

# INITIAL CORE DESCRIPTIONS

DEEP SEA DRILLING PROJECT

LEG 46

MID-ATLANTIC RIDGE



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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POST OFFICE BOX 1529  
LA JOLLA, CALIFORNIA 92093

Dear Colleague:

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

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

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

Sincerely,

A handwritten signature in cursive script that reads "David G. Moore".

David G. Moore  
Chief Scientist  
Deep Sea Drilling Project

# INITIAL CORE DESCRIPTIONS DEEP SEA DRILLING PROJECT

## LEG 46

January 28, 1976 – March 10, 1976

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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 Sciences, University of Miami  
Scripps Institution of Oceanography, University of California  
University of Washington  
Woods Hole Oceanographic Institution  
Institute of Geophysics, University of Hawaii  
School of Oceanography, Oregon State University  
Graduate School of Oceanography, University of Rhode Island  
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USSR Academy of Sciences, P. P. Shirshov Institute of Oceanology, Moscow  
Bundesanstalt für Geowissenschaften und Rohstoffe, Hannover  
National Environment Research Council, London  
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## INITIAL CORE DESCRIPTIONS

### INTRODUCTION

The objective of Leg 46 of the *Glomar Challenger* was to build on the successes of Legs 37 and 45 in the study of the ocean crust, and in particular to continue the longitudinal transect in the Atlantic. Two holes were drilled on Leg 46. Hole 396A was a mud-line test, and only two cores of Pliocene nannofossil ooze were recovered. Hole 396B penetrated a total of 405.5 meters subbottom and 255 meters into basement, which is composed of pillow lavas, flows, breccia, sand, and gravel, all of basaltic composition. Indurated limestone is sometimes present between the pillows.

Leg 46 began at San Juan, Puerto Rico, on January 28, 1976 and ended in Las Palmas, Canary Islands, on March 10, 1976.

The two holes are located about 150 km east of the axis of the mid-Atlantic ridge at 22°59.14'N, 43°30.90'W (Figure 1). This location is only about 150 meters from Hole 396, which was a one-bit pilot hole drilled on Leg 45. Water depth at the site is 4465 meters. The sediment thickness is 150 meters, but because the casing for the reentry cone had to be washed into the sediment, only a few cores at the top and bottom of the sediment were recovered. A complete set of sediment cores was recovered on Leg 45. Figure 2 is an isopach map of the sediment pond.

A total of 35 cores were cut on Leg 46. Overall recovery was 23%, with much lower recovery in the basaltic rubble zone at the bottom of 396B. Table 1 is a summary of the cores taken.

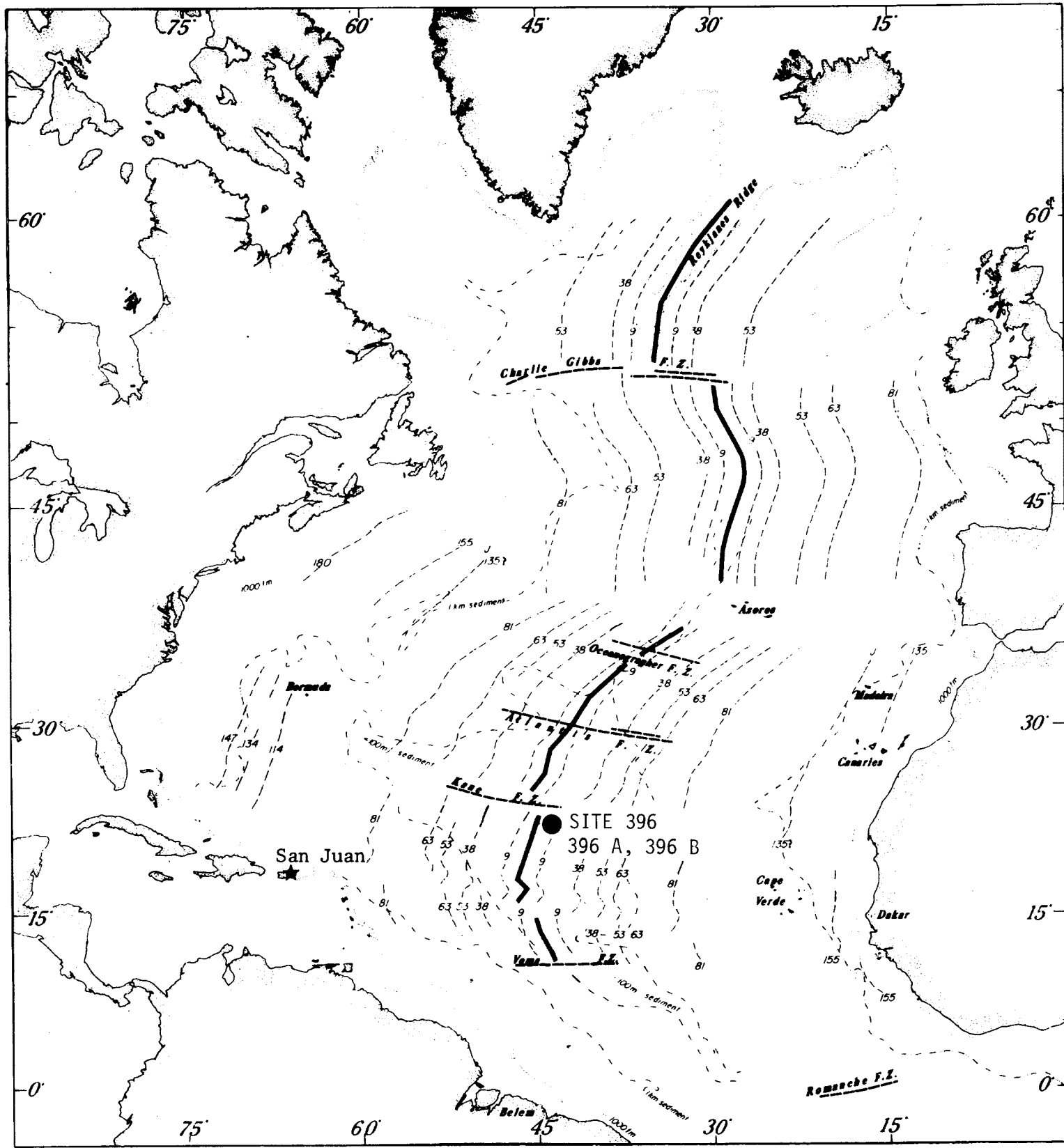


Figure 1. Leg 46 site map.

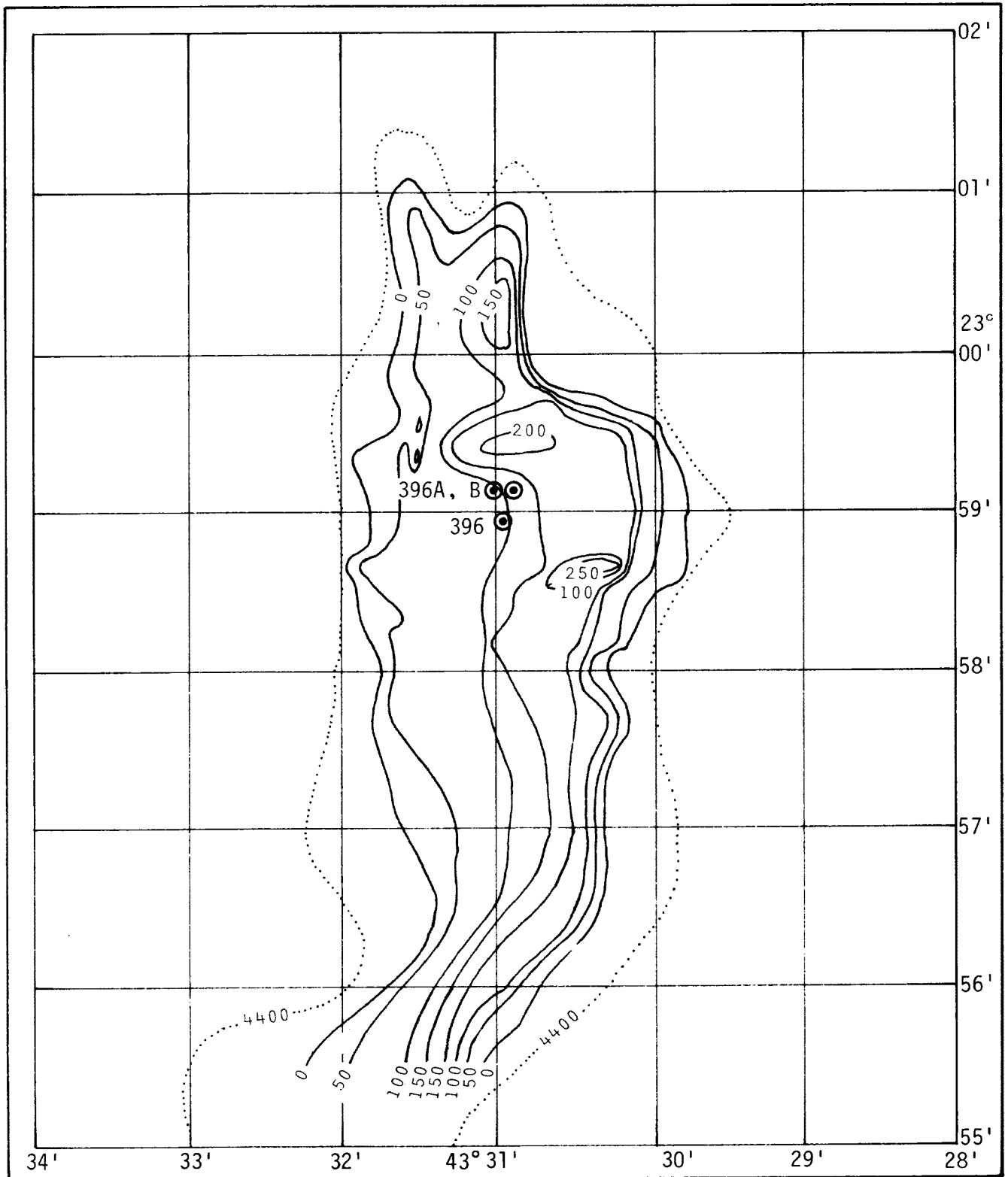


Figure 2. Isopach map showing location of Holes 396A, 396B, and 396 (Leg 45). Dotted line is 4400 meter depth contour.

Table 1. Leg 46 Coring Summary

Number	Depth Below Sea Floor (m)		Length Cored (m)	Length Recovered (m)	Percent Recovery
	Top	Bottom			
<u>SITE 396 - Hole A</u>					
1	0.0	9.5	9.5	0.6	6.3
2	9.5	19.0	9.5	CC	1.0
<u>SITE 396 - Hole B</u>					
1	122.0	131.5	9.5	1.95	20.5
2	131.5	141.0	9.5	1.50	15.8
3	141.0	150.5	9.5	1.70	17.9
4	150.5	157.0	6.5	1.46	22.0
5	157.0	166.5	9.5	2.23	23.0
6	166.5	174.0	7.5	0.85	11.0
7	174.0	183.5	9.5	2.4	25.0
8	183.5	193.0	9.5	1.87	20.0
9	193.0	202.5	9.5	3.0	32.0
10	202.5	212.0	9.5	2.0	22.0
11	212.0	214.5	2.5	1.7	68.0
12	214.5	216.0	1.5	1.12	67.0
13	216.0	225.5	9.5	2.25	24.0
14	225.5	235.0	9.5	3.35	35.0
15	235.0	244.5	9.5	6.6	69.0
16	244.5	254.0	9.5	5.8	61.0
Drilled	254.0	267.5	13.5	---	---
17	267.5	273.0	5.5	4.25	77.0
18	273.0	277.0	4.0	2.3	58.0
19	277.0	286.5	9.5	0.07	1.0
20	286.5	296.0	9.5	6.6	69.0
21	296.0	305.5	9.5	1.45	15.0
22	305.5	315.0	9.5	4.5	47.0
23	315.0	324.5	9.5	0.95	10.0
24	324.5	334.0	9.5	0.70	7.4
25	334.0	343.5	9.5	0.12	0.1
26	343.5	353.0	9.5	0.07	0.7
27	353.0	358.0	5.0	0.0	0.0
28	358.0	367.5	9.5	0.08	0.7
29	367.5	377.0	9.5	0.0	0.0
30	377.0	382.0	5.0	1.0	20.0
31	382.0	386.5	4.5	0.0	0.0
32	386.5	396.0	9.5	0.82	9.0
33	396.0	405.5	9.5	0.90	9.0
Total for both holes			424.5	64.40	15.0

Eight lithologic units have been identified (Figure 3). Units 1, 2, and 3 are composed primarily of sparsely-olivine-and-plagioclase-phyric basalt. Units 1 and 2 are pillow sequences with limestone-cemented (lithified nannofossil ooze) palagonite breccias in their upper parts. Unit 1 is separated from Unit 2 by 20 cm of limestone. Unit 3 is a flow or sill 8.5 meters thick, although neither top nor bottom could be identified with certainty. Unit 4 is a pillow sequence composed of porphyritic basalt with 15% to 25% olivine and plagioclase phenocrysts. The average plagioclase to olivine ratio is about 6:1. Unit 5 is composed of sparsely-olivine-and-plagioclase-phyric basalt pillows and carbonate-cemented breccia. Recovery in this unit was poor and the bottom of the unit was chosen on the basis of downhole logs. Unit 6 also has poor recovery but appears to be primarily basaltic sand, gravel, and sparsely-phyric basalt pillows. Unit 7 is a moderately-olivine-and-plagioclase-phyric basalt pillow sequence, again with poor recovery. Unit 8 is basaltic gravel or sand.

Magnetic Unit 1 (Figure 3) has a mean inclination of  $+18^\circ$ , however the sediment in Core 13 Section 2 has an inclination of  $-35^\circ$  which differs significantly from the  $+18^\circ$  inclination of the basalts of this unit. Unit II has a mean inclination of  $-67^\circ$ , excluding one sample in Core 13 Section 3 which has an inclination of  $+55^\circ$ . That exception could be the result of misorientation. Unit III has a mean inclination of  $-7^\circ$  with very little scatter around this value. Unit IV has a mean inclination of  $+31^\circ$  but is poorly defined since there were few oriented samples available for magnetic study. Mean values for intensity of remanent magnetization for Units I through IV are, respectively,  $1.03 \times 10^{-3}$ ,  $2.37 \times 10^{-3}$ ,  $3.45 \times 10^{-3}$  and  $1.85 \times 10^{-3}$  emu/cc. Contrary to the experience of other legs there was



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DEPTH (m)	DENSITY	RECOVERY	CORE NUMBER	LITHOLOGIC UNIT	MAGNETIC UNIT	CHEMICAL UNIT	ZONES OF ALTERATION	GRAIN DENSITY
175	>2.86	[Pattern]	4	1	I	A <sub>1</sub>	[Pattern]	d <sub>1</sub>
		[Pattern]	5					
		[Pattern]	6					
		[Pattern]	7					
		[Pattern]	8					
		[Pattern]	9					
		[Pattern]	10					
		[Pattern]	11					
		[Pattern]	12					
		[Pattern]	13					
		[Pattern]	14					
		225	<2.81				[Pattern]	
[Pattern]	16			3				
[Pattern]	17							
275		[Pattern]	18	4	III	B <sub>1</sub>	[Pattern]	
		[Pattern]	19					
300		[Pattern]	20	4	III	B <sub>2</sub>	[Pattern]	
		[Pattern]	21					
		[Pattern]	22					
		[Pattern]	23					
325		[Pattern]	24	5	IV	C	[Pattern]	d <sub>3</sub>
		[Pattern]	25					
		[Pattern]	26					
350	>2.87	[Pattern]	27	6		C	[Pattern]	
		[Pattern]	28					
375		[Pattern]	29	6		C	[Pattern]	
		[Pattern]	30					
		[Pattern]	31					
400		[Pattern]	32	7		D	[Pattern]	
		[Pattern]	33	8				

Figure 3. Stratigraphic summary of Hole 396B.

no evidence of drilling remanence during A. C. demagnetization.

