTZ-SILT BEARING CLAYSTONE, FE-CLAYSTONE

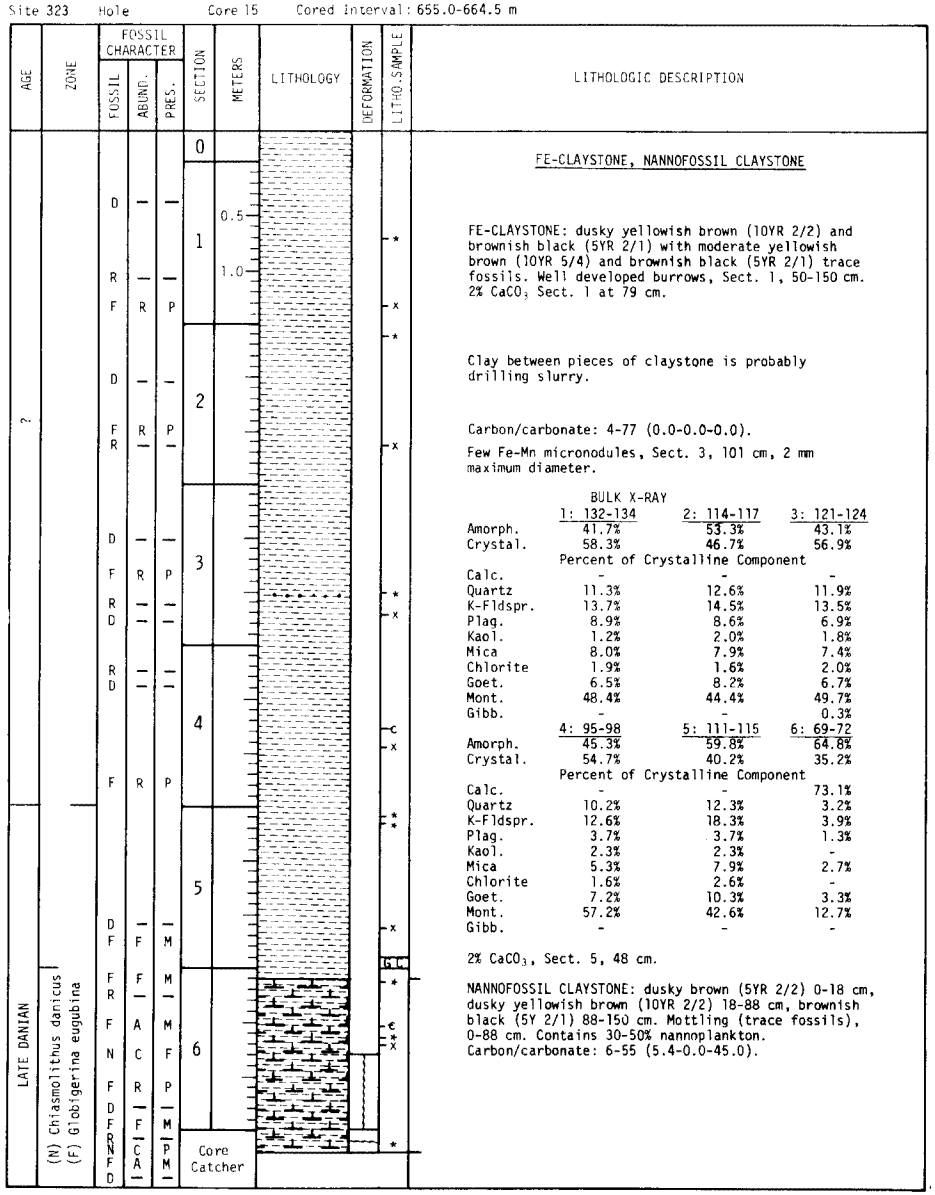
DRILLING BRECCIA:

QUARTZ-SILT BEARING CLAYSTONE: brown (5YR 5/1) at top with bioturbations with greensih gray (5G 6/1) mottles surrounding pyrite. Color becomes increasingly greenish gray (5G 6/1) downward to 70 cm. Sharp color change at 70 cm to light bluish gray (5B 7/1). Composition: 85-90% qtz., 10% qtz., traces fldspr., glauc., pyrite(?), heavy andopaque mins., volc. glass, auth. carb.
FE-CLAYSTONE: dusky yellowish brown (10YR 2/2) with moderate yellowish brown (10YR 5/2) mottles (probably trace fossils. Carbon/carbonate: 2-85 (0.1-0.0-0.0).

BULK X-RAY (2: 93-97)
Amorph. 47.1% Crystal. 52.9%
Percent of Crystalline Component

Quartz	11.3%	Chlorite	2.5%
K-Fldspr.	7.7%	Goethite	5.8%
Plag.	7.3%	Mont.	54.6%
Kaol.	0.9%	Gibbsite	0.1%
Mica	9.9%		

Site 323 Hole Core 15 Cored Interval: 655.0-664.5 m



FE-CLAYSTONE, NANNOFOSSIL CLAYSTONE

FE-CLAYSTONE: dusky yellowish brown (10YR 2/2) and brownish black (5YR 2/1) with moderate yellowish brown (10YR 5/4) and brownish black (5YR 2/1) trace fossils. Well developed burrows, Sect. 1, 50-150 cm. 2% $CaCO_3$ Sect. 1 at 79 cm.

Clay between pieces of claystone is probably drilling slurry.

Carbon/carbonate: 4-77 (0.0-0.0-0.0).

Few Fe-Mn micronodules, Sect. 3, 101 cm, 2 mm maximum diameter.

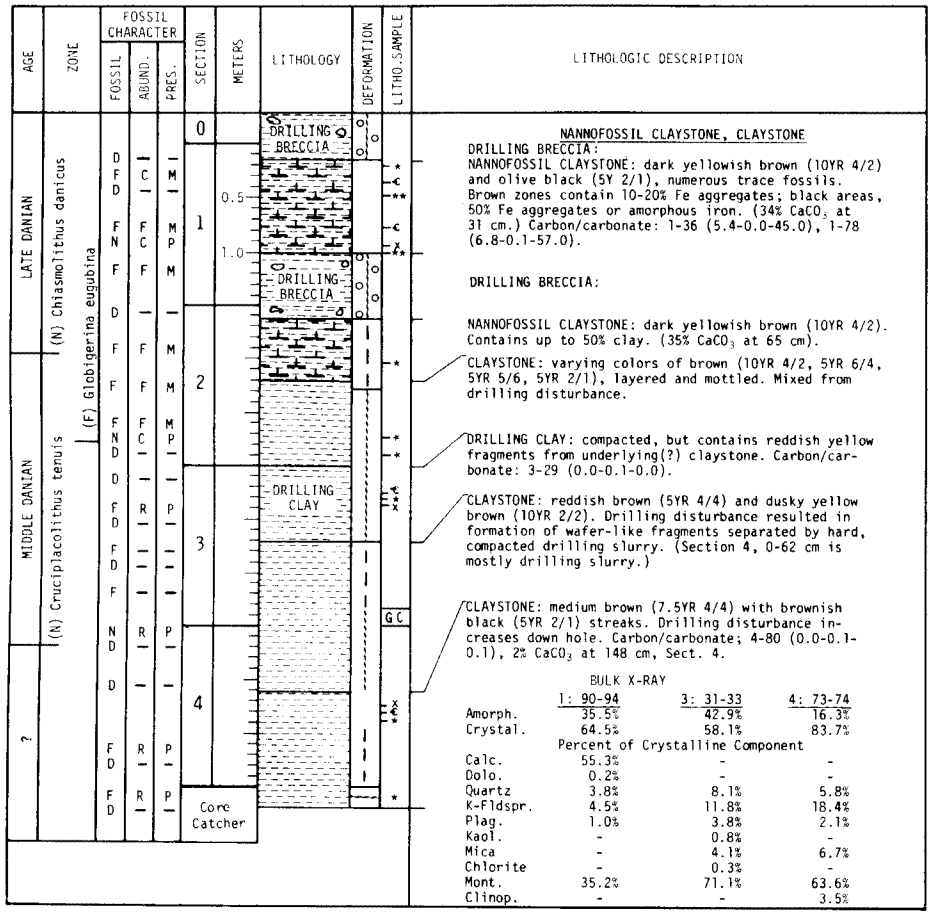
BULK X-RAY

	1: 132-134	2: 114-117	3: 121-124
Amorph.	41.7%	53.3%	43.1%
Crystal.	58.3%	46.7%	56.9%
	Percent of Crystalline Component		
Calc.	-	-	-
Quartz	11.3%	12.6%	11.9%
K-Fldspr.	13.7%	14.5%	13.5%
Plag.	8.9%	8.6%	6.9%
Kaol.	1.2%	2.0%	1.8%
Mica	8.0%	7.9%	7.4%
Chlorite	1.9%	1.6%	2.0%
Goet.	6.5%	8.2%	6.7%
Mont.	48.4%	44.4%	49.7%
Gibb.	-	-	0.3%
	4: 95-98	5: 111-115	6: 69-72
Amorph.	45.3%	59.8%	64.8%
Crystal.	54.7%	40.2%	35.2%
	Percent of Crystalline Component		
Calc.	-	-	73.1%
Quartz	10.2%	12.3%	3.2%
K-Fldspr.	12.6%	18.3%	3.9%
Plag.	3.7%	3.7%	1.3%
Kaol.	2.3%	2.3%	-
Mica	5.3%	7.9%	2.7%
Chlorite	1.6%	2.6%	-
Goet.	7.2%	10.3%	3.3%
Mont.	57.2%	42.6%	12.7%
Gibb.	-	-	-

2% $CaCO_3$, Sect. 5, 48 cm.

NANNOFOSSIL CLAYSTONE: dusky brown (5YR 2/2) 0-18 cm, dusky yellowish brown (10YR 2/2) 18-88 cm, brownish black (5Y 2/1) 88-150 cm. Mottling (trace fossils), 0-88 cm. Contains 30-50% nannoplankton.
Carbon/carbonate: 6-55 (5.4-0.0-45.0).

Site 323 Hole Core 16 Cored Interval: 664.5-674.0 m



NANNOFOSSIL CLAYSTONE, CLAYSTONE

DRILLING BRECCIA:
NANNOFOSSIL CLAYSTONE: dark yellowish brown (10YR 4/2) and olive black (5Y 2/1), numerous trace fossils. Brown zones contain 10-20% Fe aggregates; black areas, 50% Fe aggregates or amorphous iron. (34% $CaCO_3$ at 31 cm.) Carbon/carbonate: 1-36 (5.4-0.0-45.0), 1-78 (6.8-0.1-57.0).

DRILLING BRECCIA:

NANNOFOSSIL CLAYSTONE: dark yellowish brown (10YR 4/2). Contains up to 50% clay. (35% $CaCO_3$ at 65 cm).

CLAYSTONE: varying colors of brown (10YR 4/2, 5YR 6/4, 5YR 5/6, 5YR 2/1), layered and mottled. Mixed from drilling disturbance.

DRILLING CLAY: compacted, but contains reddish yellow fragments from underlying(?) claystone. Carbon/carbonate: 3-29 (0.0-0.1-0.0).