Analysis of 41 basaltic samples for 8 major (Si, Al, Mg, Fe, K, Ti, Ca, Mn) and 4 trace (Cr, Ni, Sr, Zr) elements were carried out on board X-ray fluorescence methods.  $H_2O^+$  and  $CO_2$  analyses were made with a CHN-analyzer. In most cases the freshest possible samples were chosen for analysis.

There are 4 major chemical units (A, B, C, D), with A being subdivided into 3 subunits and B subdivided into 2 subunits (Figure 3). The major units are very similar to the major lithologic units. The total chemical variation within the basalts sampled is relatively small and typical of mid-ocean ridge basalts with  $MgO = 7\%-9\%$ ,  $Mg/(Mg+Fe) = 0.57\%-0.66\%$ ,  $TiO_2 = 0.9\%-1.7\%$ ,  $CaO = 10.8\%-12.8\%$ ,  $Al_2O_3 = 15\%-18\%$ , total Fe as FeO =  $7.4\%-10.4\%$ ,  $K_2O = 0.1\%-0.35\%$ , Zr = 60-130 ppm, Sr = 110-170 ppm, Cr = 250-370 ppm, and Ni = 110-160 ppm. The steplike chemical changes between units and the relative chemical homogeneity that exists within many of the groups may indicate that the chemically defined units represent discrete magma batches. Chemical variation within the individual subgroup A are more difficult to explain. The subgroups of A might be related through pyroxene fractionation but this is uncertain in the light of the absence of clinopyroxene phenocrysts. The subgroups of B might be derived through fractionation of plagioclase.

The basaltic rocks from Hole 396B are mostly slightly weathered to almost fresh. Six zones of more severe alteration occur near interlayers of nannofossil oozes, cemented pillow-rind breccias, and/or filled open fractures and voids in the basalt. Four of these zones coincide with the

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upper part of four lithological units, including the uppermost basalts of the basement just under the pond sediments.

The alteration is accompanied by fissure and vesicle fillings of secondary minerals such as calcite, zeolites, smectites and Mn oxides/hydroxides. During alteration, Sr, "loss of ignition", and to a lesser degree  $K_2O$  increase significantly. A correlation also seems to exist between the presence of smectites in slightly weathered samples and their  $K_2O$  content, and between  $CO_2$  content and the observed presence of calcite.

A satisfactory correlation was noticed between the zones of maximum alteration and the porosity, density and sound velocity logs.

No high temperature alteration products were observed but we suspect that products of pneumatolytic alteration might be found during further investigations of the 8.5 m thick cooling unit (lithologic Unit 3).

The well known relationships among wet bulk density, porosity, and velocity were found. It was somewhat of a surprise that the grain densities could be put into three groups ( $d_1-d_3$ ) that have densities greater than 2.86, 2.81 and 2.87 gm/cc, respectively. There seems to be generally similar variations displayed by the downhole sonic velocity log. The sample velocities measured on board ship, however, are higher, since much of the less hard low velocity material is not recovered.

A unique aspect of the Leg 46 program was the ability to make continuous logs of density, porosity, sonic velocity, natural gamma-ray activity and electrical conductivity. This facility was provided by Schlumberger Well Services of Long Beach, California. Other special

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equipment included an A.C. washer and spinner magnetometer provided by Dalhousie University, and an X-ray fluorescence unit provided by CNEXO. All this equipment greatly enhanced shipboard analysis.

Four downhole logs were made. This required a total of 34 hours of ship's time. The logs were extremely valuable, especially in correlating with properties of recovered samples. In particular, the unique zone of coarse basaltic sand which was found below about 310 meters subbasement was identified in the logs. Other units were similarly identified. This is the first time that such logs have been made in oceanic basement and similar logs should prove useful in future hard-rock drill holes.

Comparison with dredge hauls from 22°N and with analyses of glasses from the FAMOUS area indicates that the Leg 46 samples are generally similar and are systematically more "evolved" than the more primitive samples from the FAMOUS area. This regional pattern, if not a result of sampling bias, may have important implications for the development of this portion of the oceanic crust. If real, it may indicate either tectonic conditions that restrict or slow the rise of magma beneath the ridge and thus prevent relatively unfractionated magmas from reaching the near-sea-bottom environment. More fundamentally, it may indicate conditions of primary magma formation reflecting upper mantle heterogeneities and possibly different degrees of partial melting.

The tectonic history of the region is still largely unknown in spite of many successful physical property and downhole measurements.

## EXPLANATORY NOTES

### Introduction

Persons wishing to obtain samples are directed to the DSDP-NSF sample distribution policy (p.24 ). Sample requests must be submitted on standard DSDP request forms which may be obtained from:

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

The following material is intended as an aid in understanding:

- (1) the terminology, labeling, and numbering conventions used by the Deep Sea Drilling Project;
- (2) the sedimentary, igneous, and metamorphic classification used on Leg 46; and
- (3) the presentation of the lithologic and paleontologic data on the core forms which make up much of this publication.

### Numbering of Sites, Holes, Cores, Samples

Drill site numbers run consecutively from the first site drilled by *Glomar Challenger* in 1968; the site number is thus unique. Sites are drilled in site survey areas, designated by a mnemonic letter code and a number. On Leg 46, Atlantic Transect Area AT-6 was drilled. The first (or only) hole drilled at a site takes the site number. Additional holes at the same site are further distinguished by a letter suffix. The first hole has only the site number; the second has the site number with suffix A; the third has the site number with suffix B; and so forth. It is important, for sampling purposes, to distinguish the holes drilled at a

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site, since recovered sediments or rocks usually do not come from equivalent positions in the stratigraphic column at different holes.

Cores are numbered sequentially from the top down. In the ideal case, each core consists of 9.3 meters of sediment or rock in a plastic liner 6.6 cm in diameter. In addition, a short, ideally 20 cm, sample is obtained from the core catcher (a multi-fingered device at the bottom of the core barrel which prevents cored materials from sliding out during core-barrel recovery. During Leg 46 the core catcher sample was split, described, and placed at the bottom of the material recovered in the core barrel, taking care to maintain its proper vertical orientation. This sample represents the lowest sample recovered in a particular cored interval.

The cored interval is the interval in meters below the sea floor measured from the point at which coring for a particular core was started to the point at which it was terminated. This interval is generally about 9.5 meters (nominal length of a core barrel) but may be shorter or longer if conditions dictate.

When a core is brought aboard the *Glomar Challenger* it is labeled and the plastic liner and core cut into 1.5 meter sections. A full, 9.5 meter core consists of seven sections, numbered 1 to 7 from the top down. Generally, something less than 9.5 meters is recovered. In this case, the sections are still numbered starting with 1 at the top, but the number of sections is the number of 1.5 meter intervals needed to accommodate the length of core recovered. If a core contains a length of material less than the length of the cored interval, the recovered material is measured from the top of the recovered material, with the top of Section 1 equal

to the top of the cored interval. Figure 4 illustrates the possible core configurations and the section labeling procedure. For basalts the voids in the core are closed and styrofoam spacers put between pieces which cannot be fit together (see section on "Basement Description" ).

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

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

Leg (Optional)  
Site  
Hole  
Core Number  
Section Number  
Interval in centimeters from top of section

Site 396A-1-2, 122-124 cm (10cc) designates a 10cc sample taken from Section 2 of Core 1 from the second hole drilled at Site 396, Hole A. 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), or 3.2 meters. Note, however, that subsequent sample requests should refer to a specific interval within a core section (in centimeters) rather than depth in meters below the sea floor.

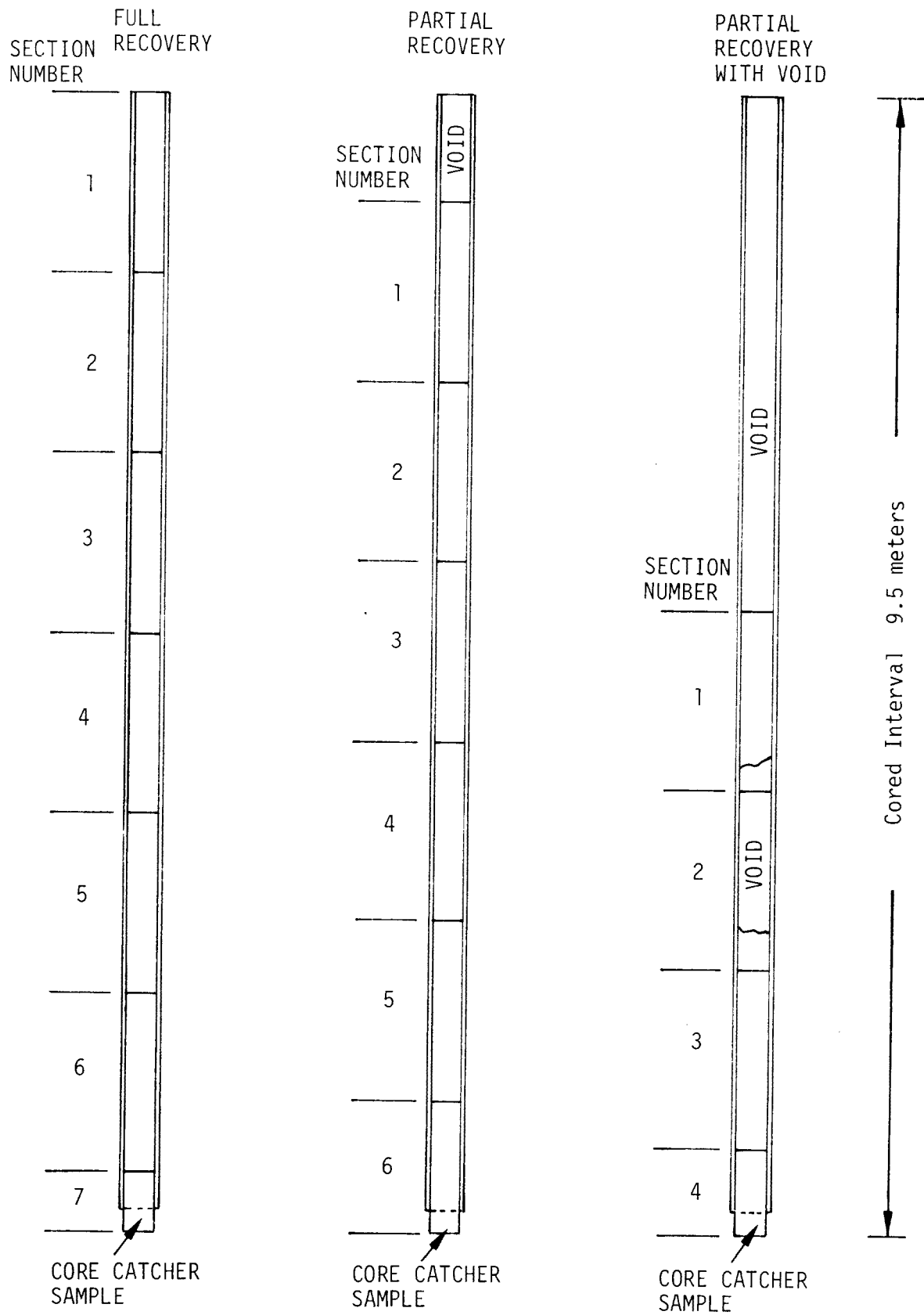


Figure 4. Labeling of sections for various kinds of recovery.



## SEDIMENT DESCRIPTION CONVENTIONS

### Core Disturbance

Sediment descriptions are given on sediment core description sheets. (Figure 5 is an example.) Conventions for descriptions are discussed below. The symbols used on Leg 46 are presented in Figure 6.

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

----- Slightly deformed; bedding contacts slightly bent.

--- Moderately deformed; bedding contacts have undergone extreme bowing.

~~~~~ Severely deformed; bedding completely disturbed, often showing symmetrical diapir-like structures, or water-saturated intervals that have lost all aspects of original bedding and sediment cohesiveness.

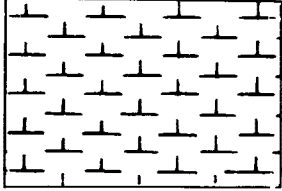
### Smear Slides

The lithologic classification of sediments is based on visual estimates of texture and composition in smear slides made on board ship. These estimates are of areal abundances on the slide and may differ somewhat from the more accurate laboratory analyses of grain size, carbonate content, and mineralogy. Experience has shown that distinctive minor components can be accurately estimated ( $\pm 1$  or 2%), but than an

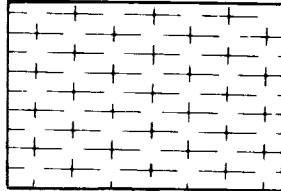
| SITE           |                  | HOLE                                                           |        |      | CORE    |        | CORED INTERVAL: (meters below the sea floor)    |                                       |                               |                       |                                                                                                               |
|----------------|------------------|----------------------------------------------------------------|--------|------|---------|--------|-------------------------------------------------|---------------------------------------|-------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------|
| TIME-ROCK UNIT | BIOSTRAT ZONE    | FOSSIL CHARACTER                                               |        |      | SECTION | METERS | GRAPHIC LITHOLOGY                               | DRILLING DISTURBANCE                  | SEDIMENTARY STRUCTURES        | LITHOLOGIC SAMPLE     | LITHOLOGIC DESCRIPTION                                                                                        |
|                |                  | FORAMS                                                         | NANNOS | RADS |         |        |                                                 |                                       |                               |                       |                                                                                                               |
|                | Nannofossil Zone | ABUNDANCE: A- abundant, C-common, F-frequent, R-rare, --absent |        |      |         |        |                                                 |                                       |                               |                       |                                                                                                               |
|                |                  | PRESERVATION: G-good, M-moderate, P-poor                       |        |      |         |        |                                                 |                                       |                               |                       |                                                                                                               |
|                |                  |                                                                |        |      | 1       | 0.5    | See key to graphic lithology symbols (Figure 7) | --- slight; --- moderate; --- severe; | S=smear slide V=some velocity | see explanatory notes | Lithologic Description<br><br>Smear Slide Description<br>Section-Depth (cm)<br>% Components<br><br>Grain Size |
|                |                  |                                                                |        |      | 2       | 1.0    |                                                 |                                       |                               |                       |                                                                                                               |
|                |                  |                                                                |        |      | 3       |        |                                                 |                                       |                               |                       |                                                                                                               |
|                |                  |                                                                |        |      | 4       |        |                                                 |                                       |                               |                       |                                                                                                               |
|                |                  |                                                                |        |      | 5       |        |                                                 |                                       |                               |                       |                                                                                                               |
|                |                  |                                                                |        |      | 6       |        |                                                 |                                       |                               |                       |                                                                                                               |
|                |                  |                                                                |        |      | 7       |        |                                                 |                                       |                               |                       |                                                                                                               |
|                |                  |                                                                |        | CC   |         |        |                                                 |                                       |                               |                       |                                                                                                               |

Figure 5. Sample core form (sediment).

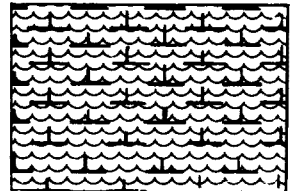
15  
Nannofossil Ooze



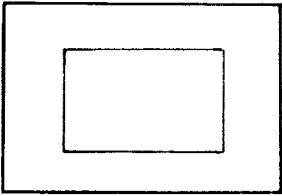
Foram-Nanno Ooze



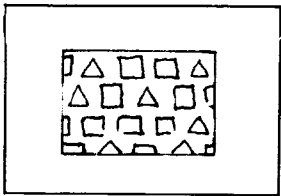
Marly Nanno Ooze



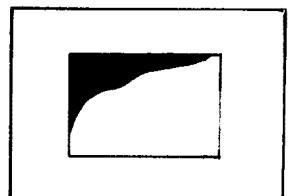
Sparcely phyrlic basalt (Shape of piece)



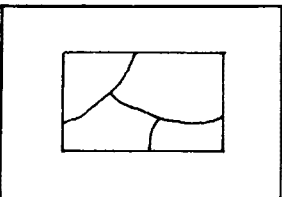
Porphyritic basalt (Shape of piece)



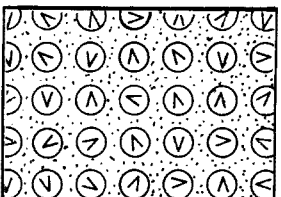
Glass (black)



Fracture or Vein



Basaltic Sand and Gravel



Drilling Disturbance: - - - - - Slight; - - - - - Moderate; ~~~~~ Severe

Alteration of Basalt: Blank = fresh, / = moderate, ——— = severe

Figure 6. Symbols used on core forms.

accuracy of  $\pm 10\%$  for major constituents is rarely attained. Carbonate content is especially difficult to estimate in smear slides, as is the amount of clay present. The location of smear slides made are given on the core description sheets.

### Sediment Induration

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

#### a). Calcareous sediments

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

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

Hard: Cemented rocks are termed limestones.

#### b). The following criteria are used for other sediments:

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

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

### Sediment Classification

The sediment classification scheme used on Leg 46 is basically that devised by the JOIDES Panel on Sedimentary Petrology and Physical Properties

and adopted for use by the JOIDES Planning Committee in March, 1974, with minor modifications. The classification is outlined below. Only those portions pertinent to Leg 46 are listed. A compilation of symbols is given in Figure 6.

- I. General rules for class limits and order of components in a sediment name.
  - A. Sediment assumes the names of those components present only in quantities greater than 15 per cent.
  - B. Where more than one component is present, the component in greatest abundance is listed farthest to the right, and other components are listed progressively to the left in order of decreasing abundance.
  - C. The class limits are based on percentage intervals given below for various sediment types.

## II. Pelagic Biogenic Calcareous Sediments

>30%  $\text{CaCO}_3$   
<30% terrigenous components  
<30% siliceous microfossils

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

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

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

## III. Transitional Biogenic Calcareous Sediments

>30%  $\text{CaCO}_3$   
>30% terrigenous components or pelagic clay  
<30% siliceous microfossils

If  $\text{CaCO}_3 = 30-60\%$ : marly is used as a qualifier.

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

If  $\text{CaCO}_3 > 60\%$ :

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

NOTE: Sediments containing 10-30 per cent  $\text{CaCO}_3$  fall in other classes where they are denoted with the adjective "calcareous", "nannofossil", etc.

### Biostratigraphy

At the time of this compilation biostratigraphic studies of Leg 46 sediments are still in progress. Age boundaries shown are based on preliminary nannofossil studies by D. Bukry (USGS).

## BASEMENT DESCRIPTION

### Core Forms

Initial Core Description forms for igneous and metamorphic rocks are not the same as those used for sediments. The sediment barrel sheets are substantially those published in previous Initial Reports. Igneous rock representation on barrel sheets, however, is too compressed to provide adequate information about the rocks sampling. Consequently, Visual Core Description forms, modified from those used on board ship, are used here for more complete graphic representation. Each of these forms covers one 1.5 meter section. All shipboard chemical and physical property data, as well as summary hand-specimen and thin section descriptions are presented for each section.

The symbols and number of format conventions for igneous and metamorphic rocks are presented in Figure 6. It is expected that this list will increase and be amended on future legs.

All basalts on Leg 46 were split using a rock saw into archive and working halves. The latter was described and sampled on board ship. In a typical basalt description form (Figure 7), the left box is a visual representation of the working half using the symbols of Figure 6. Two closely spaced horizontal lines in this column indicate the location of styrofoam spacers taped between basalt pieces inside the liner. Each piece is numbered sequentially from the top of each section, beginning with the number 1. Pieces are labeled on the rounded, not the sawed surface. Pieces which could be fit together before splitting are given

the same number, but are separately consecutively lettered, as 1A, 1B, 1C, etc. Spacers were placed between pieces with different numbers, but not between those with different letters and the same number. In general, addition of spacers represents a drilling gap (no recovery). All pieces which are cylindrical and longer than the liner diameter have orientation arrows pointing up, both on the archive and working halves. Special procedures were adopted to ensure that orientation was preserved through every step of the sawing and labeling process. All orientable pieces are indicated by upward-pointing arrows to the right of the graphic representation on the description forms. Since the pieces were rotated during drilling it is not possible to sample for declination studies.

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

- C = X-ray fluorescence and CHN chemical analysis
- M = magnetics measurement
- V = sonic velocity measurements
- T = thin section
- D = density measurements
- P = porosity measurements

The state of alteration (see Figure 6 for symbols) is shown in the column labeled "Alteration."

On Leg 46 some pieces were stored permanently in distilled water. These are labeled with a "W" in the "Special Storage" column.

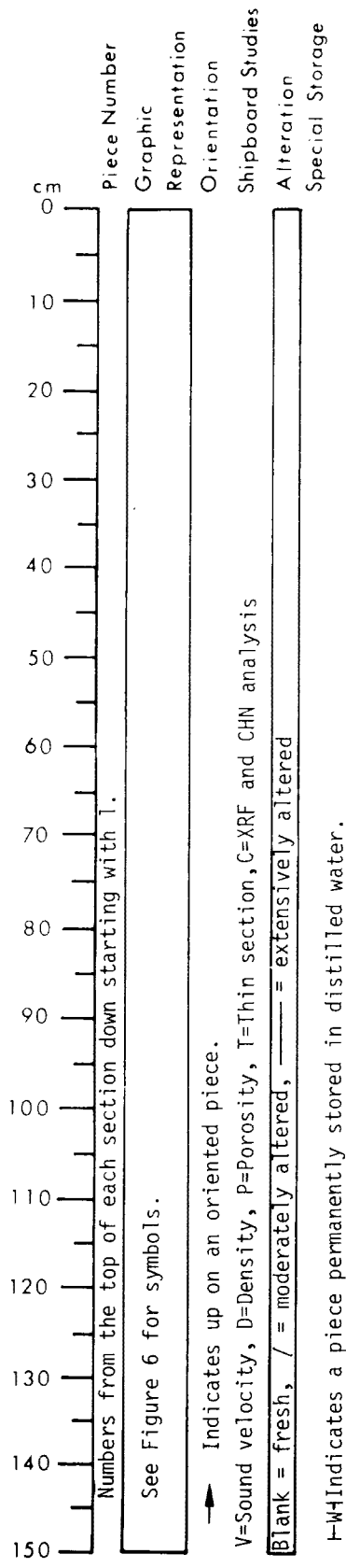


## Igneous and Metamorphic Rock Classification

All the igneous rocks recovered on Leg 46 are basalts. Their classification is based primarily on mineralogy of minerals visible in hand specimens, and secondarily on texture. Thin section work in general added no new information to the hand specimen classification.

Basalts were termed sparsely phyric or porphyritic, depending on the proportion of phenocrysts visible with binocular microscope ( $\sim 12\times$ ). Sparsely phyric basalts are those with less than about 1-2 per cent phenocrysts. Porphyritic basalts contain more than 10 per cent phenocrysts. No basalts of intermediate phenocryst content were recovered.