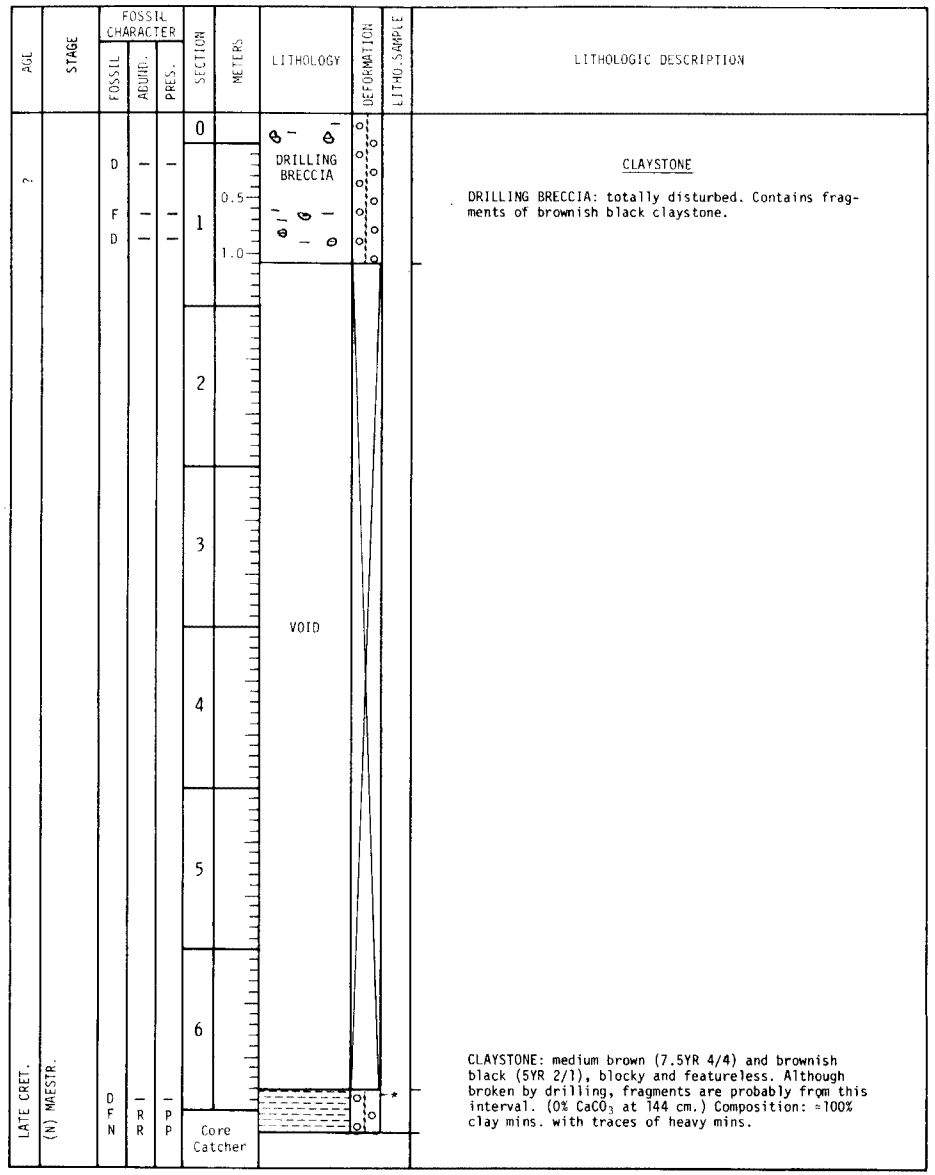
CLAYSTONE: reddish brown (5YR 4/4) and dusky yellow brown (10YR 2/2). Drilling disturbance resulted in formation of wafer-like fragments separated by hard, compacted drilling slurry. (Section 4, 0-62 cm is mostly drilling slurry.)

CLAYSTONE: medium brown (7.5YR 4/4) with brownish black (5YR 2/1) streaks. Drilling disturbance increases down hole. Carbon/carbonate; 4-80 (0.0-0.1-0.1), 2% $CaCO_3$ at 148 cm, Sect. 4.

BULK X-RAY

	1: 90-94	3: 31-33	4: 73-74
Amorph.	35.5%	42.9%	16.3%
Crystal.	64.5%	58.1%	83.7%
Percent of Crystalline Component			
Calc.	55.3%	-	-
Dolo.	0.2%	-	-
Quartz	3.8%	8.1%	5.8%
K-Fldspr.	4.5%	11.8%	18.4%
Plag.	1.0%	3.8%	2.1%
Kaol.	-	0.8%	-
Mica	-	4.1%	6.7%
Chlorite	-	0.3%	-
Mont.	35.2%	71.1%	63.6%
Clinop.	-	-	3.5%

Site 323 Hole Core 17 Cored Interval: 674.0-683.5 m

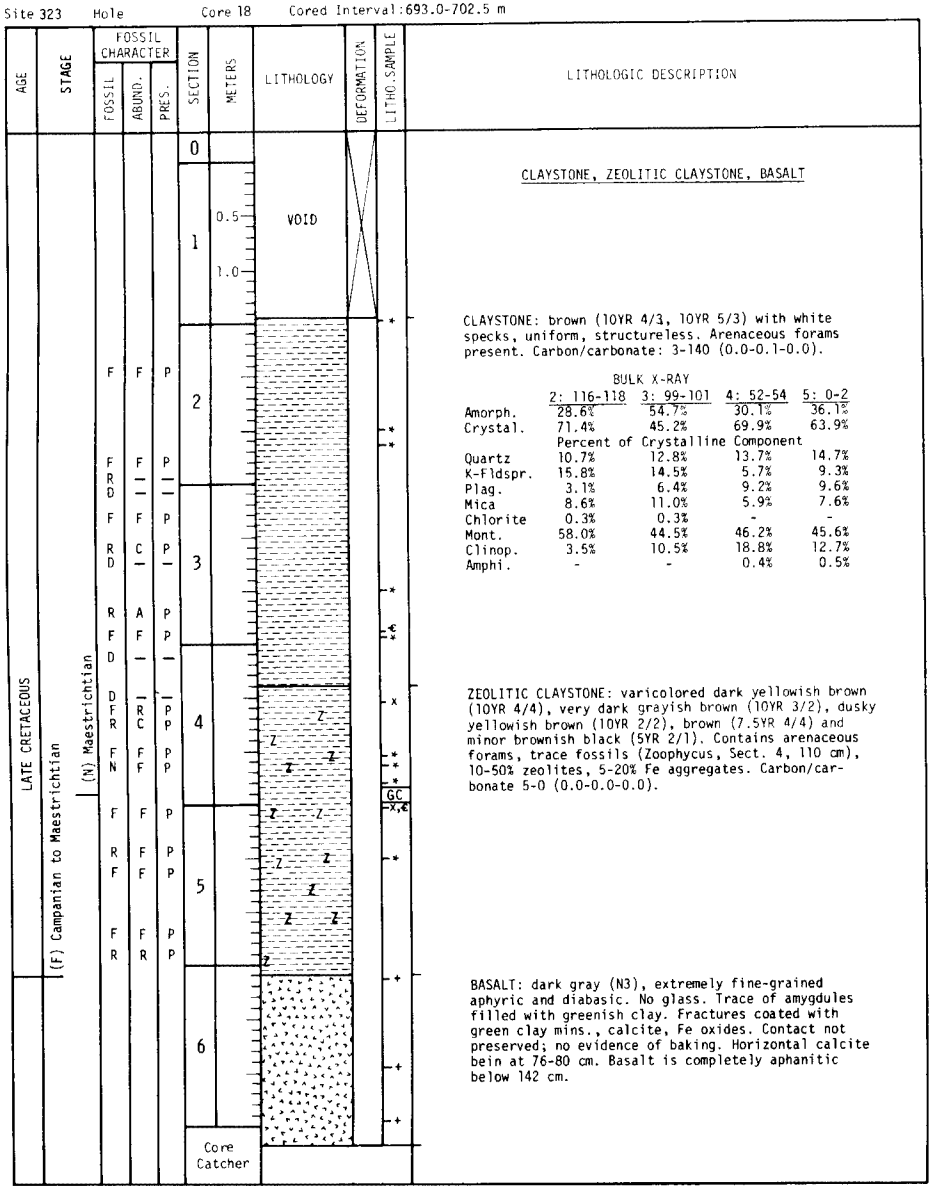


CLAYSTONE

DRILLING BRECCIA: totally disturbed. Contains fragments of brownish black claystone.

CLAYSTONE: medium brown (7.5YR 4/4) and brownish black (5YR 2/1), blocky and featureless. Although broken by drilling, fragments are probably from this interval. (0% $CaCO_3$ at 144 cm.) Composition: ≈100% clay mins. with traces of heavy mins.

Site 323 Hole Core 18 Cored Interval: 693.0-702.5 m



CLAYSTONE, ZEOLITIC CLAYSTONE, BASALT

CLAYSTONE: brown (10YR 4/3, 10YR 5/3) with white specks, uniform, structureless. Arenaceous forams present. Carbon/carbonate: 3-140 (0.0-0.1-0.0).

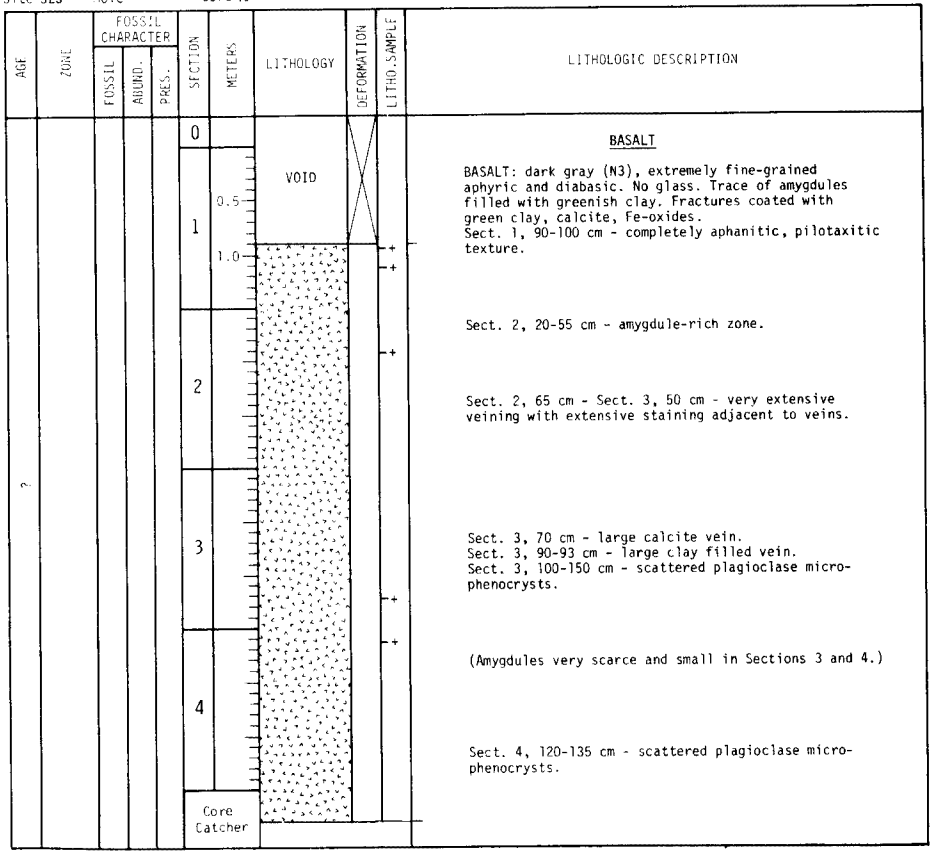
BULK X-RAY

	2: 116-118	3: 99-101	4: 52-54	5: 0-2
Amorph.	28.6%	54.7%	30.1%	36.1%
Crystal.	71.4%	45.2%	69.9%	63.9%
	Percent of Crystalline Component			
Quartz	10.7%	12.8%	13.7%	14.7%
K-Fldspr.	15.8%	14.5%	5.7%	9.3%
Plag.	3.1%	6.4%	9.2%	9.6%
Mica	8.6%	11.0%	5.9%	7.6%
Chlorite	0.3%	0.3%	-	-
Mont.	58.0%	44.5%	46.2%	45.6%
Clinop.	3.5%	10.5%	18.8%	12.7%
Amphi.	-	-	0.4%	0.5%

ZEOLITIC CLAYSTONE: varicolored dark yellowish brown (10YR 4/4), very dark grayish brown (10YR 3/2), dusky yellowish brown (10YR 2/2), brown (7.5YR 4/4) and minor brownish black (5YR 2/1). Contains arenaceous forams, trace fossils (Zoophycus, Sect. 4, 110 cm), 10-50% zeolites, 5-20% Fe aggregates. Carbon/carbonate 5-0 (0.0-0.0-0.0).

BASALT: dark gray (N3), extremely fine-grained aphyric and diabasic. No glass. Trace of amygdules filled with greenish clay. Fractures coated with green clay mins., calcite, Fe oxides. Contact not preserved; no evidence of baking. Horizontal calcite bein at 76-80 cm. Basalt is completely aphanitic below 142 cm.

Site 323 Hole Core 19 Cored Interval: 702.5-712.0 m



BASALT

BASALT: dark gray (N3), extremely fine-grained aphyric and diabasic. No glass. Trace of amygdules filled with greenish clay. Fractures coated with green clay, calcite, Fe-oxides.
Sect. 1, 90-100 cm - completely aphanitic, pilotaxitic texture.

Sect. 2, 20-55 cm - amygdule-rich zone.

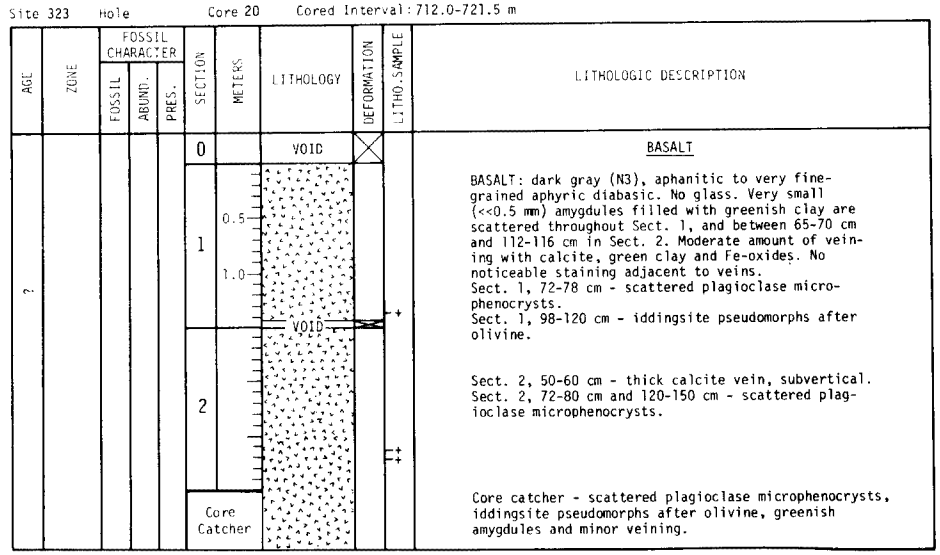
Sect. 2, 65 cm - Sect. 3, 50 cm - very extensive veining with extensive staining adjacent to veins.