No petrochemical or normative classification schemes are used on the core forms. More complete data will allow this type of classification in the Initial Report.



### VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
|     |      |      |      |     |

Depth: \_\_\_\_\_ m to \_\_\_\_\_ m

Summary of Visual Description

Summary of Thin Section Description

Shipboard Chemical and Physical Property Data

Figure 7. Sample core form (basement).

# sample-distribution policy

**D**istribution 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.)*

REFERENCES

Moberly, R., Jr., and Heath, G. R., 1971. Carbonate sedimentary rocks from the western Pacific: Leg 7, Deep Sea Drilling Project, in Winterer, E. L., Riedel, W. R., et al., 1971, Initial Reports of the Deep Sea Drilling Project, v. 7, Washington (U. S. Government Printing Office), p. 977-985.

SITE SUMMARY SHEET

LEG 46

SITE 396 HOLE A

|                               |                                             |
|-------------------------------|---------------------------------------------|
| Date Occupied                 | <u>0120 February 5, 1976</u>                |
| Date Departed                 | <u>2000 February 6, 1976</u>                |
| Time on Hole                  | <u>42.7 hrs.</u>                            |
| Position: Latitude            | <u>22°59.14'N</u>                           |
| Longitude                     | <u>43°30.90'W</u>                           |
| Water Depth (sea level)       | <u>4459 corrected meters, echo sounding</u> |
| Water Depth (rig floor)       | <u>4463 corrected meters, echo sounding</u> |
| Bottom Felt at                | <u>4465 meters, drill pipe</u>              |
| Penetration                   | <u>123.5 meters</u>                         |
| Number of Holes               | <u>1</u>                                    |
| Number of Cores               | <u>2</u>                                    |
| Total Length of Cored section | <u>13 meters</u>                            |
| Total Core Recovered          | <u>0.64 meters</u>                          |
| Percentage Core Recovery      | <u>4.9%</u>                                 |
| <u>Oldest Sediment Cored</u>  |                                             |
| Depth Subbottom               | <u>120 meters</u>                           |
| Nature                        | <u>nanno foram ooze</u>                     |
| Age                           | <u>Pliocene</u>                             |
| Measured velocity             | <u>1.5, 1.6 km/sec</u>                      |
| <u>Basement</u>               |                                             |
| Depth Subbottom               | <u>basement not penetrated</u>              |
| Nature                        | <u>probably basalt (no recovered)</u>       |
| Velocity Range                | <u>--- km/sec</u>                           |

Site Summary Sheet  
Leg 46, Site 396, Hole A (continued)

Principal Results:

The purpose of this hole was to determine exact sediment thickness so proper casing length could be hung below cone on deep hole attempt. This hole was washed down to near basement. Then two sediment cores were taken before drilling indicated basalt was reached.

| SITE 396               | HOLE A     | CORE 1        | CORED INTERVAL: 0.0-9.5 m |        | LITHOLOGIC SAMPLE | LITHOLOGIC STRUCTURES | LITHOLOGIC DESCRIPTION                                                                                                                                                                                                                                                  |
|------------------------|------------|---------------|---------------------------|--------|-------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |            |               | SECTION                   | METERS |                   |                       |                                                                                                                                                                                                                                                                         |
| TIME-ROCK UNIT         | QUATERNARY | BIOSTRAT ZONE | (N) Gephyrocapsa Oceanica | FORAMS |                   |                       | Grayish-orange (10YR 7/4) nanmo-foram ooze - totally unconsolidated.<br>Components: 15% clay, 10% carbonate unspicified, 25% forams, 45% nanmos, 5% diatoms and rads<br>Approximate sonic velocity 1.5 km/sec<br>Grain size: 101 cm - 4.2% sand, 31.2% silt, 64.6% clay |
|                        |            |               |                           | NANNOS |                   |                       |                                                                                                                                                                                                                                                                         |
| FOSSIL CHARACTER       |            |               |                           |        |                   |                       |                                                                                                                                                                                                                                                                         |
| RADS                   |            |               |                           |        |                   |                       |                                                                                                                                                                                                                                                                         |
| SECTION                |            |               |                           | 1      | 0.5               | VOID                  |                                                                                                                                                                                                                                                                         |
| METERS                 |            |               |                           |        |                   |                       |                                                                                                                                                                                                                                                                         |
| GRAPHIC LITHOLOGY      |            |               |                           |        |                   |                       |                                                                                                                                                                                                                                                                         |
| DRILLING DISTURBANCE   |            |               |                           |        |                   |                       |                                                                                                                                                                                                                                                                         |
| SEDIMENTARY STRUCTURES |            |               |                           |        |                   |                       |                                                                                                                                                                                                                                                                         |
| LITHOLOGIC SAMPLE      |            |               |                           |        |                   |                       |                                                                                                                                                                                                                                                                         |

| SITE 396               | HOLE A | CORE 2        | CORED INTERVAL: 9.5-19.0 m |        | LITHOLOGIC SAMPLE | LITHOLOGIC STRUCTURES | LITHOLOGIC DESCRIPTION                                      |
|------------------------|--------|---------------|----------------------------|--------|-------------------|-----------------------|-------------------------------------------------------------|
|                        |        |               | SECTION                    | METERS |                   |                       |                                                             |
| TIME-ROCK UNIT         |        | BIOSTRAT ZONE |                            | FORAMS |                   |                       | Core catcher of grayish-orange (10YR 7/4) nanmo-foram ooze. |
|                        |        |               |                            | NANNOS |                   |                       |                                                             |
| FOSSIL CHARACTER       |        |               |                            |        |                   |                       |                                                             |
| RADS                   |        |               |                            |        |                   |                       |                                                             |
| SECTION                |        |               |                            |        |                   |                       |                                                             |
| METERS                 |        |               |                            |        |                   |                       |                                                             |
| GRAPHIC LITHOLOGY      |        |               |                            |        |                   |                       |                                                             |
| DRILLING DISTURBANCE   |        |               |                            |        |                   |                       |                                                             |
| SEDIMENTARY STRUCTURES |        |               |                            |        |                   |                       |                                                             |
| LITHOLOGIC SAMPLE      |        |               |                            |        |                   |                       |                                                             |

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SITE SUMMARY SHEET

|                               |                                             |
|-------------------------------|---------------------------------------------|
| LEG 46                        | SITE <u>396</u> HOLE <u>B</u>               |
| Date Occupied                 | <u>2000 February 6, 1976</u>                |
| Date Departed                 | <u>1845 March 1, 1976</u>                   |
| Time on Hole                  | <u>23.9 days</u>                            |
| Position: Latitude            | <u>22°59.14'N</u>                           |
| Longitude                     | <u>43°30.90'W</u>                           |
| Water Depth (sea level)       | <u>4459 corrected meters, echo sounding</u> |
| Water Depth (rig floor)       | <u>4463 corrected meters, echo sounding</u> |
| Bottom Felt at                | <u>4465 meters, drill pipe</u>              |
| Penetration                   | <u>405.5 meters</u>                         |
| Number of Holes               | <u>1</u>                                    |
| Number of Cores               | <u>33</u>                                   |
| Total Length of Cored section | <u>270.0 meters</u>                         |
| Total Core Recovered          | <u>63.56 meters</u>                         |
| Percentage Core Recovery      | <u>23.3%</u>                                |
| <u>Oldest Sediment Cored</u>  |                                             |
| Depth Subbottom               | <u>150.5 meters</u>                         |
| Nature                        | <u>nanno foram ooze</u>                     |
| Age                           | <u>Miocene</u>                              |
| Measured velocity             | <u>1.5 km/sec</u>                           |
| <u>Basement</u>               |                                             |
| Depth Subbottom               | <u>405.5 meters</u>                         |
| Nature                        | <u>basalt</u>                               |
| Velocity Range                | <u>3.4 to 6.0 km/sec</u>                    |



Site Summary Sheet  
Leg 46, Site 396, Hole B (continued)

Principal Results:

The basalts recovered are typical mid-ocean ridge tholeiites with relatively narrow limits in chemical composition, especially for MgO, while TiO<sub>2</sub> and FeO\* contents are relatively high. Basalts at the top are sparsely phyric; below this they are porphyritic and similar to ones at Site 396. The last 90 meters is a basaltic detritus. Magnetic units from top to bottom had inclinations of +18°, -67°, -7°, and +31° with the last being very poorly defined. Intensities varied from 1.03 to  $3.45 \times 10^{-3}$  emu/cc. Downhole logs were run for density, sonic velocity, porosity, electrical conductivity and natural gamma-ray activity. These logs could be correlated with many of the studies of recovered samples.

| SITE 396      | HOLE B                         | CORE 1   | CORED INTERVAL: 122.0-131.5 m | FOSSIL CHARACTER |               |        |        |      | LITHOLOGIC DESCRIPTION |                |                   |                                                                                                                                                                                                                                           |
|---------------|--------------------------------|----------|-------------------------------|------------------|---------------|--------|--------|------|------------------------|----------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                                |          |                               | TIME-ROCK UNIT   | BIOSTRAT ZONE | FORAMS | NANNOS | RADS |                        | SECTION METERS | GRAPHIC LITHOLOGY | DISTURBANCE                                                                                                                                                                                                                               |
| UPPER MIOCENE | (N) Triquetrorhabdulus rugosus | CG AG FG |                               |                  |               |        |        | 0.5  | VOID                   |                | V                 | Grayish orange (10YR 7/4) nanno-fossil ooze. Components: 20% clay, 10% carbonate unspecified, 15% forams, 50% nannos, 5% diatoms and rads. Grain size: 100 cm - 0.0% sand, 39.3% silt, 60.1% clay. Approximate sonic velocity 1.5 km/sec. |
|               |                                |          |                               |                  |               |        |        | 1.0  | VOID                   |                | A S C A V         |                                                                                                                                                                                                                                           |
|               |                                |          |                               |                  |               |        |        |      | VOID                   |                | V                 |                                                                                                                                                                                                                                           |

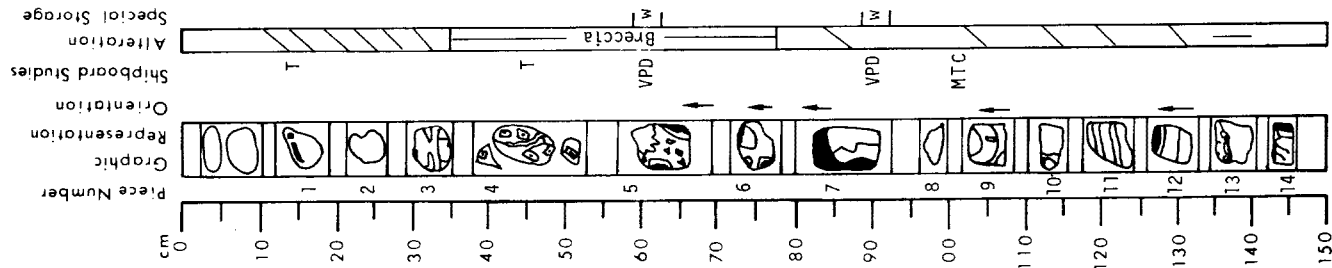
| SITE 396      | HOLE B         | CORE 3 | CORED INTERVAL: 141-150.5 m | FOSSIL CHARACTER |               |        |        |      | LITHOLOGIC DESCRIPTION |                |                   |                                                        |
|---------------|----------------|--------|-----------------------------|------------------|---------------|--------|--------|------|------------------------|----------------|-------------------|--------------------------------------------------------|
|               |                |        |                             | TIME-ROCK UNIT   | BIOSTRAT ZONE | FORAMS | NANNOS | RADS |                        | SECTION METERS | GRAPHIC LITHOLOGY | DISTURBANCE                                            |
| UPPER MIOCENE | (N) Amuroithus |        |                             |                  |               |        |        | 0.5  | VOID                   |                | V                 | Marly nanno ooze                                       |
|               |                |        |                             |                  |               |        |        | 1.0  | VOID                   |                | V                 | 91-96 cm is foram rich layer                           |
|               |                |        |                             |                  |               |        |        |      | VOID                   |                | V                 | Grain size: 100 cm - 0.1% sand, 20.6% silt, 79.3% clay |

| SITE 396      | HOLE B                     | CORE 2   | CORED INTERVAL: 131.5-141.0 m | FOSSIL CHARACTER |               |        |        |      | LITHOLOGIC DESCRIPTION |                |                   |                                                                                                                                                                                |
|---------------|----------------------------|----------|-------------------------------|------------------|---------------|--------|--------|------|------------------------|----------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                            |          |                               | TIME-ROCK UNIT   | BIOSTRAT ZONE | FORAMS | NANNOS | RADS |                        | SECTION METERS | GRAPHIC LITHOLOGY | DISTURBANCE                                                                                                                                                                    |
| UPPER MIOCENE | Triquetrorhabdulus rugosus | CG AG FG |                               |                  |               |        |        | 0.5  | VOID                   |                | V                 | 16-116 cm - grayish-orange (10YR 7/4) nanno-fossil ooze. Grain size: 99 cm - 0.0% sand, 37.3% silt, 62.7% clay                                                                 |
|               |                            |          |                               |                  |               |        |        | 1.0  | VOID                   |                | V S V S           | 116-120 cm - very pale brown (10YR 8/3) foram-nanno ooze, moderately indurated. Components: 10% clay, 25% carbonate unspecified, 50% forams, 10% nannos, 5% diatoms and rads   |
|               |                            |          |                               |                  |               |        |        |      | VOID                   |                | V S               | 120-128 cm - dark brown (10YR 4/4) marly nanno ooze, moderately indurated. Components: 5% heavy minerals, 55% clay, 5% carbonate unspecified, 25% nannos, 10% diatoms and rads |
|               |                            |          |                               |                  |               |        |        |      | VOID                   |                | V S               | 128-150 cm - brownish yellow (10YR 6/6) marly nanno ooze                                                                                                                       |
|               |                            |          |                               |                  |               |        |        |      | VOID                   |                | V                 | Approximate sonic velocity 1.6 km/sec.                                                                                                                                         |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|       |         |    |      |     |
|-------|---------|----|------|-----|
| LEG   | SITE    | HO | CORE | SEC |
| 46396 | B010401 |    |      |     |

Depth: 150.5 m to 152.0 m



Visual Description

Structure: Pillow lava sequence with 4 subdivisions: 1) altered basalt (10-35 cm); 2) sideromelane-carbonate breccia (35-70 cm); 3) massive thick pillow (70-120 cm); and 4) smaller broken-up pillows with some carbonate breccias (120-150 cm).

Texture: Dominantly pillow rinds, generally with variolitic zones, about 30% more thoroughly crystallized basalt.

Mineralogy: Very sparsely olivine-phyric (much less than 1% becoming slightly more abundant downwards) with rare plagioclase phenocrysts, in some cases glomerophyric. Size of phenocrysts generally less than 1 mm. Vesicles generally less than 2%(?), round to irregular, partly filled with clays(?), rarely carbonate.

Alteration: Relatively fresh except for about 1 cm wide alteration halos around fractures, many of which are filled by fine-grained carbonate. Some olivines partially iddingsitized, some sideromelane partly palagonitized; partial recrystallization of fine-grained carbonate.

Thin Section Description

Phenocrysts: less than 1% olivine and plagioclase

Groundmass: olivine, 5%, 0.1-0.2 mm, skeletal; plagioclase, 30%, 0.1-0.5 mm, spherulitic and skeletal; clinopyroxene, 10%, very small, skeletal; glass, 55%, brown fresh and palagonitized on pillow margin, altered the clay in interior. Vesicles: 1%, less than 1 mm

Texture: holohyaline, variolitic, intersertal

Alteration: clay partially filling vesicles

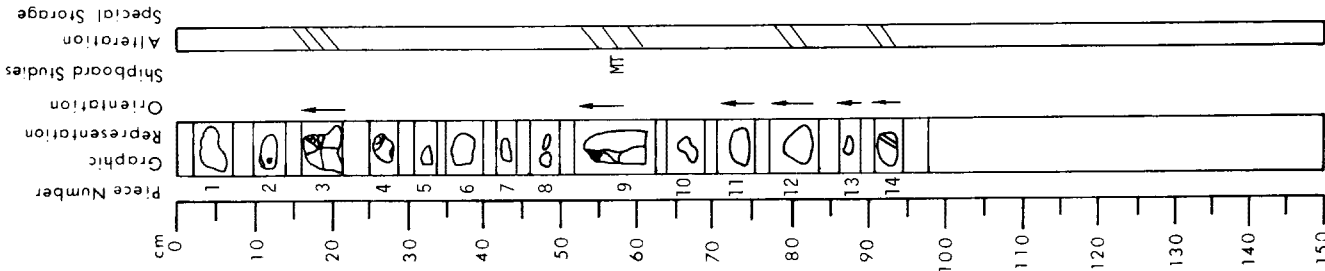
Shipboard Data

|                                |       |                               |       |
|--------------------------------|-------|-------------------------------|-------|
| Bulk Analysis: 103-105 cm      |       | Magnetic Data: 103-105 cm     |       |
| SiO <sub>2</sub>               | 49.91 | MnO                           | 0.18  |
| Al <sub>2</sub> O <sub>3</sub> | 15.51 | Loss on Ignition              | -1.67 |
| Fe <sub>2</sub> O <sub>3</sub> | 10.20 | H <sub>2</sub> O <sup>+</sup> | 0.93  |
| MgO                            | 7.88  | CO <sub>2</sub>               | 0.14  |
| CaO                            | 11.87 | Cr                            | 355.0 |
| Na <sub>2</sub> O              | 2.53  | Ni                            | 146.0 |
| K <sub>2</sub> O               | 0.28  | Sr                            | 126.0 |
| TiO <sub>2</sub>               | 1.43  | Zr                            | 97.0  |
| P <sub>2</sub> O <sub>5</sub>  | 0.15  |                               |       |
| Physical Properties: 60-62 cm  |       | Vp (km/sec)                   |       |
|                                |       | 3.5*                          |       |
|                                |       | Porosity (%)                  |       |
|                                |       | 35.0                          |       |
|                                |       | Wet Bulk Density              |       |
|                                |       | 1.92                          |       |
|                                |       | Grain Density                 |       |
|                                |       | 2.40                          |       |
|                                |       | Stable Inclination            |       |
|                                |       | +15.5                         |       |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|       |         |    |      |     |
|-------|---------|----|------|-----|
| LEG   | SITE    | HO | CORE | SEC |
| 46396 | B010402 |    |      |     |

Depth: 152.0 m to 153.5 m



Visual Description

Structure: Pillow lava sequence.

Texture: Dominantly pillow rinds with variolitic zones.

Mineralogy: Very sparsely olivine-phyric with rare plagioclase phenocrysts (< 1 mm). Vesicles less than 2%, partly filled by clays, rarely carbonate.

Alteration: Relatively fresh, except near fractures. Glass partly palagonitized, or iddingsitized.

Thin Section Description

Phenocrysts: less than 1%, olivine

Groundmass: olivine, 3%, 0.1-0.2 mm, skeletal; plagioclase, 30%, up to 0.3 mm, skeletal and spherulitic; glass, 66%, partially altered

Vesicles: 3%, 0.2-0.4 mm, empty

Texture: intersertal

Shipboard Data

|                         |                    |                         |
|-------------------------|--------------------|-------------------------|
| Magnetic Data: 57-59 cm | Intensity (emu/cc) | 1.68 x 10 <sup>-4</sup> |
| Stable inclination      |                    | +11.0                   |

### VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE  | H | O | CORE | SEC |
|-----|-------|---|---|------|-----|
| 4   | 63916 | B | 0 | 0    | 501 |

Depth: 157.0 m to 158.5 m

#### Visual Description

Structure: Variably altered aphyric pillowed basalts. Cemented by indurated carbonate ooze.