Sect. 3, 70 cm - large calcite vein.
Sect. 3, 90-93 cm - large clay filled vein.
Sect. 3, 100-150 cm - scattered plagioclase microphenocrysts.

(Amygdules very scarce and small in Sections 3 and 4.)

Sect. 4, 120-135 cm - scattered plagioclase microphenocrysts.

Site 323 Hole Core 20 Cored Interval: 712.0-721.5 m



BASALT

BASALT: dark gray (N3), aphanitic to very fine-grained aphyric diabasic. No glass. Very small (<<0.5 mm) amygdules filled with greenish clay are scattered throughout Sect. 1, and between 65-70 cm and 112-116 cm in Sect. 2. Moderate amount of veining with calcite, green clay and Fe-oxides. No noticeable staining adjacent to veins.
Sect. 1, 72-78 cm - scattered plagioclase microphenocrysts.
Sect. 1, 98-120 cm - iddingsite pseudomorphs after olivine.

Sect. 2, 50-60 cm - thick calcite vein, subvertical.
Sect. 2, 72-80 cm and 120-150 cm - scattered plagioclase microphenocrysts.

Core catcher - scattered plagioclase microphenocrysts, iddingsite pseudomorphs after olivine, greenish amygdules and minor veining.

Site 323 Hole Core 21 Cored Interval: 721.5-731.0 m

AGE	ZONE	FOSSIL CHARACTER: FOSSIL	FOSSIL CHARACTER: ABUND.	FOSSIL CHARACTER: PRES.	SECTION	METERS	LITHOLOGY	DEFORMATION	LITHO. SAMPLE	LITHOLOGIC DESCRIPTION
?					0					**BASALT**
					Core Catcher					BASALT: dark gray (N3), very fine-grained diabasic. Contains: 2% fresh plagioclase microphenocrysts, 0.5% greenish amygdules (<0.5 mm), no glass. Calcite veins are 0.5-1.0 mm thick, randomly oriented with 2-4 mm stains along sides. Tiny fractures contain small amount of green clay. (Total recovery for Hole 21 was a single 8cc long core in the core catcher.)

DEEP SEA DRILLING PROJECT

LEG 35 SITE 324

SITE SUMMARY SHEET

POSITION: Latitude: 69°03.21'S Longitude: 98°47.20'W
(Antarctic Continental Rise)

WATER DEPTH: 4433 corrected meters, echo sounding
4449 meters, drill pipe measurement

NUMBER OF HOLES: 1 NUMBER OF CORES ATTEMPTED: 10

PENETRATION: 218 meters TOTAL LENGTH OF CORED SECTION: 95.0 meters

TOTAL CORE RECOVERED: 48.0 meters PERCENTAGE CORE RECOVERED: 51%

OLDEST SEDIMENT CORED:

DEPTH SUBBOTTOM: 199.0 meters NATURE: Claystone fragments, coarse sand

AGE: Pliocene VELOCITY: 1.598 km/sec in firm clay at 174.6 meters subbottom depth

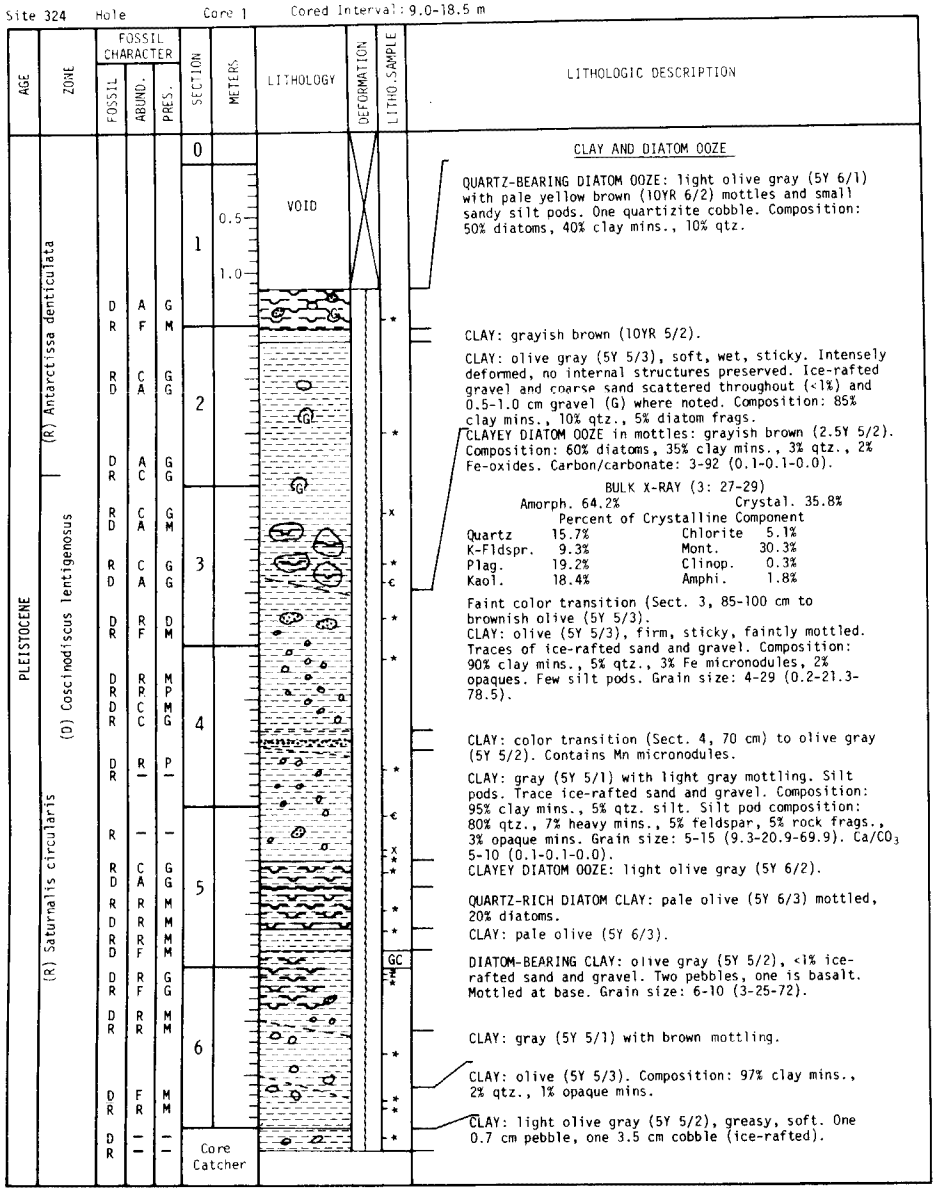
BASEMENT:

Not reached

PRINCIPAL RESULTS:

A single shallow hole was drilled on the lower continental rise. Fifty meters of Pliocene and Quaternary gray clay and minor claystone were recovered from the 218 meters penetrated. Ice-rafted debris, common in the upper part of the sequence decreases with depth but is present throughout. An upper (50 m thick) acoustically laminated unit corresponds to soft watery diatomaceous clay and ooze with abundant ice-rafted debris. This is underlain by an acoustically transparent layer which comprises about 120 meters of gray unfossiliferous clay with silt laminae and thin (<1 cm) beds. A deeper acoustically stratified zone is composed of silty clay and sand beds. It was in this lower unit that sand plugged the bit causing hole abandonment.

Site 324 Hole Core 1 Cored Interval: 9.0-18.5 m



CLAY AND DIATOM OOZE

QUARTZ-BEARING DIATOM OOZE: light olive gray (5Y 6/1) with pale yellow brown (10YR 6/2) mottles and small sandy silt pods. One quartizite cobble. Composition: 50% diatoms, 40% clay mins., 10% qtz.

CLAY: grayish brown (10YR 5/2).

CLAY: olive gray (5Y 5/3), soft, wet, sticky. Intensely deformed, no internal structures preserved. Ice-rafted gravel and coarse sand scattered throughout (<1%) and 0.5-1.0 cm gravel (G) where noted. Composition: 85% clay mins., 10% qtz., 5% diatom frags.

CLAYEY DIATOM OOZE in mottles: grayish brown (2.5Y 5/2). Composition: 60% diatoms, 35% clay mins., 3% qtz., 2% Fe-oxides. Carbon/carbonate: 3-92 (0.1-0.1-0.0).

BULK X-RAY (3: 27-29)

Amorph. 64.2% Crystal. 35.8%

Percent of Crystalline Component

Quartz	15.7%	Chlorite	5.1%
K-Fldspr.	9.3%	Mont.	30.3%
Plag.	19.2%	Clinop.	0.3%
Kaol.	18.4%	Amphi.	1.8%

Faint color transition (Sect. 3, 85-100 cm to brownish olive (5Y 5/3).
CLAY: olive (5Y 5/3), firm, sticky, faintly mottled. Traces of ice-rafted sand and gravel. Composition: 90% clay mins., 5% qtz., 3% Fe micronodules, 2% opaques. Few silt pods. Grain size: 4-29 (0.2-21.3-78.5).

CLAY: color transition (Sect. 4, 70 cm) to olive gray (5Y 5/2). Contains Mn micronodules.

CLAY: gray (5Y 5/1) with light gray mottling. Silt pods. Trace ice-rafted sand and gravel. Composition: 95% clay mins., 5% qtz. silt. Silt pod composition: 80% qtz., 7% heavy mins., 5% feldspar, 5% rock frags., 3% opaque mins. Grain size: 5-15 (9.3-20.9-69.9). Ca/CO_3 5-10 (0.1-0.1-0.0).
CLAYEY DIATOM OOZE: light olive gray (5Y 6/2).

QUARTZ-RICH DIATOM CLAY: pale olive (5Y 6/3) mottled, 20% diatoms.
CLAY: pale olive (5Y 6/3).

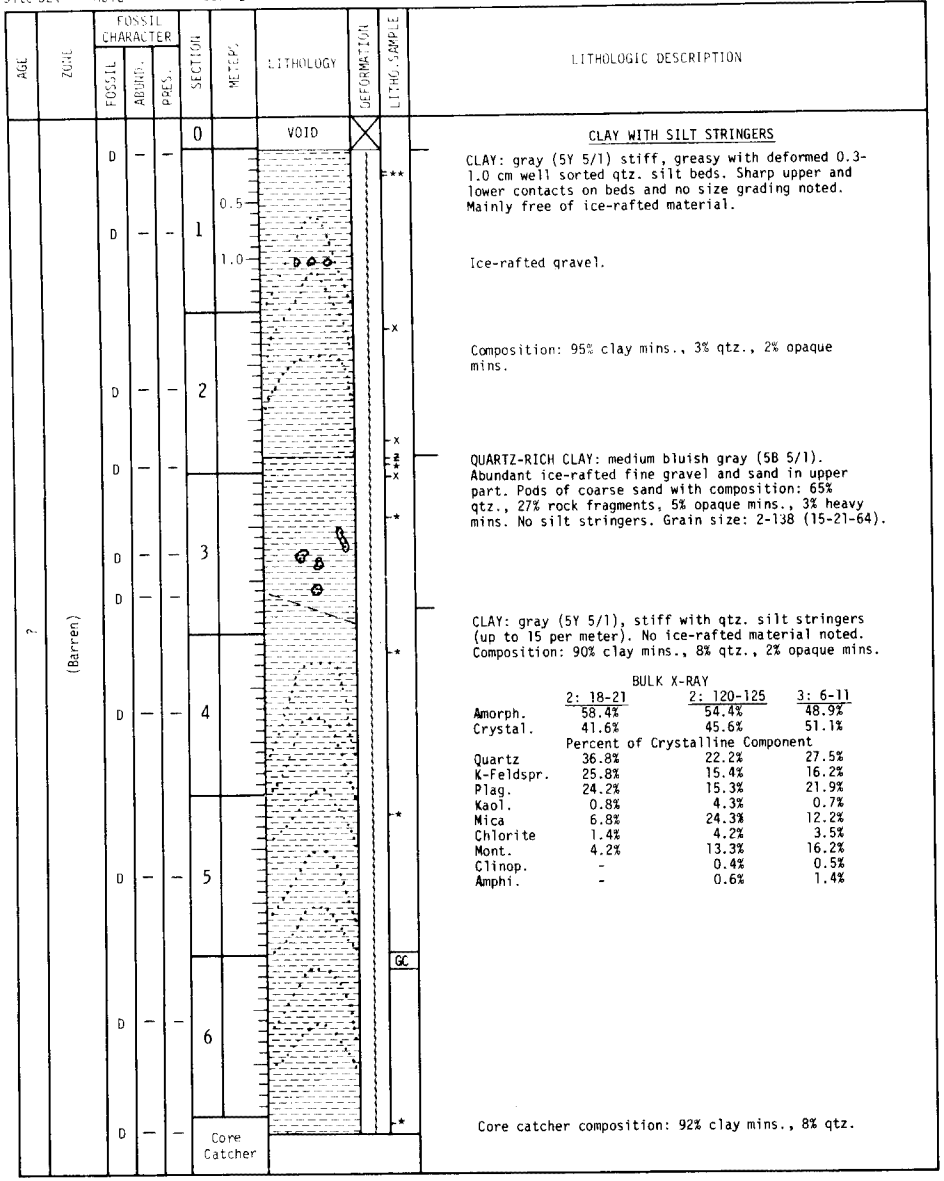
DIATOM-BEARING CLAY: olive gray (5Y 5/2), <1% ice-rafted sand and gravel. Two pebbles, one is basalt. Mottled at base. Grain size: 6-10 (3-25-72).