Texture and Mineralogy: The basaltic rock have widely variable textures ranging from haloyaline in the glass rims of the pillows to almost intersertal in the largest blocks. Few to rare olivine microphenocrysts ranging from 0.5 to 1 mm (and exceptionally up to 1.5 mm) in length are observed. Plagioclase is very rarely found as microphenocrysts but are most abundant as very small (much less than 1 mm in length) microclites. Glomerophyric aggregates of plagioclase are rare.

Vesicles are always very abundant, and their diameter is about 0.1 to 0.2 mm but 0.5 mm vesicles have been frequently observed as well as larger irregularly shaped cavities. They are often filled with zeolites(?) and more rarely smectites.

Alteration: Most samples are altered except for one piece (#9); the alteration appears to follow the fracture network and shows up as concentric rims of various colors from pale yellowish brown to olive green. Olivine is generally altered to "iddingsite" in the altered rims and it is probably more often unaltered in the fresh basaltic cores.

#### Thin Section Description

Phenocrysts: less than 1% olivine

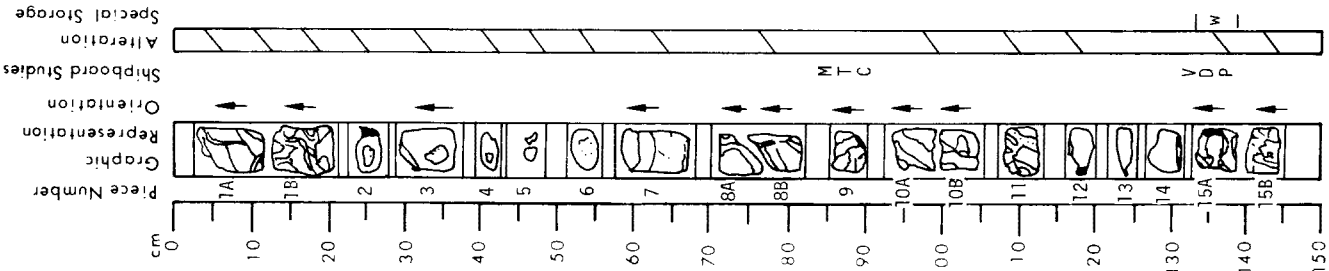
Groundmass: olivine, 2%; 0.05-0.1 mm, skeletal; plagioclase, 40%, 0.1-0.4 mm, skeletal and spherulitic; clinopyroxene, 37%, 0.05-0.4 mm, skeletal and spherulitic, glass, 20%, altered

Vesicles: 2%, 0.5 mm

Texture: intersertal

#### Shipboard Data

|                                |           |                                   |                                            |
|--------------------------------|-----------|-----------------------------------|--------------------------------------------|
| Bulk Analysis: 86-88 cm        |           | Magnetic Data: 86-88 cm           |                                            |
| SiO <sub>2</sub>               | 49.69 MnO | 0.18                              | Intensity (emu/cc) 1.49 x 10 <sup>-3</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 15.65     | Loss on ignition -0.93            | Stable inclination +17.5                   |
| Fe <sub>2</sub> O <sub>3</sub> | 10.01     | H <sub>2</sub> O <sup>+</sup> .73 | Physical Properties: 135-137 cm            |
| MgO                            | 8.05      | CO <sub>2</sub> .13               | Vp (km/sec) 4.9                            |
| CaO                            | 11.30     | Cr 358.0                          | Porosity (%) 14.0                          |
| Na <sub>2</sub> O              | 2.53      | Ni 124.0                          | Wet Bulk Density 2.52                      |
| K <sub>2</sub> O               | 0.18      | Sr 118.0                          | Grain Density 2.77                         |
| TiO <sub>2</sub>               | 1.37      | Zr 89.0                           |                                            |
| P <sub>2</sub> O <sub>5</sub>  | 0.14      |                                   |                                            |



### VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE  | H | O | CORE | SEC  |
|-----|-------|---|---|------|------|
| 4   | 63916 | B | 0 | 0    | 5102 |

Depth: 158.5 m to 160.0 m

#### Visual Description

Structure: Variably altered aphyric pillowed basalts. Cemented by indurated carbonate ooze.

Texture and Mineralogy: The basaltic rock have widely variable textures ranging from haloyaline in the glass rims of the pillows to almost intersertal in the largest blocks. Few to rare olivine microphenocrysts ranging from 0.5 to 1 mm (and exceptionally up to 1.5 mm) in length are observed. Plagioclase is very rarely found as microphenocrysts but are most abundant as very small (much less than 1 mm in length) microclites. Glomerophyric aggregates of plagioclase are rare.

Vesicles are always very abundant, and their diameter is about 0.1 to 0.2 mm but 0.5 mm vesicles have been frequently observed as well as larger irregularly shaped cavities. They are often filled with zeolites(?) and more rarely smectites.

Alteration: Most samples are altered; the alteration appears to follow the fracture network and shows up as concentric rims of various colors from pale yellowish brown to pale gray, around fresher (dark gray) cores. Olivine is generally altered to "iddingsite" in the altered rims and it is probably more often unaltered in the fresh basaltic cores.

#### Thin Section Description

Phenocrysts: less than 1% olivine, altered

Groundmass: olivine, less than 1%; plagioclase, 40%, skeletal and spherulitic, clinopyroxene, 25%, 0.05-0.1 mm, skeletal and spherulitic, opaque, 5%, 1-2, skeletal, glass, 28%

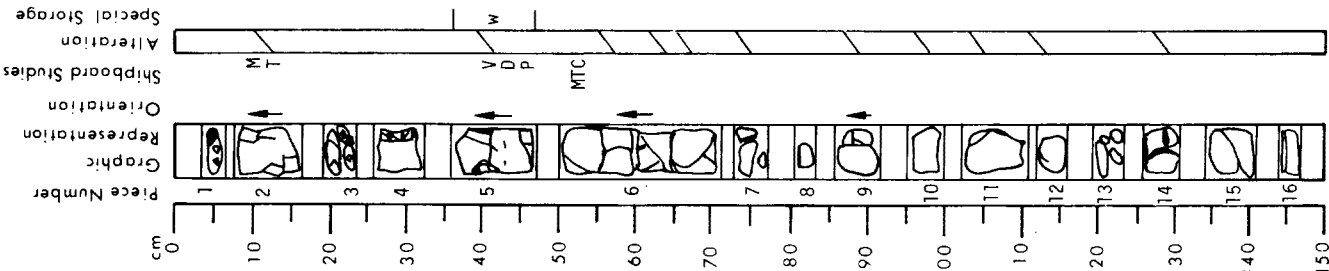
Vesicles: 3%, less than 1 mm

Texture: spherulitic to intersertal

Alteration: glass partly altered to clay, calcite partly filling vesicles; clay, calcite, and zeolite filling vein

#### Shipboard Data

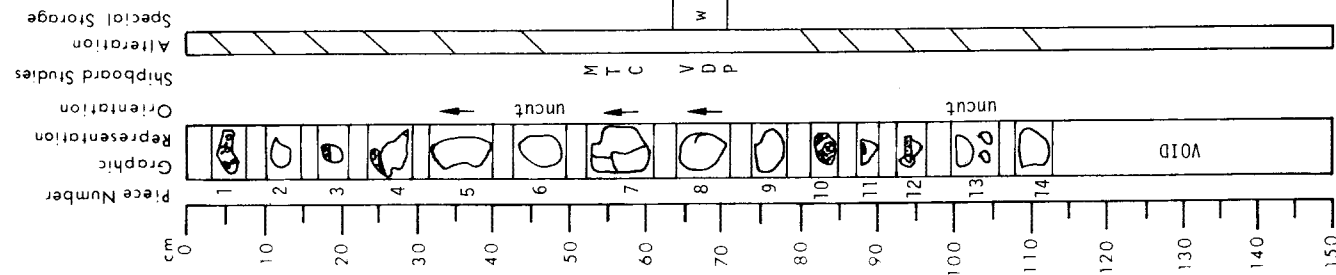
|                                |           |                                    |                                            |
|--------------------------------|-----------|------------------------------------|--------------------------------------------|
| Bulk Analysis: 51-53 cm        |           | Magnetic Data: 12-14 cm            |                                            |
| SiO <sub>2</sub>               | 49.66 MnO | 0.17                               | Intensity (emu/cc) 3.83 x 10 <sup>-5</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 15.28     | Loss on ignition -1.79             | Stable inclination +21.5                   |
| Fe <sub>2</sub> O <sub>3</sub> | 10.21     | H <sub>2</sub> O <sup>+</sup> .77  | Physical Properties: 38-40 cm              |
| MgO                            | 7.96      | H <sub>2</sub> O <sup>-</sup> N.D. | Vp (km/sec) 5.9                            |
| CaO                            | 12.03     | CO <sub>2</sub> .37                | Porosity (%) 5.0                           |
| Na <sub>2</sub> O              | 2.53      | Cr 327.0                           | Wet Bulk Density 2.75                      |
| K <sub>2</sub> O               | 0.29      | Ni 140.0                           | Grain Density 2.85                         |
| TiO <sub>2</sub>               | 1.40      | Sr 120.0                           |                                            |
| P <sub>2</sub> O <sub>5</sub>  | 0.12      | Zr 95.0                            |                                            |



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 46  | 396  | B    | 016  | 01  |

Depth: 166.5 m to 168.0 m



**Visual Description**  
 Structure: Basalt pillow sequence with interbedded nanofossil ooze, now well-lithified. Contains considerable carbonate-palagonite breccia.  
 Texture: Sediment - well-lithified. Basalt - pillows with glassy rim, variolitic zone and microilitic interior.  
 Mineralogy: Basalt - very rare phenocrysts of olivine.  
 Alteration: Palagonitization of small basalt fragments and pillow rims. Brown alteration of basalt along fracture.

**Thin Section Description**  
 Phenocrysts: 1% olivine  
 Groundmass: olivine, 4%, .05 mm, anhedral; plagioclase, 35%, 0.1-0.4 mm, skeletal to spherulitic; clinopyroxene, 20%, 0.1 mm, skeletal to dendritic; opaque, 15%, 0.05 mm, anhedral, glass, 25%, altered  
 Vesicles: 5%, less than 1 mm  
 Texture: intersertal

**Alteration:** clay and calcite filling vesicles, glass altered to clay  
**Shipboard Data**  
 Bulk Analysis: 55-57 cm  
 SiO<sub>2</sub> 50.03 MnO 0.17  
 Al<sub>2</sub>O<sub>3</sub> 16.14 Loss on ignition -2.64  
 Fe<sub>2</sub>O<sub>3</sub> 9.58 H<sub>2</sub>O<sup>+</sup> .94  
 MgO 7.66 H<sub>2</sub>O<sup>-</sup> N.D.  
 CaO 12.24 CO<sub>2</sub> .22  
 Na<sub>2</sub>O 2.59 Cr 341.0  
 K<sub>2</sub>O 0.25 Ni 138.0  
 TiO<sub>2</sub> 1.44 Sr 146.0  
 P<sub>2</sub>O<sub>5</sub> 0.14 Zr 90.0

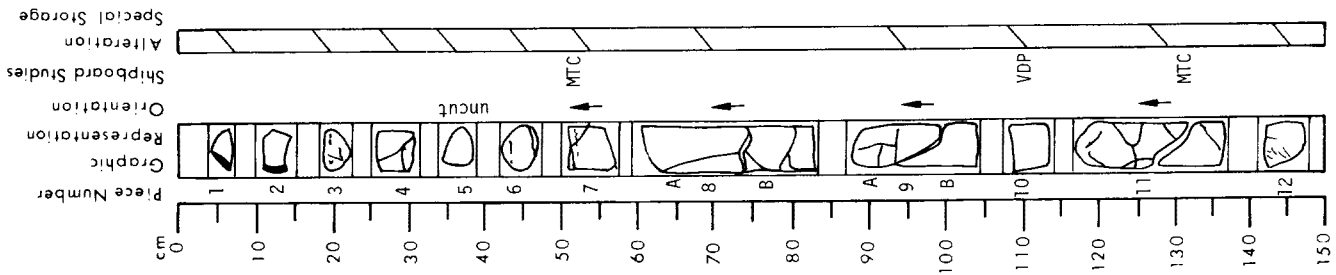
Magnetic Data: 55-57 cm  
 Intensity (emu/cc) 0.95 x 10<sup>-3</sup>  
 Stable inclination +22.0

Physical Properties: 66-68 cm  
 Vp (km/sec) 5.6  
 Porosity (%) 2.1  
 Wet Bulk Density 2.86  
 Grain Density 2.90

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 46  | 396  | B    | 017  | 01  |

Depth: 174.0 m to 175.5 m



**Visual Description**  
 Structure: Basalt pillow sequence.  
 Texture: Basalt - primarily microilitic pillow margins are glassy with a variolitic zone grading into a microilitic interior.  
 Mineralogy: Basalt - sparse olivine and plagioclase phenocrysts - plagioclase appears to increase slightly downward.  
 Alteration: Brown alteration near cracks. Some vug fillings in variolitic zones.

**Thin Section Description**  
 Phenocrysts: 1% olivine (altered) and plagioclase  
 Groundmass: olivine, 5%, 1-5 mm, skeletal; plagioclase, 35%, 1-5 mm, skeletal to spherulitic; clinopyroxene, 15%, .05 mm, skeletal to spherulitic; opaque, 5%, skeletal, 5; glass, 35%, altered  
 Vesicles: 5% to 1 mm, mostly empty  
 Texture: intersertal

**Alteration:** clay filling some vesicles, glass altered to clays  
**Shipboard Data**  
 Bulk Analysis: 53-55 cm 132-134 cm  
 SiO<sub>2</sub> 49.42 49.42  
 Al<sub>2</sub>O<sub>3</sub> 15.63 15.30  
 Fe<sub>2</sub>O<sub>3</sub> 10.47 10.42  
 MgO 8.03 8.02  
 CaO 11.82 11.70  
 Na<sub>2</sub>O 2.53 2.63  
 K<sub>2</sub>O 0.19 0.25  
 TiO<sub>2</sub> 1.42 1.42  
 P<sub>2</sub>O<sub>5</sub> 0.14 0.14  
 MnO 0.19 0.18  
 Loss on ignition -1.27 -2.01  
 H<sub>2</sub>O<sup>+</sup> .81 0.97  
 H<sub>2</sub>O<sup>-</sup> N.D. N.D.  
 CO<sub>2</sub> .23 0.13  
 Cr 357.0 345.0  
 Ni 133.0 133.0  
 Sr 122.0 124.0  
 Zr 99.0 96.0

Magnetic Data: 53-55 cm 132-134 cm  
 Intensity (emu/cc) 1.10 x 10<sup>-3</sup> 0.91 x 10<sup>-3</sup>  
 Stable inclination +19.5 +20.5

Physical Properties: 110-112 cm  
 Vp (km/sec) 5.5  
 Porosity (%) 3.5  
 Wet Bulk Density 2.82  
 Grain Density 2.89

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 416 | 396  | B    | 0017 | 012 |

Depth: 175.5 m to 177.0 m

Visual Description

Structure: Basalt pillow sequence - flow units larger than in Core 6 - no sediment.  
 Texture: Basalt glass near pillow margins, thin variolitic zone and microlitic center. Most fragments have microlitic texture.

Mineralogy: Sparse olivine and plagioclase phenocrysts (<1%).

Alteration: Glass slightly palagonitized. Brown alteration along cracks and calcite veins. Vesicle filling in variolitic zone in piece #9.

Thin Section Description

Phenocrysts: 1% plagioclase

Groundmass: olivine, 5%, 0.2 mm, skeletal - auhedral; plagioclase, 40%, to 0.5 mm, skeletal-spherulitic; clinopyroxene, 10%, 0.05 mm, skeletal-spherulitic; opaque, 10%, 2μ, skeletal; glass, 30%, partially altered

Vesicles: 40%, less than 1 mm, mostly empty

Texture: intersertal

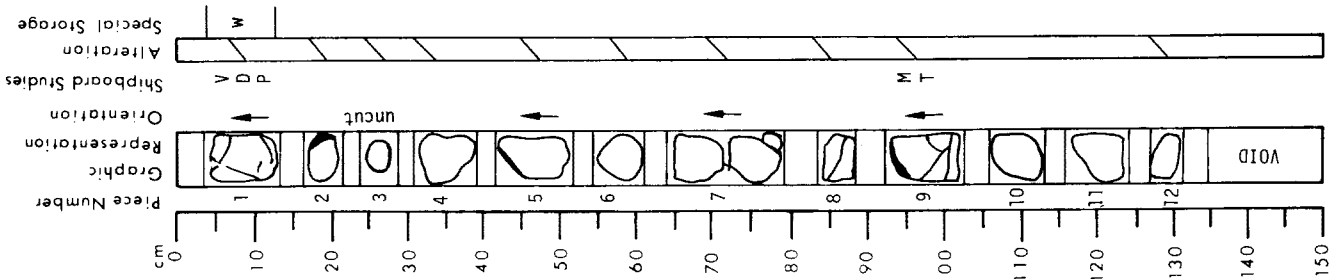
Alteration: clay and zeolite filling vesicles

Shipboard Data

Magnetic Data: 96-98 cm  
 Intensity (emu/cc) 0.75 x 10<sup>-3</sup>  
 Stable inclination +21.0

Physical Properties: 8-10 cm

Vp (km/sec) 4.7  
 Porosity (%) 9.9  
 Wet Bulk Density 2.76  
 Grain Density 2.96



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 416 | 396  | B    | 0017 | 003 |

Depth: 177.0 m to 178.5 m

Visual Description

Structure: Basalt pillow sequence - flow units larger than in Core 6 - no sediment.  
 Texture: Basalt glass near pillow margins, thin variolitic zone and microlitic center. Most fragments have microlitic texture.

Mineralogy: Sparse olivine and plagioclase phenocrysts (<1%).

Alteration: Glass slightly palagonitized. Brown alteration along cracks and calcite veins.

Thin Section Description

Phenocrysts: ~1% olivine

Groundmass: olivine, 1%, subhedral to skeletal; plagioclase 20%, to 1 mm, skeletal laths; clinopyroxene, fine-grained in groundmass; opaque, 2-3μ, skeletal

Vesicles: 1%, to 0.5 mm, some partly filled with smectite or calcite

Texture: intersertal

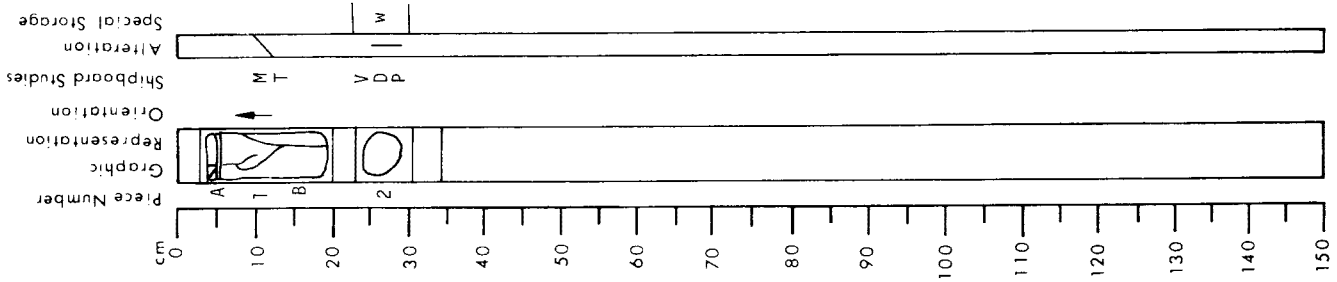
Alteration: clay replacing glass, calcite as vesicle fillings and auhedral patches

Shipboard Data

Magnetic Data: 13-15 cm  
 Intensity (emu/cc) 1.27 x 10<sup>-3</sup>  
 Stable inclination +21.5

Physical Properties: 25-27 cm

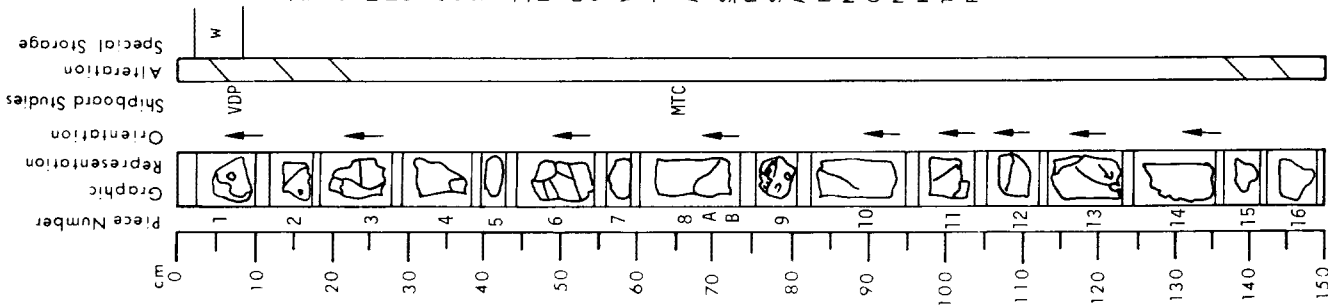
Vp (km/sec) 4.6  
 Porosity (%) 15.3  
 Wet Bulk Density 2.67  
 Grain Density 2.98



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|        |      |      |    |   |      |     |
|--------|------|------|----|---|------|-----|
| LEG    | SITE | H    | O  | L | CORE | SEC |
| 463916 | B    | 0108 | 01 |   |      |     |

Depth: 183.5 m to 185.0 m



**Visual Description**  
 Lithology: Basalt pillow sequence. Grain size generally increases toward center of pillows. Vesicles increase and become more irregular from glassy rind toward center of pillows.  
 Mineralogy: Very sparsely plagioclase and olivine phyric (less than 1%). Plagioclase phenocrysts (up to larger than 1 cm) commonly have rounded outlines. Olivine is generally present, and some are euhedral and very fresh.  
 Alteration: Except for ~1-2 cm oxidized halos there is much fresh basalt. Fractures are generally filled with two generations of minerals (zeolite? followed by clay and/or carbonate?). Also vesicles in coarser-grained basalt filled with smectite(?) lining, and a center of white zeolite or carbonate(?).

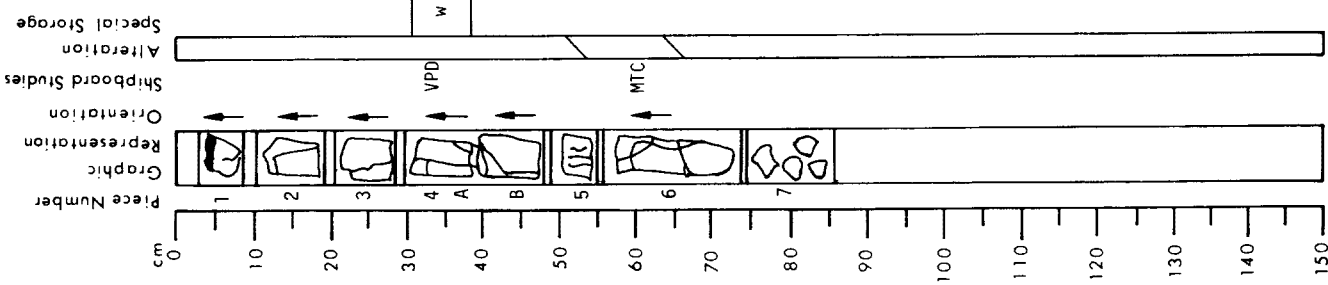
**Thin Section Description**

Phenocrysts: less than 1% olivine and plagioclase  
 Groundmass: olivine, ~10%, ~1 mm, skeletal; plagioclase, about 50%, needles; clinopyroxene, dendrite and rare needles in mesostasis; glass, 20-30%  
 Vesicles: ~2%, ~0.5 mm, most partly filled  
 Texture: varfolitic to intersertal

**Alteration: yellow clay as vesicle fillings**

**Shipboard Data**

|                                |       |                               |       |
|--------------------------------|-------|-------------------------------|-------|
| Bulk Analysis: 62-64 cm        |       | Magnetic Data: 62-64 cm       |       |
| SiO <sub>2</sub>               | 49.96 | MnO                           | 0.19  |
| Al <sub>2</sub> O <sub>3</sub> | 15.38 | Loss on ignition              | -2.08 |
| Fe <sub>2</sub> O <sub>3</sub> | 10.61 | H <sub>2</sub> O <sup>+</sup> | 1.24  |
| MgO                            | 7.93  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                            | 11.50 | CO <sub>2</sub>               | 0.16  |
| Na <sub>2</sub> O              | 2.53  | Cr                            | 308.0 |
| K <sub>2</sub> O               | 0.31  | Ni                            | 124.0 |
| TiO <sub>2</sub>               | 1.51  | Sr                            | 131.0 |
| P <sub>2</sub> O <sub>5</sub>  | 0.16  | Zr                            | 92.0  |



**Visual Description**  
 Lithology: Basalt pillow sequence. Grain size generally increases toward center of pillows. Vesicles increase and become more irregular from glassy rind toward center of pillows.  
 Mineralogy: Very sparsely plagioclase and olivine phyric (less than 1%). Plagioclase phenocrysts (up to larger than 1 cm) commonly have rounded outlines. Olivine is generally present, and some are euhedral and very fresh.  
 Alteration: Except for ~1-2 cm oxidized halos there is much fresh basalt. Fractures are generally filled with two generations of minerals (zeolite? followed by clay and/or carbonate?). Also vesicles in coarser-grained basalt filled with smectite(?) lining, and a center of white zeolite or carbonate(?).

**Thin Section Description**

Phenocrysts: <1% olivine  
 Groundmass: olivine, 5%, 0.5 mm, skeletal; plagioclase, 30%; clinopyroxene, 0.3 mm dendrites in mesostasis; glass, ~60%, tachylite  
 Vesicles: <5%, ~0.5 mm, some completely filled  
 Texture: intersertal

**Alteration: clay and calcite filling vesicles**

**Shipboard Data**

|                                |       |                               |       |
|--------------------------------|-------|-------------------------------|-------|
| Bulk Analysis: 60-62 cm        |       | Magnetic Data: 60-62 cm       |       |
| SiO <sub>2</sub>               | 50.13 | MnO                           | 0.19  |
| Al <sub>2</sub> O <sub>3</sub> | 15.30 | Loss on ignition              | -3.57 |
| Fe <sub>2</sub> O <sub>3</sub> | 10.29 | H <sub>2</sub> O <sup>+</sup> | 1.21  |
| MgO                            | 7.17  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                            | 11.80 | CO <sub>2</sub>               | 0.50  |
| Na <sub>2</sub> O              | 2.66  | Cr                            | 293.0 |
| K <sub>2</sub> O               | 0.27  | Ni                            | 130.0 |
| TiO <sub>2</sub>               | 1.55  | Sr                            | 141.0 |
| P <sub>2</sub> O <sub>5</sub>  | 0.14  | Zr                            | 109.0 |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|        |      |      |    |   |      |     |
|--------|------|------|----|---|------|-----|
| LEG    | SITE | H    | O  | L | CORE | SEC |
| 463916 | B    | 0108 | 02 |   |      |     |

Depth: 185.0 m to 186.5 m

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |        |      |     |
|-----|------|--------|------|-----|
| LEG | SITE | HOLE   | CORE | SEC |
| 46  | 396  | B00901 |      |     |

Depth: 193.0 m to 194.5 m

Visual Description

Lithology: Massive, vesicular, sparsely phyric basalt throughout with scattered glassy pillow rinds. The glassy margins grade inward to a variolitic zone in which vesicles are filled with a brown alteration product. Pillow intervals are well-crystallized. (Similar to Core 8.)

Mineralogy: Plagioclase and olivine phenocrysts are present in most samples. The olivine phenocrysts are euhedral, fresh, and small (<1 mm) but they are more abundant than plagioclase (5:1). Plagioclase occurs as equant to elongate grains up to 1 cm in diameter. Melt inclusions are present in the larger grains.

Alteration: Generally fresh with alteration occurring in 0.5-2 cm brown halos around fractures. Fractures are generally filled with white crystalline material. Olivines within brown halos are iddingsitized. Glassy margins of pillow rinds are only slightly palagonitized.

Thin Section Description

Phenocrysts: <1% olivine and plagioclase

Groundmass: olivine, <5%, plagioclase, 30-50%, up to 1 mm, needles; clinopyroxene, 5-10%, small crystals and dendrites, alteration, glass, <50%, tachylite

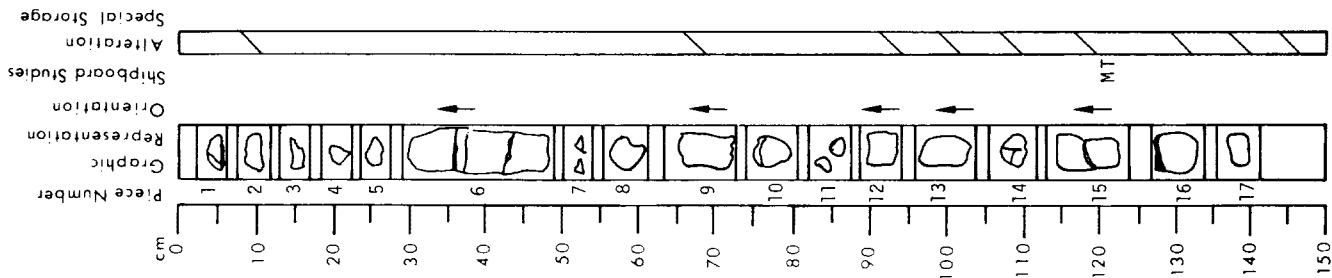
Vesicles: 1-2%, <1 mm, about 1/2 filled

Texture: intersertal-variolitic

Alteration: glass altered to clay, clay and calcite filling vesicles

Shipboard Data

Magnetic Data: 120-122 cm  
Intensity (emu/cc) 1.21 x 15-3  
Stable inclination +20.0



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |        |      |     |
|-----|------|--------|------|-----|
| LEG | SITE | HOLE   | CORE | SEC |
| 46  | 396  | B00902 |      |     |

Depth: 194.5 m to 196.0 m

Visual Description

Lithology: Massive, vesicular, sparsely phyric basalt throughout with scattered glassy pillow rinds. The glassy margins grade inward to a variolitic zone in which vesicles are filled with a brown alteration product. Pillow intervals are well-crystallized. (Similar to Core 8.)

Mineralogy: Plagioclase and olivine phenocrysts are present in most samples. The olivine phenocrysts are euhedral, fresh, and small (<1 mm) but they are more abundant than plagioclase (5:1). Plagioclase occurs as equant to elongate grains up to 1 cm in diameter. Melt inclusions are present in the larger grains.

Alteration: Generally fresh with alteration occurring in 0.5-2 cm brown halos around fractures. Fractures are generally filled with white crystalline material. Olivines within brown halos are iddingsitized. Glassy margins of pillow rinds are only slightly palagonitized.

Thin Section Description

Phenocrysts: <1% olivine and plagioclase

Groundmass: olivine, 5%, 0.2 mm, euhedral; plagioclase, 30-40%, 0.5 mm, needles and laths; clinopyroxene, 0.2 mm, euhedral to dendritic; glass, 50%, tachylite

Vesicles: <5%, 0.5 mm, generally open

Texture: intersertal to variolitic

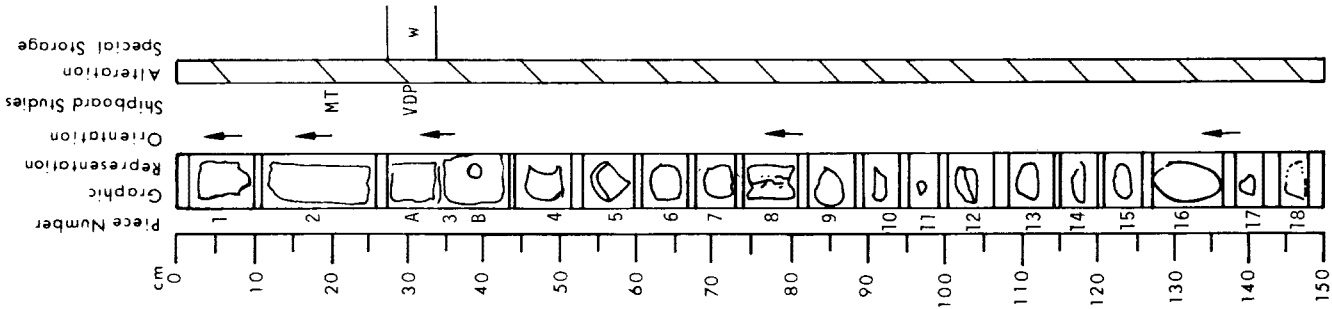
Alteration: a little colorless clay

Shipboard Data

Magnetic Data: 19-21 cm  
Intensity (emu/cc) 1.13 x 10-3  
Stable inclination +20.0

Physical Properties: 29-31 cm

Vp (km/sec) 5.6  
Porosity (%) 6.5  
Wet Bulk Density 2.78  
Grain Density 2.90





VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |   |   |   |      |     |
|-----|------|---|---|---|------|-----|
| LEG | SITE | H | O | L | CORE | SEC |
| 4   | 6    | 3 | 9 | 6 | 0    | 9   |
| 6   | 3    | 9 | 6 | 0 | 9    | 0   |
|     |      |   |   |   |      |     |
|     |      |   |   |   |      |     |
|     |      |   |   |   |      |     |

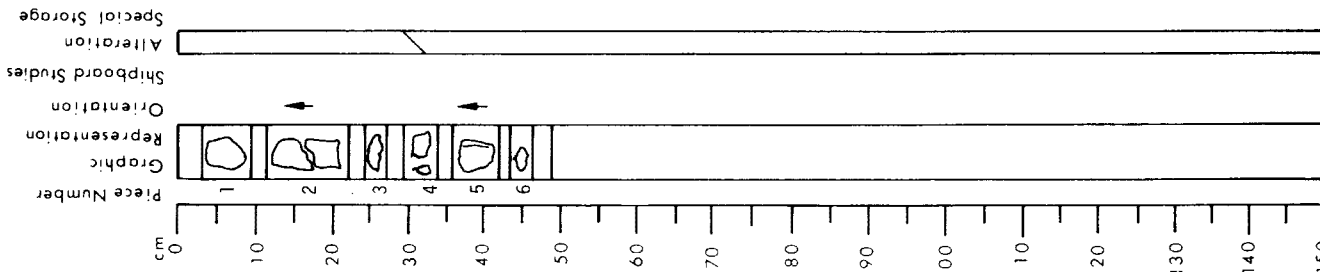
Depth: 196.0 m to 197.5 m

Visual Description

Lithology: Massive, vesicular, sparsely phyrlic basalt throughout with scattered glassy pillow rinds. The glassy margins grade inward to a variolitic zone in which vesicles are filled with a brown alteration product. Pillow intervals are well-crystallized. (Similar to Core 8.)

Mineralogy: Plagioclase and olivine phenocrysts are present in most samples. The olivine phenocrysts are euhedral, fresh, and small (<1 mm) but they are more abundant than plagioclase (5:1). Plagioclase occurs as equant to elongate grains up to 1 cm in diameter. Melt inclusions are present in the larger grains.

Alteration: Generally fresh with alteration occurring in 0.5-2 cm brown halos around fractures. Fractures are generally filled with white crystalline material. Olivines within brown halos are iddingsitized. Glassy margins of pillow rinds are only slightly palagonitized.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |   |   |   |      |     |
|-----|------|---|---|---|------|-----|
| LEG | SITE | H | O | L | CORE | SEC |
| 4   | 6    | 3 | 9 | 6 | 0    | 1   |
| 6   | 3    | 9 | 6 | 0 | 1    | 0   |
|     |      |   |   |   |      |     |
|     |      |   |   |   |      |     |
|     |      |   |   |   |      |     |

Depth: 202.5 m to 204.0 m

Visual Description

Structure: Massive pillow basalt with infrequent glass rinds. No distinct units. Texture: Glassy to crystalline with few narrow variolitic zones close to the glass rinds.

The basalt is sparsely phyrlic with a few phenocrysts of plagioclase (average 2 mm, up to 8 mm) and olivine (average 1 mm, up to 3 mm). Some plagioclase phenocrysts are skeletal.

From about 3% to much less than 1% vesicles (from 0.1 to 0.5 mm).

Mineralogy: Plagioclase and olivine phenocrysts.

Alteration: The color of the basalt changes from dark gray to a brownish gray along fractures which are usually filled white secondary minerals (carbonate and/or zeolites). The same minerals form fragmented crusts on samples surfaces. No coating (very thin: less than 1 mm) and patches are sparsely distributed on the fracture surfaces. In the altered zones, the olivine phenocrysts are partly "iddingsitized."

Thin Section Description

Phenocrysts: <1% olivine (2 mm) and plagioclase (1.5 mm)

Groundmass: olivine, 1%, 0.05 mm, skeletal; plagioclase, 20-50%, up to 1 mm long, clinopyroxene, 30%, to 0.3 mm, dendritic; opaque, 2-3%, 1-7 $\mu$ , cube-skeletal, glass, 20-80%

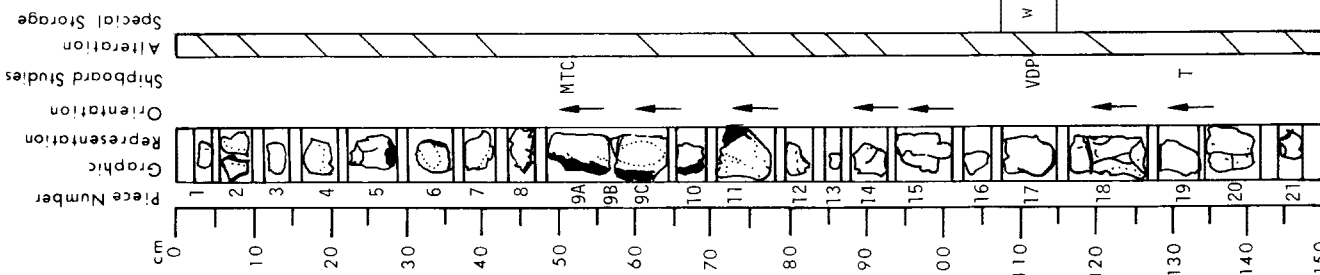
Vesicles: 1-3%, 0.1-0.3 mm, filled

Texture: variolitic to intersertal

Alteration: olivines altered, clay and calcite filling vesicles

Shipboard Data

|                                |           |                               |                                            |
|--------------------------------|-----------|-------------------------------|--------------------------------------------|
| Bulk Analytals: 51-53 cm       |           | Magnetic Data: 51-53 cm       |                                            |
| SiO <sub>2</sub>               | 49.85 MnO | 0.20                          | Intensity (emu/cc) 1.69 x 10 <sup>-3</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 15.41     | Loss on ignition              | Stable inclination +21.0                   |
| Fe <sub>2</sub> O <sub>3</sub> | 10.90     | H <sub>2</sub> O <sup>+</sup> | -1.43                                      |
| MgO                            | 7.70      | H <sub>2</sub> O <sup>-</sup> | 0.83                                       |
| CaO                            | 11.79     | CO <sub>2</sub>               | N.D.                                       |
| Na <sub>2</sub> O              | 2.59      | Cr                            | 0.18                                       |
| K <sub>2</sub> O               | 0.17      | Ni                            | 319.0                                      |
| TiO <sub>2</sub>               | 1.54      | Sr                            | 120.0                                      |
| P <sub>2</sub> O <sub>5</sub>  | 0.15      | Zr                            | 128.0                                      |
|                                |           |                               | 111.0                                      |



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|       |        |      |      |     |
|-------|--------|------|------|-----|
| LEG   | SITE   | HOLE | CORE | SEC |
| 46396 | B01002 |      |      |     |

Depth: 204.0 m to 205.5 m

Visual Description

Structure: Massive pillow basalt with infrequent glass rinds. No distinct units.  
 Texture: Glassy to crystalline with few narrow variolitic zones close to the glass rinds.  
 The basalt is sparsely pyritic with a few phenocrysts of plagioclase (average 2 mm, up to 8 mm) and olivine (average 1 mm, up to 3 mm). Some plagioclase phenocrysts are skeletal.  
 From about 3% to much less than 1% vesicles (from 0.1 to 0.5 mm).  
 Mineralogy: Plagioclase and olivine phenocrysts.

Alteration: The color of the basalt changes from dark gray to a brownish gray along fractures which are usually filled with secondary minerals (carbonate and/or zeolites). The same minerals form fragmented crusts on sample surfaces. Mn coating (very thin; less than 1 mm) and patches are sparsely distributed on the fracture surfaces. In the altered zones, the olivine phenocrysts are partly "iddingsitized."