CLAY: gray (5Y 5/1) with brown mottling.

CLAY: olive (5Y 5/3). Composition: 97% clay mins., 2% qtz., 1% opaque mins.

CLAY: light olive gray (5Y 5/2), greasy, soft. One 0.7 cm pebble, one 3.5 cm cobble (ice-rafted).

Site 324 Hole Core 2 Cored Interval: 47.0-56.5 m



CLAY WITH SILT STRINGERS

CLAY: gray (5Y 5/1) stiff, greasy with deformed 0.3-1.0 cm well sorted qtz. silt beds. Sharp upper and lower contacts on beds and no size grading noted. Mainly free of ice-rafted material.

Ice-rafted gravel.

Composition: 95% clay mins., 3% qtz., 2% opaque mins.

QUARTZ-RICH CLAY: medium bluish gray (5B 5/1). Abundant ice-rafted fine gravel and sand in upper part. Pods of coarse sand with composition: 65% qtz., 27% rock fragments, 5% opaque mins., 3% heavy mins. No silt stringers. Grain size: 2-138 (15-21-64).

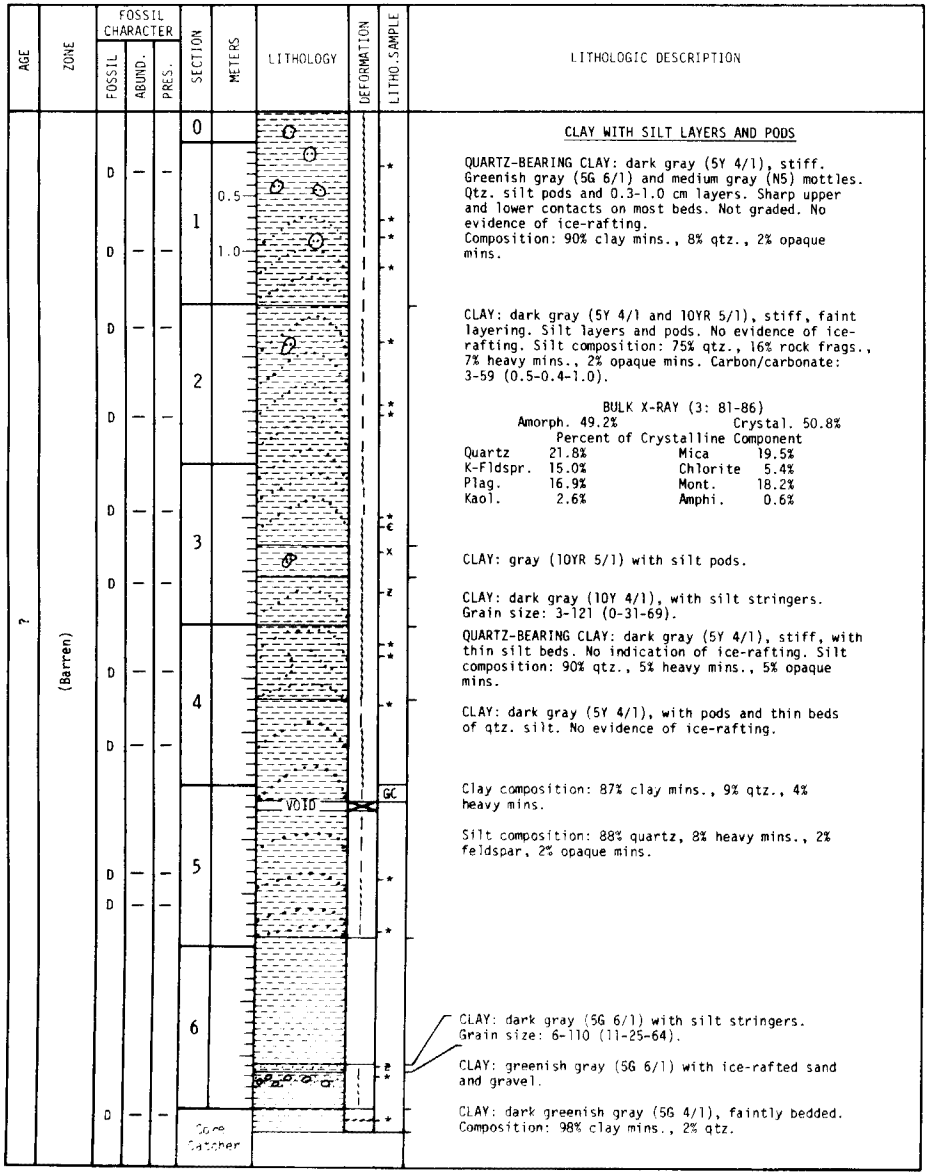
CLAY: gray (5Y 5/1), stiff with qtz. silt stringers (up to 15 per meter). No ice-rafted material noted. Composition: 90% clay mins., 8% qtz., 2% opaque mins.

BULK X-RAY

	2: 18-21	2: 120-125	3: 6-11
Amorph.	58.4%	54.4%	48.9%
Crystal.	41.6%	45.6%	51.1%
Percent of Crystalline Component			
Quartz	36.8%	22.2%	27.5%
K-Feldspr.	25.8%	15.4%	16.2%
Plag.	24.2%	15.3%	21.9%
Kaol.	0.8%	4.3%	0.7%
Mica	6.8%	24.3%	12.2%
Chlorite	1.4%	4.2%	3.5%
Mont.	4.2%	13.3%	16.2%
Clinop.	-	0.4%	0.5%
Amphi.	-	0.6%	1.4%

Core catcher composition: 92% clay mins., 8% qtz.

Site 324 Hole Core 3 Cored Interval: 75.5-85.0 m



CLAY WITH SILT LAYERS AND PODS

QUARTZ-BEARING CLAY: dark gray (5Y 4/1), stiff. Greenish gray (5G 6/1) and medium gray (N5) mottles. Qtz. silt pods and 0.3-1.0 cm layers. Sharp upper and lower contacts on most beds. Not graded. No evidence of ice-rafting.
Composition: 90% clay mins., 8% qtz., 2% opaque mins.

CLAY: dark gray (5Y 4/1 and 10YR 5/1), stiff, faint layering. Silt layers and pods. No evidence of ice-rafting. Silt composition: 75% qtz., 16% rock frags., 7% heavy mins., 2% opaque mins. Carbon/carbonate: 3-59 (0.5-0.4-1.0).

BULK X-RAY (3: 81-86)
Amorph. 49.2% Crystal. 50.8%
Percent of Crystalline Component

Quartz	21.8%	Mica	19.5%
K-Fldspr.	15.0%	Chlorite	5.4%
Plag.	16.9%	Mont.	18.2%
Kaol.	2.6%	Amphi.	0.6%

CLAY: gray (10YR 5/1) with silt pods.

CLAY: dark gray (10Y 4/1), with silt stringers. Grain size: 3-121 (0-31-69).

QUARTZ-BEARING CLAY: dark gray (5Y 4/1), stiff, with thin silt beds. No indication of ice-rafting. Silt composition: 90% qtz., 5% heavy mins., 5% opaque mins.

CLAY: dark gray (5Y 4/1), with pods and thin beds of qtz. silt. No evidence of ice-rafting.

Clay composition: 87% clay mins., 9% qtz., 4% heavy mins.

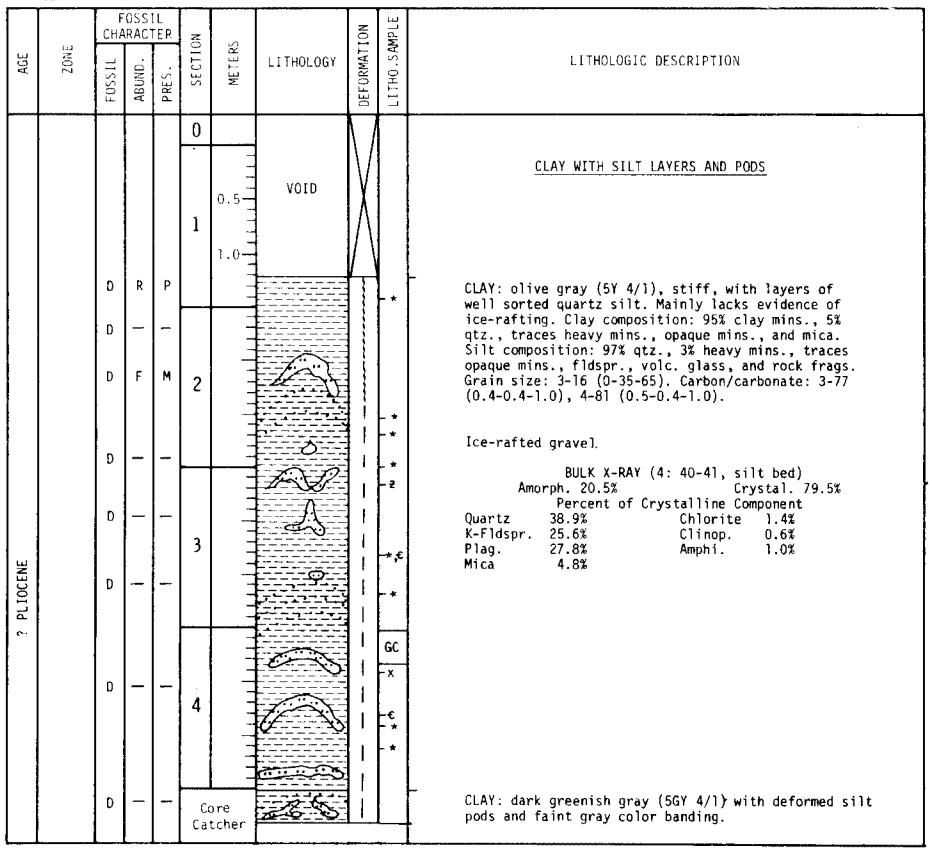
Silt composition: 88% quartz, 8% heavy mins., 2% feldspar, 2% opaque mins.

CLAY: dark gray (5G 6/1) with silt stringers. Grain size: 6-110 (11-25-64).

CLAY: greenish gray (5G 6/1) with ice-rafted sand and gravel.

CLAY: dark greenish gray (5G 4/1), faintly bedded. Composition: 98% clay mins., 2% qtz.

Site 324 Hole Core 4 Cored Interval: 104.0-113.5 m



CLAY WITH SILT LAYERS AND PODS

CLAY: olive gray (5Y 4/1), stiff, with layers of well sorted quartz silt. Mainly lacks evidence of ice-rafting. Clay composition: 95% clay mins., 5% qtz., traces heavy mins., opaque mins., and mica. Silt composition: 97% qtz., 3% heavy mins., traces opaque mins., fldspr., volc. glass, and rock frags. Grain size: 3-16 (0-35-65). Carbon/carbonate: 3-77 (0.4-0.4-1.0), 4-81 (0.5-0.4-1.0).

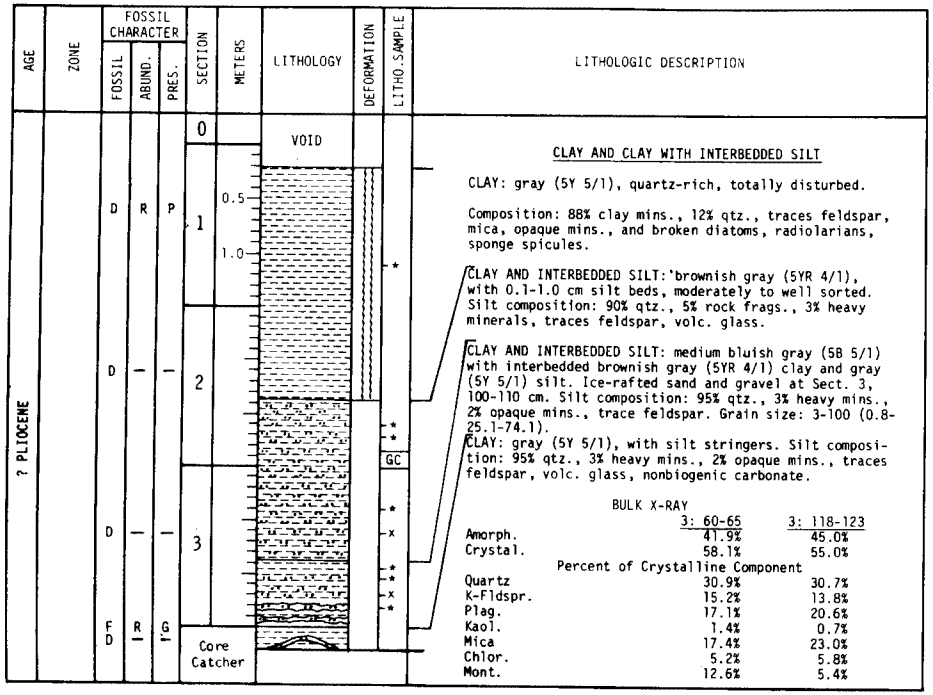
Ice-rafted gravel.

BULK X-RAY (4: 40-41, silt bed)
Amorph. 20.5% Crystal. 79.5%
Percent of Crystalline Component

Quartz	38.9%	Chlorite	1.4%
K-Fldspr.	25.6%	Clinop.	0.6%
Plag.	27.8%	Amphi.	1.0%
Mica	4.8%		

CLAY: dark greenish gray (5GY 4/1) with deformed silt pods and faint gray color banding.

Site 324 Hole Core 5 Cored Interval: 132.5-142.0 m



CLAY AND CLAY WITH INTERBEDDED SILT

CLAY: gray (5Y 5/1), quartz-rich, totally disturbed.

Composition: 88% clay mins., 12% qtz., traces feldspar, mica, opaque mins., and broken diatoms, radiolarians, sponge spicules.

CLAY AND INTERBEDDED SILT: brownish gray (5YR 4/1), with 0.1-1.0 cm silt beds, moderately to well sorted. Silt composition: 90% qtz., 5% rock frags., 3% heavy minerals, traces feldspar, volc. glass.

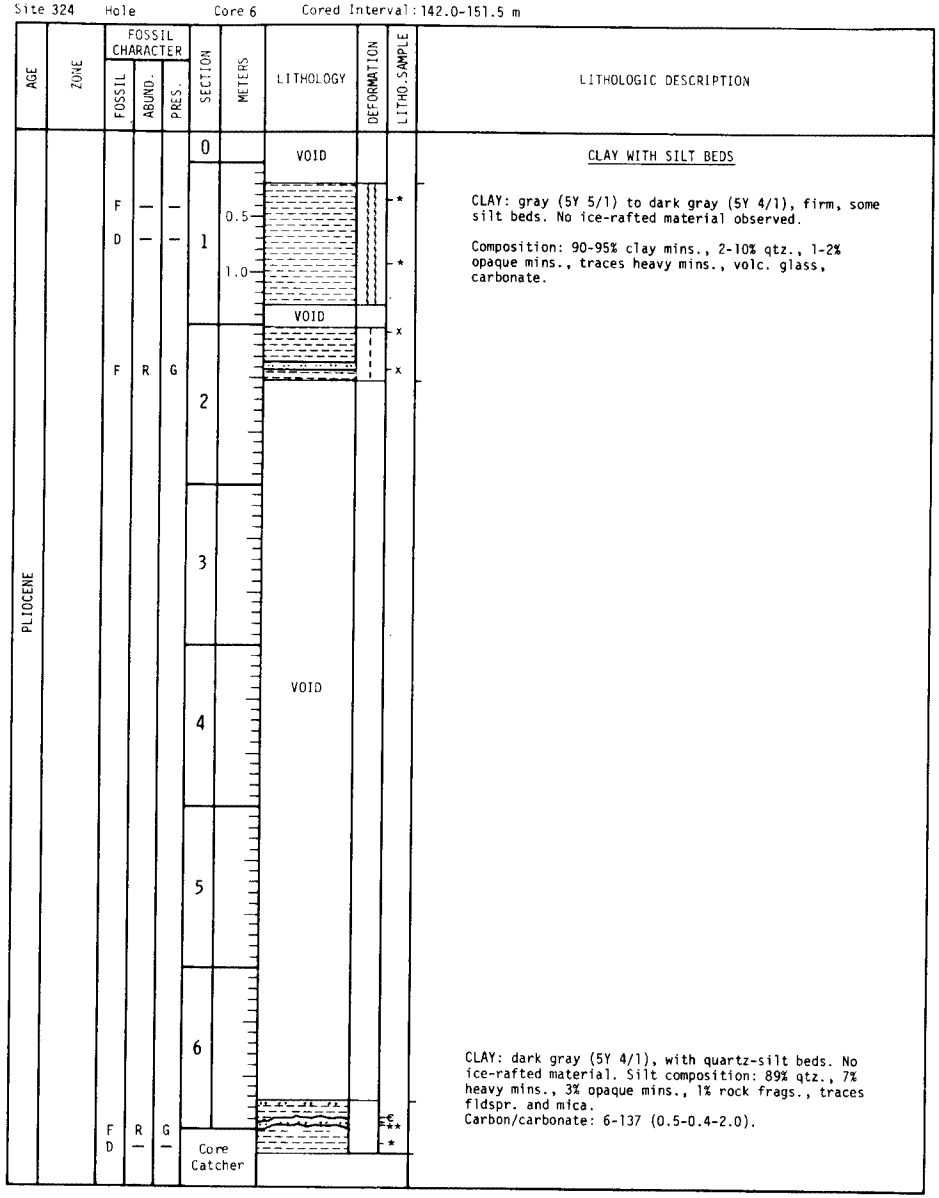
CLAY AND INTERBEDDED SILT: medium bluish gray (5B 5/1) with interbedded brownish gray (5YR 4/1) clay and gray (5Y 5/1) silt. Ice-rafted sand and gravel at Sect. 3, 100-110 cm. Silt composition: 95% qtz., 3% heavy mins., 2% opaque mins., trace feldspar. Grain size: 3-100 (0.8-25.1-74.1).

CLAY: gray (5Y 5/1), with silt stringers. Silt composition: 95% qtz., 3% heavy mins., 2% opaque mins., traces feldspar, volc. glass, nonbiogenic carbonate.

BULK X-RAY

	3: 60-65	3: 118-123
Amorph.	41.9%	45.0%
Crystal.	58.1%	55.0%
Percent of Crystalline Component		
Quartz	30.9%	30.7%
K-Fldspr.	15.2%	13.8%
Plag.	17.1%	20.6%
Kaol.	1.4%	0.7%
Mica	17.4%	23.0%
Chlor.	5.2%	5.8%
Mont.	12.6%	5.4%

Site 324 Hole Core 6 Cored Interval: 142.0-151.5 m



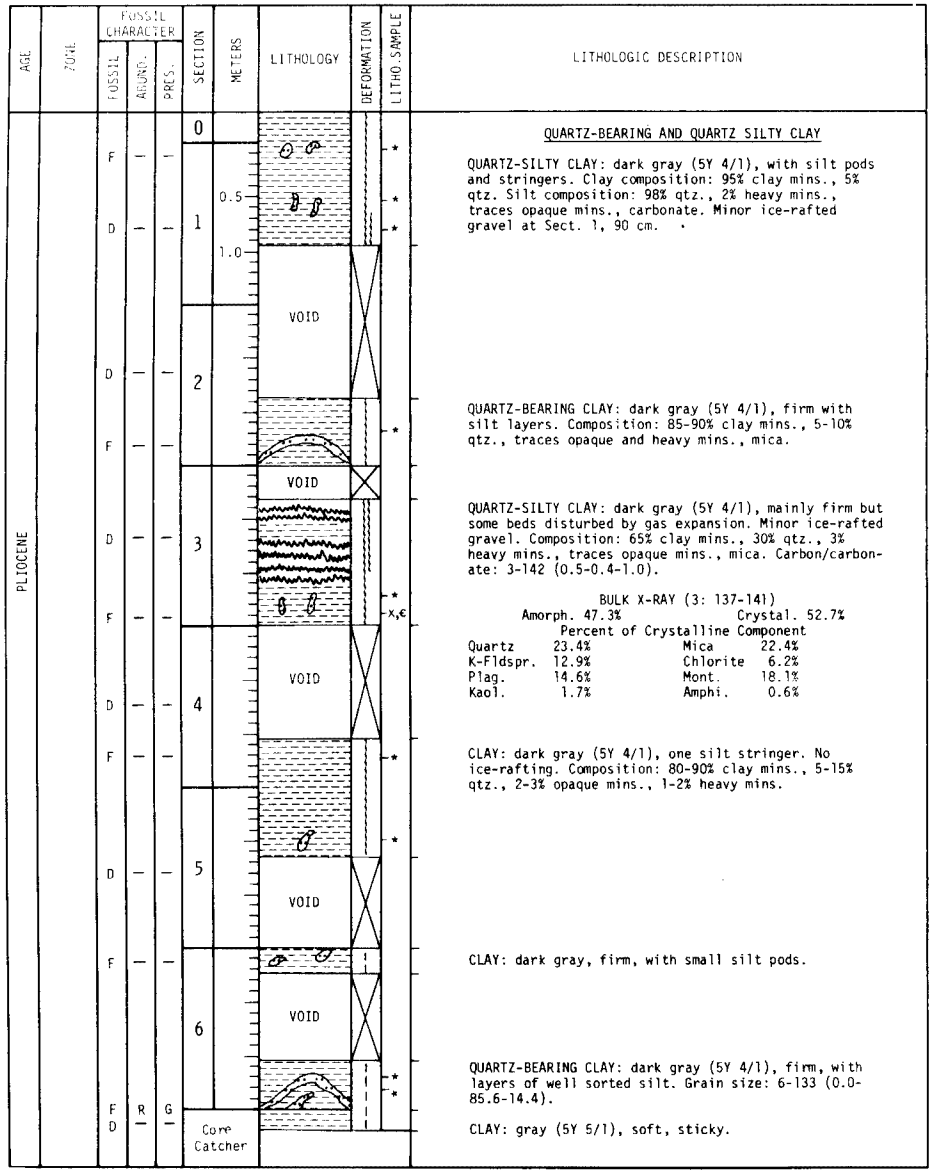
CLAY WITH SILT BEDS

CLAY: gray (5Y 5/1) to dark gray (5Y 4/1), firm, some silt beds. No ice-rafted material observed.

Composition: 90-95% clay mins., 2-10% qtz., 1-2% opaque mins., traces heavy mins., volc. glass, carbonate.

CLAY: dark gray (5Y 4/1), with quartz-silt beds. No ice-rafted material. Silt composition: 89% qtz., 7% heavy mins., 3% opaque mins., 1% rock frags., traces fldspr. and mica.
Carbon/carbonate: 6-137 (0.5-0.4-2.0).

Site 324 Hole Core 7 Cored Interval: 151.5-161.0 m



LITHOLOGIC DESCRIPTION

QUARTZ-BEARING AND QUARTZ SILTY CLAY

QUARTZ-SILTY CLAY: dark gray (5Y 4/1), with silt pods and stringers. Clay composition: 95% clay mins., 5% qtz. Silt composition: 98% qtz., 2% heavy mins., traces opaque mins., carbonate. Minor ice-rafted gravel at Sect. 1, 90 cm.

QUARTZ-BEARING CLAY: dark gray (5Y 4/1), firm with silt layers. Composition: 85-90% clay mins., 5-10% qtz., traces opaque and heavy mins., mica.

QUARTZ-SILTY CLAY: dark gray (5Y 4/1), mainly firm but some beds disturbed by gas expansion. Minor ice-rafted gravel. Composition: 65% clay mins., 30% qtz., 3% heavy mins., traces opaque mins., mica. Carbon/carbonate: 3-142 (0.5-0.4-1.0).

BULK X-RAY (3: 137-141)

Amorph. 47.3%		Crystal. 52.7%	
Percent of Crystalline Component			
Quartz	23.4%	Mica	22.4%
K-Fldspr.	12.9%	Chlorite	6.2%
Plag.	14.6%	Mont.	18.1%
Kaol.	1.7%	Amphi.	0.6%

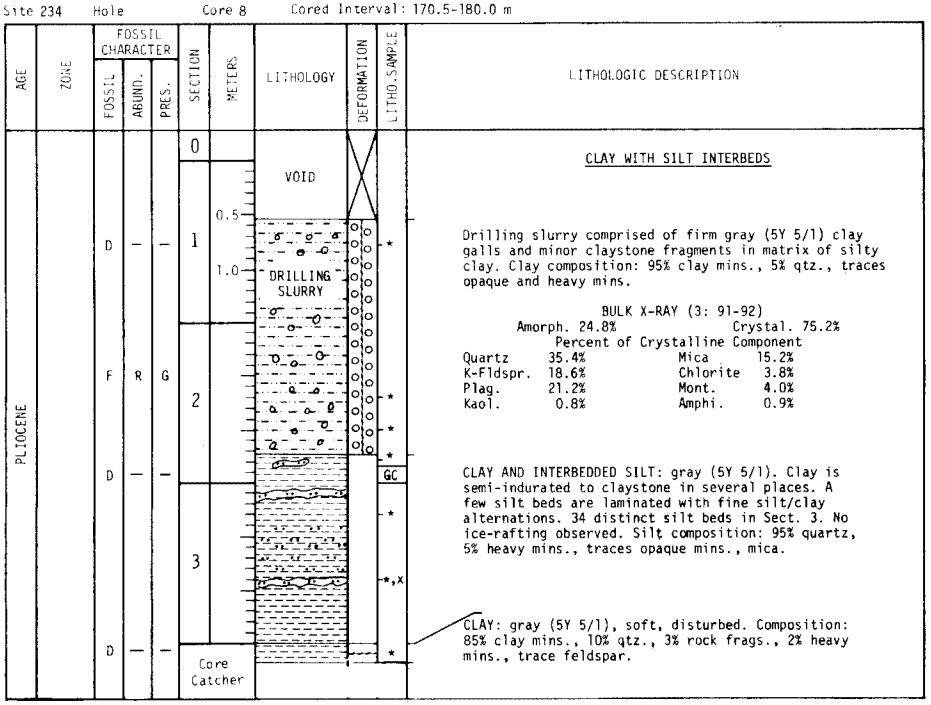
CLAY: dark gray (5Y 4/1), one silt stringer. No ice-rafting. Composition: 80-90% clay mins., 5-15% qtz., 2-3% opaque mins., 1-2% heavy mins.

CLAY: dark gray, firm, with small silt pods.

QUARTZ-BEARING CLAY: dark gray (5Y 4/1), firm, with layers of well sorted silt. Grain size: 6-133 (0.0-85.6-14.4).

CLAY: gray (5Y 5/1), soft, sticky.

Site 234 Hole Core 8 Cored Interval: 170.5-180.0 m



LITHOLOGIC DESCRIPTION

CLAY WITH SILT INTERBEDS

Drilling slurry comprised of firm gray (5Y 5/1) clay galls and minor claystone fragments in matrix of silty clay. Clay composition: 95% clay mins., 5% qtz., traces opaque and heavy mins.

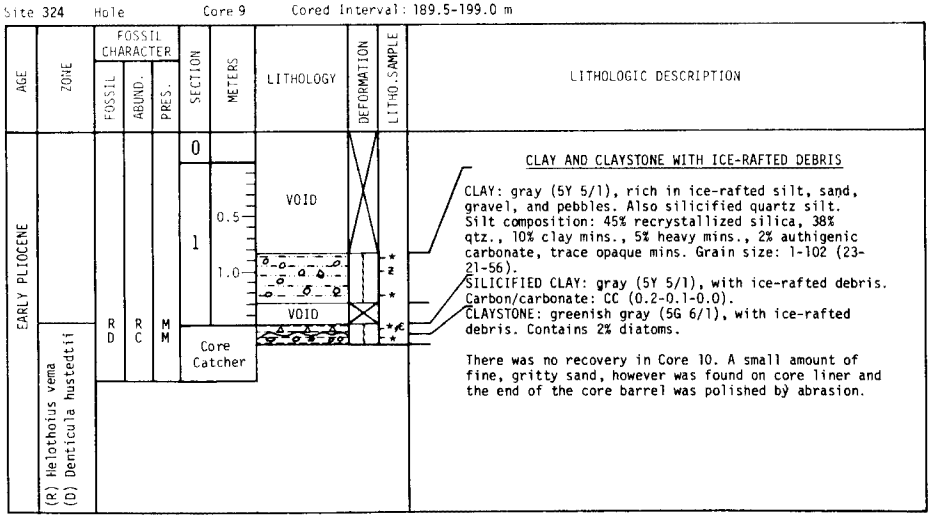
BULK X-RAY (3: 91-92)

Amorph. 24.8%		Crystal. 75.2%	
Percent of Crystalline Component			
Quartz	35.4%	Mica	15.2%
K-Fldspr.	18.6%	Chlorite	3.8%
Plag.	21.2%	Mont.	4.0%
Kaol.	0.8%	Amphi.	0.9%

CLAY AND INTERBEDDED SILT: gray (5Y 5/1). Clay is semi-indurated to claystone in several places. A few silt beds are laminated with fine silt/clay alternations. 34 distinct silt beds in Sect. 3. No ice-rafting observed. Silt composition: 95% quartz, 5% heavy mins., traces opaque mins., mica.

CLAY: gray (5Y 5/1), soft, disturbed. Composition: 85% clay mins., 10% qtz., 3% rock frags., 2% heavy mins., trace feldspar.

Site 324 Hole Core 9 Cored Interval: 189.5-199.0 m



LITHOLOGIC DESCRIPTION

CLAY AND CLAYSTONE WITH ICE-RAFTED DEBRIS

CLAY: gray (5Y 5/1), rich in ice-rafted silt, sand, gravel, and pebbles. Also silicified quartz silt. Silt composition: 45% recrystallized silica, 38% qtz., 10% clay mins., 5% heavy mins., 2% authigenic carbonate, trace opaque mins. Grain size: 1-102 (23-21-56).

SILICIFIED CLAY: gray (5Y 5/1), with ice-rafted debris. Carbon/carbonate: CC (0.2-0.1-0.0).

CLAYSTONE: greenish gray (5G 6/1), with ice-rafted debris. Contains 2% diatoms.

There was no recovery in Core 10. A small amount of fine, gritty sand, however was found on core liner and the end of the core barrel was polished by abrasion.

DEEP SEA DRILLING PROJECT

LEG 35 SITE 325

SITE SUMMARY SHEET

POSITION: Latitude: 65°02.79'S Longitude: 73°40.40'N
(Antarctic Continental Rise)

WATER DEPTH: 3748 corrected meters, echo sounding
3745 meters, drill pipe measurement

NUMBER OF HOLES: 1 NUMBER OF CORES: 10

PENETRATION: 718 meters TOTAL LENGTH OF CORED SECTION: 95 meters

TOTAL CORE RECOVERED: 34.4 meters PERCENTAGE CORE RECOVERED: 36%

OLDEST SEDIMENT CORED:

DEPTH SUBBOTTOM: 718 meters NATURE: Claystone

AGE: ? Oligocene to early Miocene VELOCITY: 3.5-4.5 km/sec

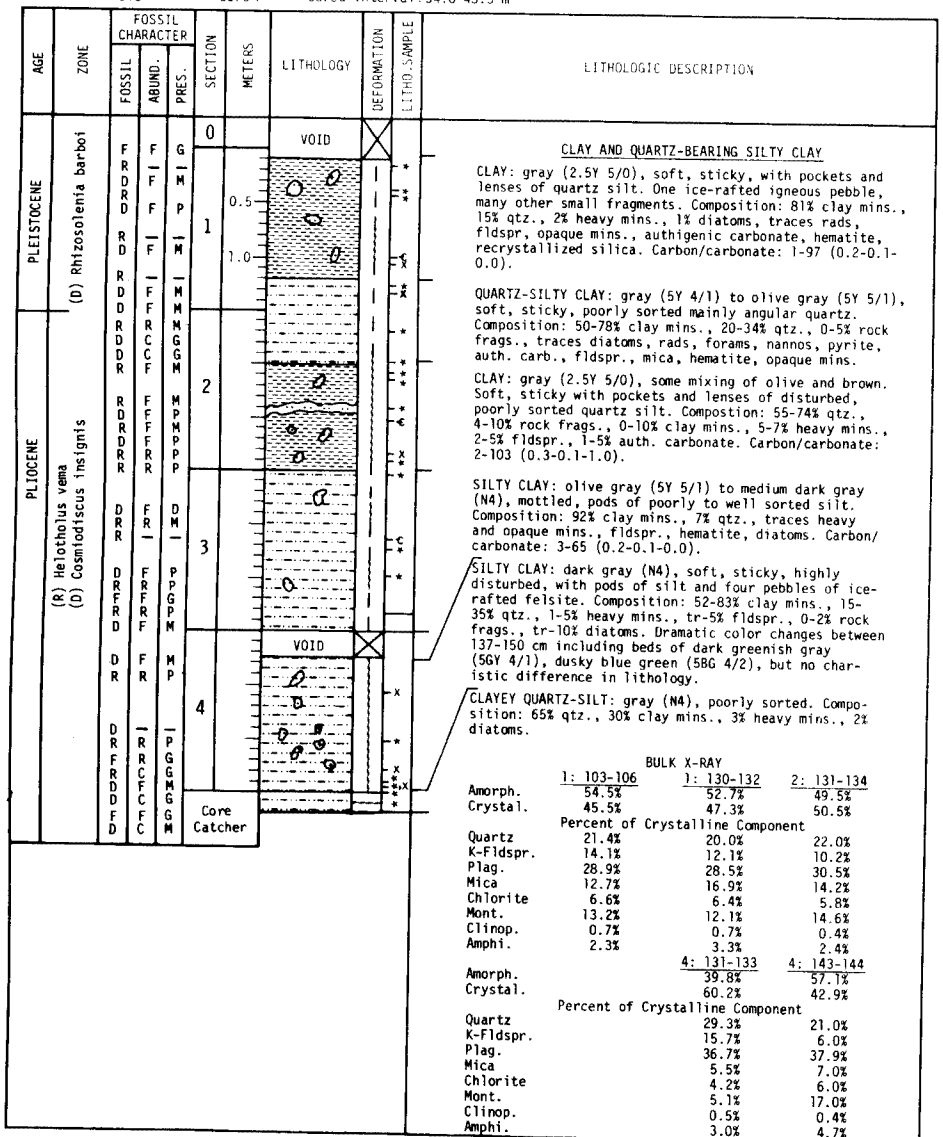
BASEMENT:

Not reached

PRINCIPAL RESULTS:

Approximately 35 meters of terrigenous clay, claystone, siltstone and sandstone were recovered from a hole drilled to 718 meters on the continental rise. The entire sequence penetrated consists of Cenozoic deposits; the oldest sediment at the bottom of the hole is (?) Oligocene to early Miocene. The lithified detrital sediments recovered intermittently from about 400 to 700 meters probably represent sediment within and below the prominant mid-section seismic reflector which probably corresponds to the high velocity (5.25 km/sec) calcite-cemented siltstone cored at 400 meters. Analysis of a nearby sonobuoy indicates the hole terminated about 500 meters from basaltic basement. The oldest ice-rafted debris was found in mid-Miocene age sediment; a similar age was found for dropstone in Hole 323.

Site 325 Hole Core 1 Cored Interval: 34.0-43.5 m



LITHOLOGIC DESCRIPTION

CLAY AND QUARTZ-BEARING SILTY CLAY

CLAY: gray (2.5Y 5/0), soft, sticky, with pockets and lenses of quartz silt. One ice-rafted igneous pebble, many other small fragments. Composition: 81% clay mins., 15% qtz., 2% heavy mins., 1% diatoms, traces rads, fldspr, opaque mins., authigenic carbonate, hematite, recrystallized silica. Carbon/carbonate: 1-97 (0.2-0.1-0.0).

QUARTZ-SILTY CLAY: gray (5Y 4/1) to olive gray (5Y 5/1), soft, sticky, poorly sorted mainly angular quartz. Composition: 50-78% clay mins., 20-34% qtz., 0-5% rock frags., traces diatoms, rads, forams, nannos, pyrite, auth. carb., fldspr., mica, hematite, opaque mins.

CLAY: gray (2.5Y 5/0), some mixing of olive and brown. Soft, sticky with pockets and lenses of disturbed, poorly sorted quartz silt. Compostion: 55-74% qtz., 4-10% rock frags., 0-10% clay mins., 5-7% heavy mins., 2-5% fldspr., 1-5% auth. carbonate. Carbon/carbonate: 2-103 (0.3-0.1-1.0).

SILTY CLAY: olive gray (5Y 5/1) to medium dark gray (N4), mottled, pods of poorly to well sorted silt. Composition: 92% clay mins., 7% qtz., traces heavy and opaque mins., fldspr., hematite, diatoms. Carbon/carbonate: 3-65 (0.2-0.1-0.0).

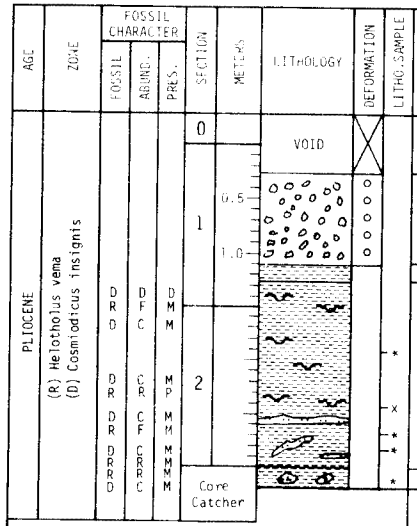
SILTY CLAY: dark gray (N4), soft, sticky, highly disturbed, with pods of silt and four pebbles of ice-rafted felsite. Composition: 52-83% clay mins., 15-35% qtz., 1-5% heavy mins., tr-5% fldspr., 0-2% rock frags., tr-10% diatoms. Dramatic color changes between 137-150 cm including beds of dark greenish gray (5GY 4/1), dusky blue green (5BG 4/2), but no characteristic difference in lithology.

CLAYEY QUARTZ-SILT: gray (N4), poorly sorted. Composition: 65% qtz., 30% clay mins., 3% heavy mins., 2% diatoms.

BULK X-RAY

	1: 103-106	1: 130-132	2: 131-134
Amorph.	54.5%	52.7%	49.5%
Crystal.	45.5%	47.3%	50.5%
Percent of Crystalline Component			
Quartz	21.4%	20.0%	22.0%
K-Fldspr.	14.1%	12.1%	10.2%
Plag.	28.9%	28.5%	30.5%
Mica	12.7%	16.9%	14.2%
Chlorite	6.6%	6.4%	5.8%
Mont.	13.2%	12.1%	14.6%
Clinop.	0.7%	0.7%	0.4%
Amphi.	2.3%	3.3%	2.4%
		4: 131-133	4: 143-144
Amorph.		39.8%	57.1%
Crystal.		60.2%	42.9%
Percent of Crystalline Component			
Quartz		29.3%	21.0%
K-Fldspr.		15.7%	6.0%
Plag.		36.7%	37.9%
Mica		5.5%	7.0%
Chlorite		4.2%	6.0%
Mont.		5.1%	17.0%
Clinop.		0.5%	0.4%
Amphi.		3.0%	4.7%

Site 325 Hole Core 2 Cored Interval: 167.0-176.5 m



LITHOLOGIC DESCRIPTION

GRAVEL AND DIATOM-BEARING CLAY

GRAVEL: rock fragments, mainly igneous, some metamorphic, maximum size 1.0 cm, average size 0.3-0.5 cm.

CLAY: gray (N4), soft, very badly disturbed.

DIATOM-BEARING CLAY: dark greenish gray (5GY 4/1), stiff, many silt layers (<1.0 cm thick). One ice-rafted basalt pebble and minor ice-rafted gravel down to Sect. 2, 69 cm. Clay composition: 76% clay mins., 15% diatoms, 9% qtz., traces fldspr., opaque mins., hematite, sponge spicules, fish remains. Silt composition: 65% qtz., 15% rock frags., 10% heavy mins., 5% fldspr., 3% diatoms.

CLAY: dark greenish gray (5GY 4/1), stiff, fine silt layers (<0.5 cm thick). Two ice-rafted basalt pebbles.

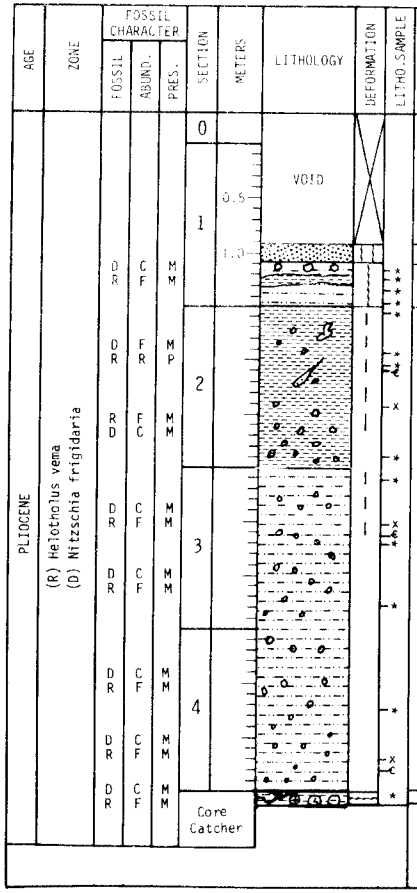
BULK X-RAY (2: 93-95)

Amorph. 56.1% Crystal. 43.9%

Percent of Crystalline Component

Quartz	24.5%	Chlorite	7.0%
K-Fldspr.	10.4%	Mont.	10.5%
Plag.	36.9%	Clinop.	0.8%
Mica	6.5%	Amphi.	3.4%

Site 325 Hole Core 3 Cored Interval: 176.5-186.0 m



LITHOLOGIC DESCRIPTION

CLAY, CLAYEY SILT AND SILTY CLAY

SAND: debris.

QUARTZ-CLAYEY SILT: dark greensih gray (5GY 4/1), firm, structureless. Ice-rafted pebbles at top, finer debris below. One 5 cm bed bluish (5G 4/1) clay.

CLAY AND SILTY CLAY: dark greenish gray (5GY 4/1) firm. Ice-rafted debris common to abundant. Poorly sorted silt layers (<0.5 cm thick). Clay composition: 90% clay mins., 5% qtz., 3% diatoms, 2% fldspr. Silt composition: 20-80% qtz., 7-65% clay mins., 3% fldspr., 3% heavy mins., 3% rock frags. Carbon/carbonate: 2-58 (0.3-0.2-1.0).

Section 3: dark greenish gray (5GY 4/1) firm, uniform, few layers of poorly sorted silt. Much ice-rafted debris (<0.5 cm). Carbon/carbonate: 3-65 (0.2-0.2-0.0).

Composition: 24-72% qtz., 10-65% clay mins., 2-5% fldspr., 3-5% heavy mins., 3-6% rock frags., 4-5% diatoms.

Section 4: dark greensih gray (5GY 4/1), uniform, poorly sorted. Abundant ice-rafted debris.

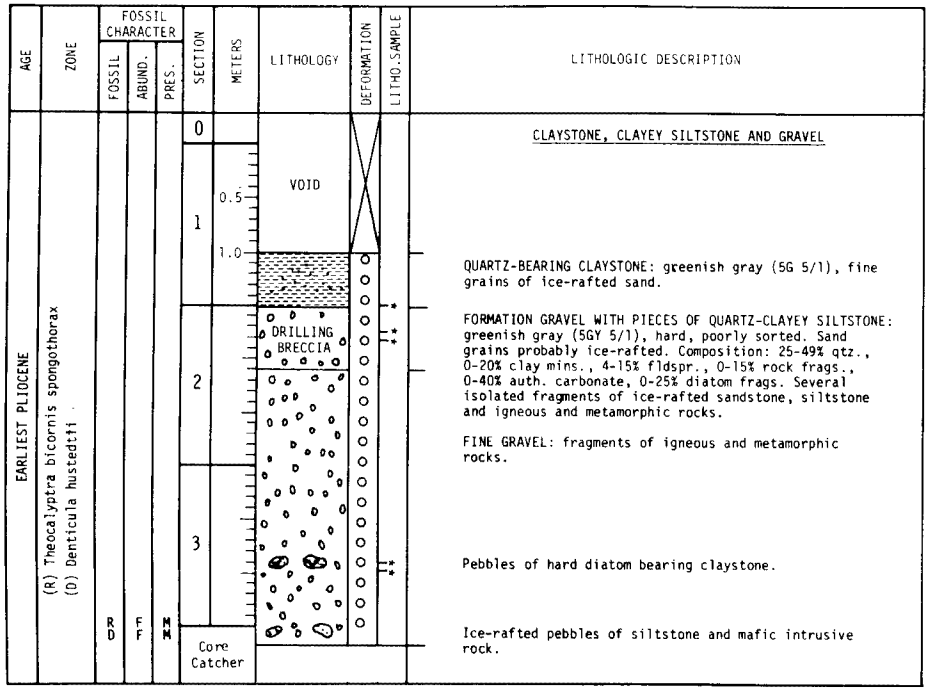
Composition: 60% clay mins., 25% qtz., 4% fldspr., 3% heavy mins., 6% diatoms. Carbon/carbonate: 4-132 (0.2-0.2-0.0).

DIATOM CLAY: olive gray (5GY 5/1). Ice-rafted pebbles of granite; siltstone and mudstone pebbles.

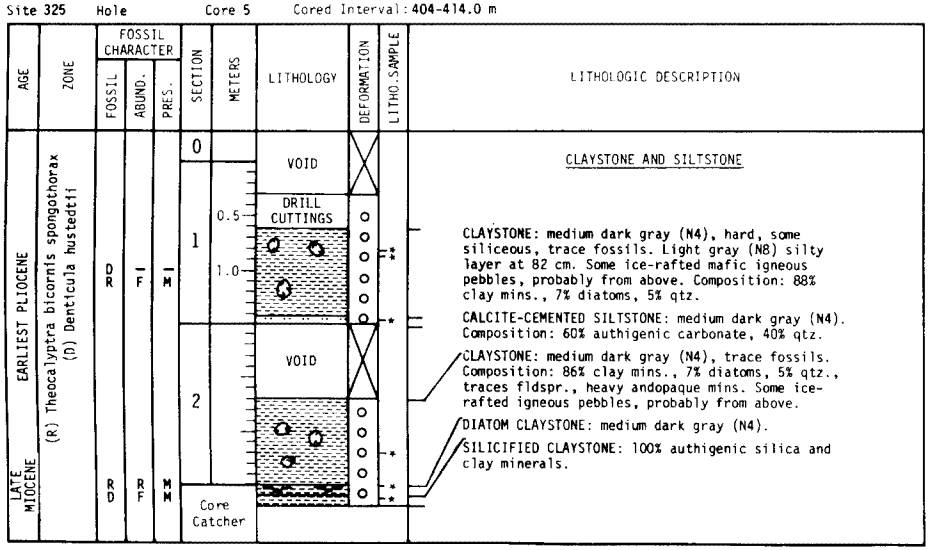
BULK X-RAY

	2: 90-92	3: 51-54	4: 121-123
Amorph.	51.2%	49.8%	49.7%
Crystal.	48.8%	50.2%	50.3%
Percent of Crystalline Component			
Quartz	22.5%	27.1%	25.2%
K-Fldspr.	10.5%	16.5%	14.0%
Plag.	37.1%	38.8%	39.4%
Mica	7.4%	3.5%	4.9%
Chlorite	6.0%	5.0%	6.0%
Mont.	12.4%	4.9%	6.1%
Clinop.	1.1%	0.5%	0.4%
Amphi.	3.1%	4.1%	0.8%

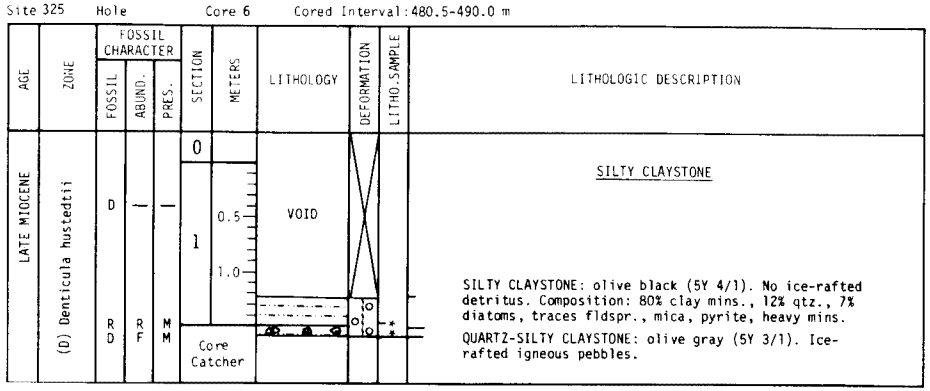
Site 325 Hole Core 4 Cored Interval: 290.5-300.0 m



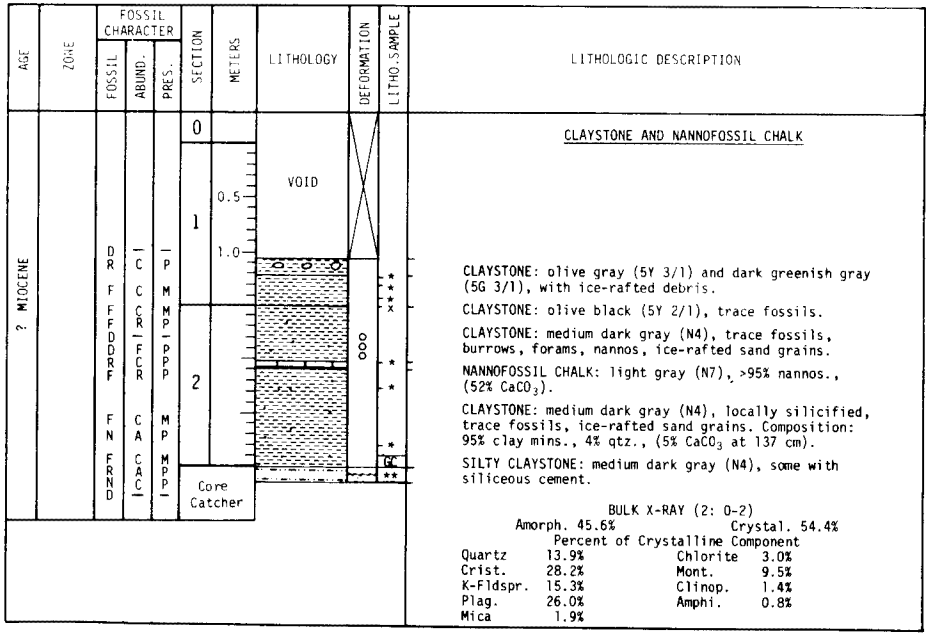
Site 325 Hole Core 5 Cored Interval: 404-414.0 m



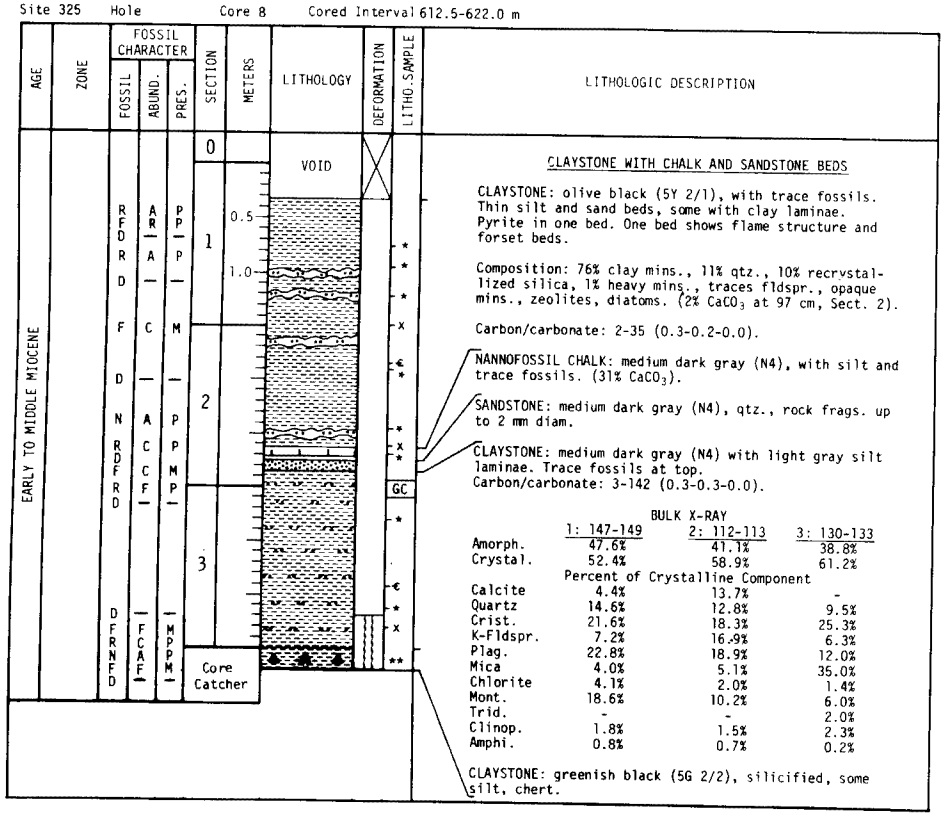
Site 325 Hole Core 6 Cored Interval: 480.5-490.0 m



Site 325 Hole Core 7 Cored Interval: 518.5-528.0 m



Site 325 Hole Core 8 Cored Interval 612.5-622.0 m



LITHOLOGIC DESCRIPTION

CLAYSTONE WITH CHALK AND SANDSTONE BEDS

CLAYSTONE: olive black (5Y 2/1), with trace fossils. Thin silt and sand beds, some with clay laminae. Pyrite in one bed. One bed shows flame structure and forset beds.

Composition: 76% clay mins., 11% qtz., 10% recrystallized silica, 1% heavy mins., traces fldspr., opaque mins., zeolites, diatoms. (2% $CaCO_3$ at 97 cm, Sect. 2).

Carbon/carbonate: 2-35 (0.3-0.2-0.0).

NANNOFOSSIL CHALK: medium dark gray (N4), with silt and trace fossils. (31% $CaCO_3$).

SANDSTONE: medium dark gray (N4), qtz., rock frags. up to 2 mm diam.

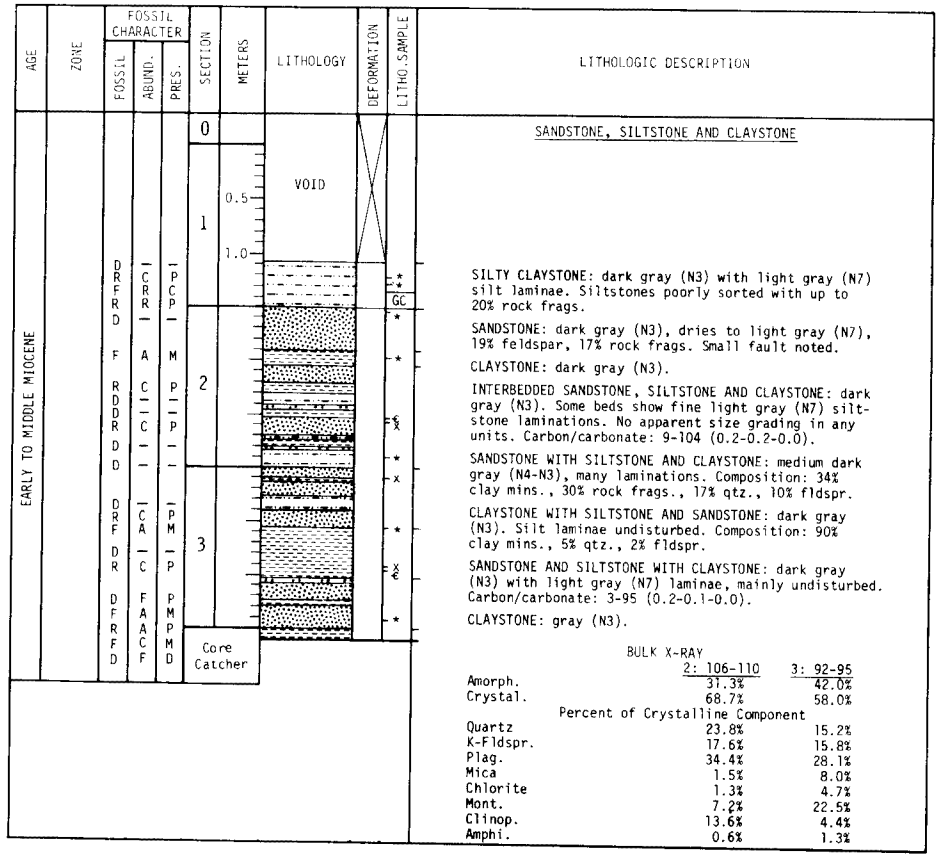
CLAYSTONE: medium dark gray (N4) with light gray silt laminae. Trace fossils at top.
Carbon/carbonate: 3-142 (0.3-0.3-0.0).

BULK X-RAY

	1: 147-149	2: 112-113	3: 130-133
Amorph.	47.6%	41.1%	38.8%
Crystal.	52.4%	58.9%	61.2%
Percent of Crystalline Component			
Calcite	4.4%	13.7%	-
Quartz	14.6%	12.8%	9.5%
Crist.	21.6%	18.3%	25.3%
K-Fldspr.	7.2%	16.9%	6.3%
Plag.	22.8%	18.9%	12.0%
Mica	4.0%	5.1%	35.0%
Chlorite	4.1%	2.0%	1.4%
Mont.	18.6%	10.2%	6.0%
Trid.	-	-	2.0%
Clinop.	1.8%	1.5%	2.3%
Amphi.	0.8%	0.7%	0.2%

CLAYSTONE: greenish black (5G 2/2), silicified, some silt, chert.

Site 325 Hole Core 9 Cored Interval: 641.0-650.5 m



LITHOLOGIC DESCRIPTION

SANDSTONE, SILTSTONE AND CLAYSTONE

SILTY CLAYSTONE: dark gray (N3) with light gray (N7) silt laminae. Siltstones poorly sorted with up to 20% rock frags.

SANDSTONE: dark gray (N3), dries to light gray (N7), 19% feldspar, 17% rock frags. Small fault noted.

CLAYSTONE: dark gray (N3).

INTERBEDDED SANDSTONE, SILTSTONE AND CLAYSTONE: dark gray (N3). Some beds show fine light gray (N7) siltstone laminations. No apparent size grading in any units. Carbon/carbonate: 9-104 (0.2-0.2-0.0).

SANDSTONE WITH SILTSTONE AND CLAYSTONE: medium dark gray (N4-N3), many laminations. Composition: 34% clay mins., 30% rock frags., 17% qtz., 10% fldspr.

CLAYSTONE WITH SILTSTONE AND SANDSTONE: dark gray (N3). Silt laminae undisturbed. Composition: 90% clay mins., 5% qtz., 2% fldspr.

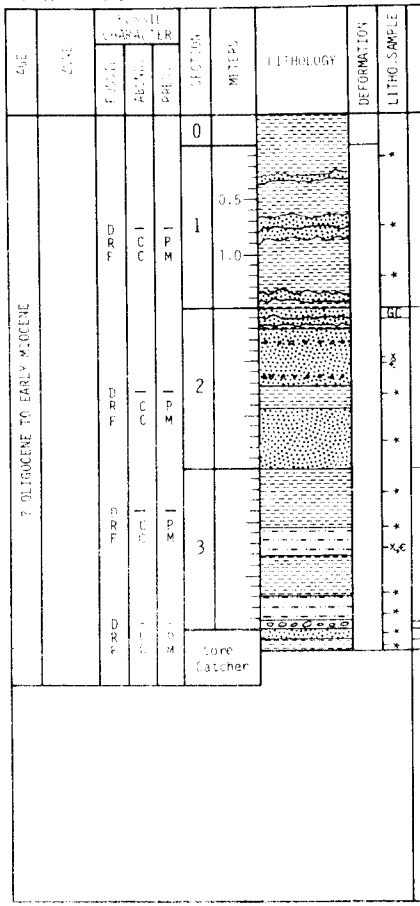
SANDSTONE AND SILTSTONE WITH CLAYSTONE: dark gray (N3) with light gray (N7) laminae, mainly undisturbed. Carbon/carbonate: 3-95 (0.2-0.1-0.0).

CLAYSTONE: gray (N3).

BULK X-RAY

	2: 106-110	3: 92-95
Amorph.	31.3%	42.0%
Crystal.	68.7%	58.0%
Percent of Crystalline Component		
Quartz	23.8%	15.2%
K-Fldspr.	17.6%	15.8%
Plag.	34.4%	28.1%
Mica	1.5%	8.0%
Chlorite	1.3%	4.7%
Mont.	7.2%	22.5%
Clinop.	13.6%	4.4%
Amphi.	0.6%	1.3%

Site 325 Hole Core 10 Cored Interval: 708.5-718.0 m



LITHOLOGIC DESCRIPTION

CLAYSTONE, SANDSTONE AND CONGLOMERATE

CLAYSTONE: greenish gray (5GY 5/1) and greenish black (5G 2/1), 95% clay mins., with poorly sorted sandstone beds. Sandstone composition: 43% rock frags., 20% fldspr., 18% qtz., 12% clay mins.

SANDSTONE WITH CLAYSTONE AND CONGLOMERATE: medium dark gray (N4). Conglomerate clasts are clay with preferential orientation parallel to bedding. Some claystone dark greenish gray (5G 5/1). Sandstone composition: 40% rock frags., 25% fldspr., 20% qtz., 12% heavy mins Claystone composition: 95% clay mins., 2% qtz., 1% opaque mins., 1% heavy mins. Carbon/carbonate: 2-50 (0.1-0.1-0.0).

SILTY AND SANDY CLAYSTONE: dark gray (N3) with light gray (N7) silty layers.

Carbon/carbonate: 3-71 (0.2-0.2-0.0).

CONGLOMERATE: well rounded clasts of clay, no preferential orientation, carbonate matrix, 49% $CaCO_3$.

SANDSTONE: medium dark gray (N4), fine- to coarse-grained, well sorted, contains qtz., rock fragments, fldspr., glauconite, with calcareous cement.

CLAYSTONE: dark gray (N3), 89% clay mins with recrystallized silica.

BULK X-RAY

	2: 46-48	3: 71-73
Amorph.	11.8%	29.0%
Crystal.	88.2%	71.0%
Percent of Crystalline Component		
Quartz	6.6%	22.7%
K-Fldspr.	14.2%	19.7%
Plag.	22.4%	32.4%
Mica	-	2.9%
Chlorite	0.7%	1.7%
Mont.	51.9%	5.4%
Clinop.	3.7%	14.7%
Amphi.	0.5%	0.6%