Thin Section Description

Phenocrysts: <1% olivine (1 mm) and plagioclase (0.4 mm)

Groundmass: olivine, <1%, 0.05 mm, skeletal; plagioclase, 30%, 0.2 mm, skeletal; clinopyroxene, 50%, 0.2 mm axiolic; opaque, <1%, 1-2μ, cube-skeletal, glass, 10% Vesicles: 1%, to 0.1 mm

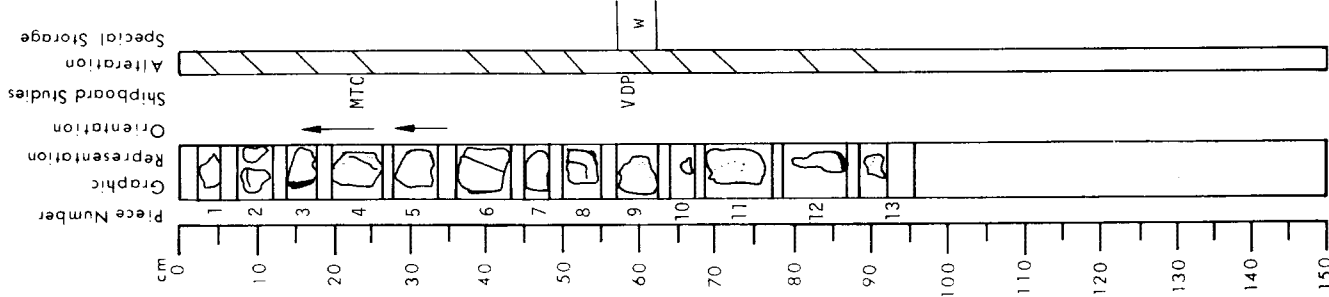
Texture: variolitic-interstitial

Alteration: olivine altered, glass altered to clay, calcite vein

Shipboard Data

Magnetic Data: 21-23 cm  
 Intensity (emu/cc) 4.01 x 10<sup>-4</sup>  
 Stable inclination +19.0°

Physical Properties: 59-61 cm  
 T<sub>p</sub> (km/sec) 5.4  
 Porosity (%) 0.8  
 Wet Bulk Density 2.87  
 Grain Density 2.89



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|       |        |      |      |     |
|-------|--------|------|------|-----|
| LEG   | SITE   | HOLE | CORE | SEC |
| 46396 | B01101 |      |      |     |

Depth: 202.5 m to 212.0 m

Visual Description

Structure: Pillow basalt with infrequent glass rinds. No distinct units.  
 Texture: Glassy to crystalline with few narrow variolitic zones close to the glass rinds.  
 The basalt is sparsely pyritic with a few phenocrysts of plagioclase (average 2 mm, up to 8 mm) and olivine (average 1 mm, up to 3 mm). Some plagioclase phenocrysts are skeletal.  
 Very few (<1%) vesicles in the upper portion, while about 1% vesicles (0.1-0.5 mm) in the lower portion.

Mineralogy: Plagioclase and olivine phenocrysts.

Alteration: The color of the basalt changes from dark gray to a brownish gray along fractures which are usually filled with secondary minerals (carbonate and/or zeolites). The same minerals form fragmented crusts on sample surfaces. Mn coating (very thin; less than 1 mm) and patches are sparsely distributed on the fracture surfaces. In the altered zones, the olivine phenocrysts are partly "iddingsitized."

Thin Section Description

Phenocrysts: <1% olivine (.75 mm) and plagioclase (1 mm)

Groundmass: olivine, 1-10%, to 0.1 mm, skeletal; anhedra; plagioclase, 30-40%, to 0.4 mm, skeletal; clinopyroxene, 40-50%, to 0.3 mm, dendritic; opaque, 1-10%, 1-10μ; skeletal; glass, <1%

Vesicles: 1-2%, mostly open

Texture: variolitic-interstitial

Alteration: phenocryst-olivine altered; clay, calcite, and zeolites in voids

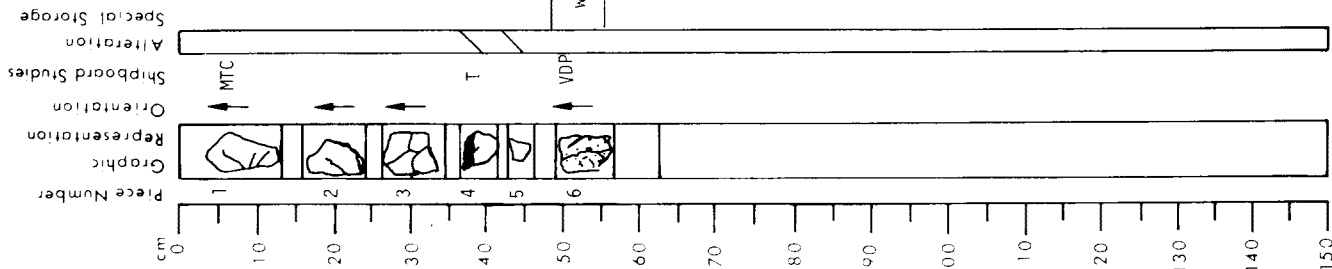
Shipboard Data

Bulk Analysis: 56-58 cm  
 SiO<sub>2</sub> 49.82 MnO 0.20 Magnetic Data: 56-58 cm  
 Al<sub>2</sub>O<sub>3</sub> 15.28 Loss on Ignition -1.39 Intensity (emu/cc) 1.25 x 10<sup>-3</sup>  
 Fe<sub>2</sub>O<sub>3</sub> 10.71 H<sub>2</sub>O 0.83 Stable inclination +5.0  
 MgO 7.77 H<sub>2</sub>O K<sub>2</sub>O 0.17  
 CaO 11.79 H<sub>2</sub>O Na<sub>2</sub>O 2.59 Cr 310.0  
 K<sub>2</sub>O 0.20 Ni 122.0  
 TiO<sub>2</sub> 1.54 Sr 126.0  
 P<sub>2</sub>O<sub>5</sub> 0.14 Zr 103.0

### VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 46  | 396  | B011 | 002  |     |

Depth: 213.5 m to 214.5 m



#### Visual Description

Structure: Pillow basalt with infrequent glass rinds. No distinct units.

Texture: Glassy to crystalline with few narrow variolitic zones close to the glass rinds.

The basalt is sparsely pyritic with a few phenocrysts of plagioclase (average 2 mm, up to 8 mm) and olivine (average 1 mm, up to 3 mm). Some plagioclase phenocrysts are skeletal.

Very few (~1%) vesicles.

Mineralogy: Plagioclase and olivine phenocrysts.

Alteration: The color of the basalt changes from dark gray to a brownish gray along fractures which are usually filled with secondary minerals (carbonate and/or zeolites). The same minerals form fragmented crusts on samples surfaces. Mn coating (very thin; less than 1 mm) and patches are sparsely distributed on the fracture surfaces. In the altered zones, the olivine phenocrysts are partly "tidingsitized."

#### Thin Section Description

Phenocrysts: Olivine (0.8 mm) and plagioclase (to 7 mm)

Groundmass: olivine, 1-10%, anhedral-prismatic; plagioclase, 1-40%, 0.2 mm, skeletal; clinopyroxene, 0-40%, to 0.4 mm, dendritic; opaque, 0-10%, 1-15μ, skeletal; glass 1-97%

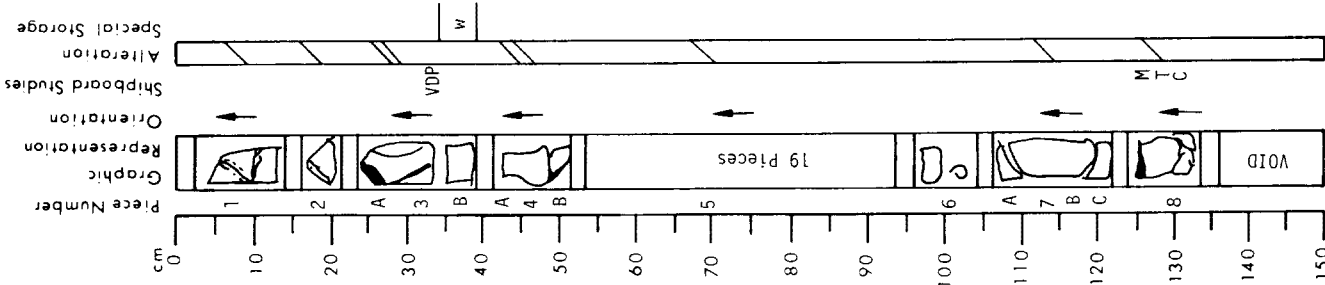
Vesicles: 1-2%, to 0.3 mm, partially filled

Texture: holohyaline to intersertal

Alteration: Olivine altered, glass altered to clay, clay filling vesicles

#### Shipboard Data

|                                            |       |                               |       |
|--------------------------------------------|-------|-------------------------------|-------|
| Bulk Analysis: 5-7 cm                      |       | Magnetic Data: 5-7 cm         |       |
| SiO <sub>2</sub>                           | 50.21 | MnO                           | 0.18  |
| Al <sub>2</sub> O <sub>3</sub>             | 15.39 | Loss on ignition              | -2.23 |
| Fe <sub>2</sub> O <sub>3</sub>             | 10.61 | H <sub>2</sub> O <sup>+</sup> | 0.95  |
| MgO                                        | 7.87  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                                        | 11.74 | CO <sub>2</sub>               | 0.32  |
| Na <sub>2</sub> O                          | 2.42  | Cr                            | 292.0 |
| K <sub>2</sub> O                           | 0.25  | Ni                            | 131.0 |
| TiO <sub>2</sub>                           | 1.54  | Sr                            | 132.0 |
| P <sub>2</sub> O <sub>5</sub>              | 0.14  | Zr                            | 103.0 |
| Stable inclination +11.0                   |       | Physical Properties: 52-54 cm |       |
| Intensity (emu/cc) 1.02 x 10 <sup>-3</sup> |       | ̄v̄p (km/sec)                 | 5.6   |
| Loss on ignition -2.23                     |       | Porosity (%)                  | 4.7   |
| H <sub>2</sub> O <sup>+</sup> 0.95         |       | Wet Bulk Density              | 2.84  |
| H <sub>2</sub> O <sup>-</sup> N.D.         |       | Grain Density                 | 2.93  |
| CO <sub>2</sub> 0.32                       |       |                               |       |



#### Visual Description

Structure: Pillow basalt sequence. Flow unit size apparently thicker (up to at least 40 cm) than in stratigraphically higher units. Fractures are common and some are filled with carbonate and clay(?).

Texture: Basalt mostly microclitic. Samples 3 and 4 have pillow margins with glass rims and variolitic zones.

Mineralogy: Rare phenocrysts of olivine and plagioclase.

Alteration: Brown alteration along cracks and veins.

#### Thin Section Description

Phenocrysts: ~1% olivine (1 mm) and plagioclase (4 mm)

Groundmass: plagioclase, 40%, to 1 mm, skeletal laths; clinopyroxene, 10%, 2 mm, anhedral; opaque, 4%, 4-10μ, skeletal; glass, 35%

Vesicles: 4%

Texture: Intersertal

Alteration: Glass altered to clay, 10% total clay

#### Shipboard Data

|                                            |       |                               |       |
|--------------------------------------------|-------|-------------------------------|-------|
| Bulk Analysis: 127-129 cm                  |       | Magnetic Data: 127-129 cm     |       |
| SiO <sub>2</sub>                           | 50.00 | MnO                           | 0.18  |
| Al <sub>2</sub> O <sub>3</sub>             | 15.07 | Loss on ignition              | -2.96 |
| Fe <sub>2</sub> O <sub>3</sub>             | 10.49 | H <sub>2</sub> O <sup>+</sup> | 1.30  |
| MgO                                        | 7.76  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                                        | 11.50 | CO <sub>2</sub>               | 0.18  |
| Na <sub>2</sub> O                          | 2.70  | Cr                            | 296.0 |
| K <sub>2</sub> O                           | 0.29  | Ni                            | 126.0 |
| TiO <sub>2</sub>                           | 1.51  | Sr                            | 136.0 |
| P <sub>2</sub> O <sub>5</sub>              | 0.14  | Zr                            | 99.0  |
| Stable inclination +14.0                   |       | Physical Properties: 35-37 cm |       |
| Intensity (emu/cc) 1.27 x 10 <sup>-3</sup> |       | ̄v̄p (km/sec)                 | 5.1   |
| Loss on ignition -2.96                     |       | Porosity (%)                  | 8.2   |
| H <sub>2</sub> O <sup>+</sup> 1.30         |       | Wet Bulk Density              | 2.76  |
| H <sub>2</sub> O <sup>-</sup> N.D.         |       | Grain Density                 | 2.92  |
| CO <sub>2</sub> 0.18                       |       |                               |       |

### VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

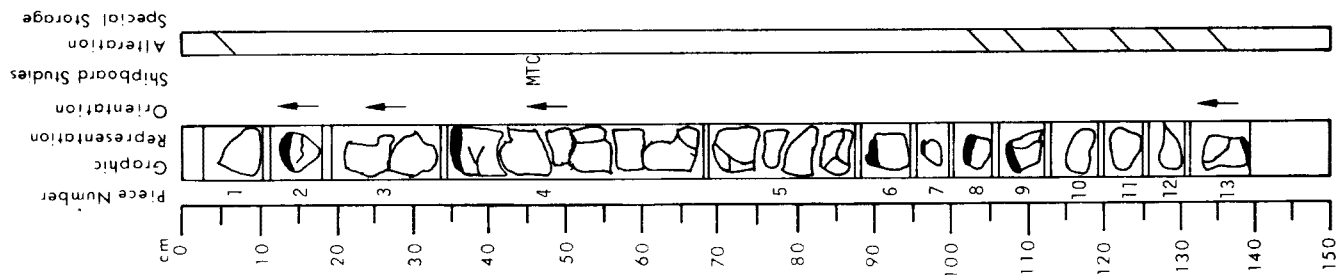
|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 46  | 396  | B011 | 201  |     |

Depth: 214.5 m to 216.0 m

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |       |      |     |
|-----|------|-------|------|-----|
| LEG | SITE | HOLE  | CORE | SEC |
| 46  | 396  | B0113 | 01   |     |

Depth: 216.0 m to 217.5 m



Visual Description

Structure and Texture: Dominantly pillows, with 1-2 cm thick, generally fresh, glassy rinds. Some longer (10-30 cm) pieces show all transactions from sideromelane rind to more fully crystallized interiors. Vesicle generally <2 vol. %. Toward interior of pillows vesicles filled with clay and carbonate.

Mineralogy: Less than 1% olivine and plagioclase phenocrysts. Similar to previous sections.

Alteration: Ratio gray (relatively fresh groundmass, but vesicles may be filled) to brown (altered "thoroughly") basalt about 70/30. Not much different from previous cores.

Thin Section Description

Phenocrysts: <1% olivine (to 1 mm)

Groundmass: olivine, <1%, 0.2 mm, skeletal-anhedral; plagioclase 10-30%, to 1 mm, fine needles; clinopyroxene, to 0.2 mm, anhedral to dendritic; glass, 25%, tachylite.

Vesicles: <3%, <0.5 mm, partially filled

Texture: intersertal-variolitic

Alteration: clay and calcite partially filling vesicles

Shipboard Data

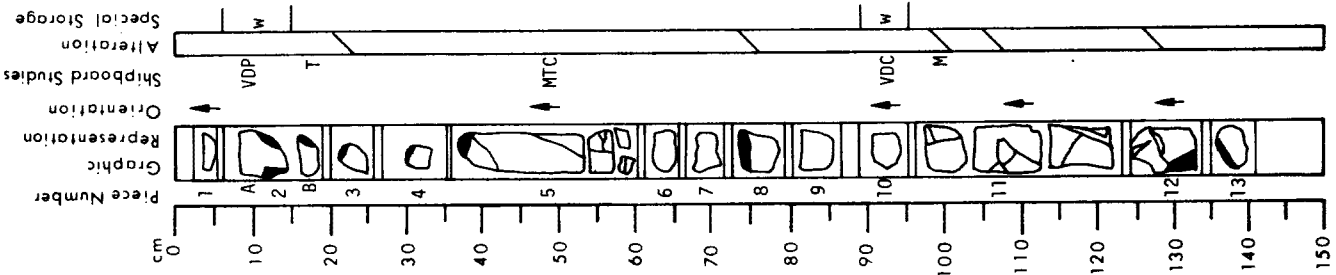
Bulk Analysis: 45-47 cm

|                                |       |                               |       |                    |                         |
|--------------------------------|-------|-------------------------------|-------|--------------------|-------------------------|
| SiO <sub>2</sub>               | 49.86 | MnO                           | 0.18  | Magnetic Data:     | 45-47 cm                |
| Al <sub>2</sub> O <sub>3</sub> | 15.28 | Loss on ignition              | -2.06 | Intensity (emu/cc) | 1.38 x 10 <sup>-3</sup> |
| Fe <sub>2</sub> O <sub>3</sub> | 10.65 | H <sub>2</sub> O <sup>+</sup> | 0.86  | Stable inclination | +12.5                   |
| MgO                            | 8.16  | H <sub>2</sub> O <sup>-</sup> | N.D.  |                    |                         |
| CaO                            | 11.60 | CO <sub>2</sub>               | 0.18  |                    |                         |
| Na <sub>2</sub> O              | 2.59  | Cr                            | 323.0 |                    |                         |
| K <sub>2</sub> O               | 0.25  | Ni                            | 131.0 |                    |                         |
| TiO <sub>2</sub>               | 1.53  | Sr                            | 124.0 |                    |                         |
| P <sub>2</sub> O <sub>5</sub>  | 0.16  | Zr                            | 100.0 |                    |                         |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |       |      |     |
|-----|------|-------|------|-----|
| LEG | SITE | HOLE  | CORE | SEC |
| 46  | 396  | B0113 | 02   |     |

Depth: 217.5 m to 219.0 m



Visual Description

Structure and Texture: Dominantly pillows, with 1-2 cm thick, generally fresh, glassy rinds. Some longer (10-30 cm) pieces show all transactions from sideromelane rind to more fully crystallized interiors. Vesicle generally <2 vol. %. Toward interior of pillows vesicles filled with clay and carbonate.

Mineralogy: Less than 1% olivine and plagioclase phenocrysts. Similar to previous sections.

Alteration: Ratio gray (relatively fresh groundmass, but vesicles may be filled) to brown (altered "thoroughly") basalt about 70/30. Not much different from previous cores.

Shipboard Data

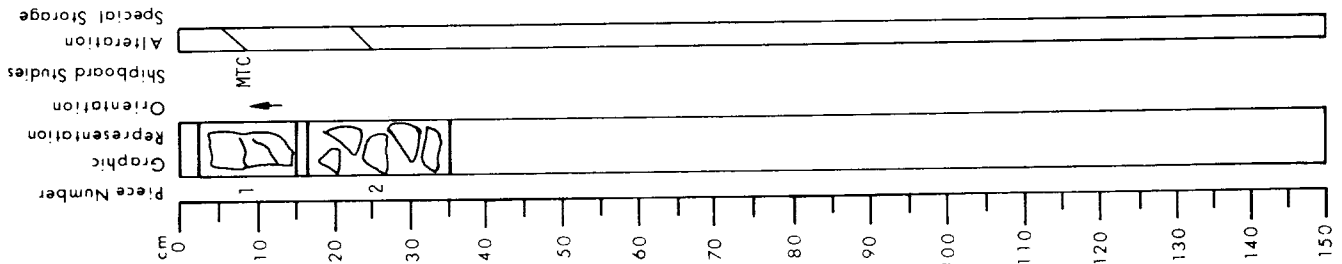
Bulk Analysis: 49-51 cm

|                                |       |          |          |                      |                         |                         |
|--------------------------------|-------|----------|----------|----------------------|-------------------------|-------------------------|
| SiO <sub>2</sub>               | 50.30 | 89-81 cm | 89-81 cm | Magnetic Data:       | 8-10 cm                 | 46-48 cm                |
| Al <sub>2</sub> O <sub>3</sub> | 15.10 | 50.14    | 50.14    | Intensity (emu/cc)   | 1.51 x 10 <sup>-6</sup> | 7.84 x 10 <sup>-4</sup> |
| Fe <sub>2</sub> O <sub>3</sub> | 10.26 | 15.41    | 15.41    | Stable inclination   | -35.07                  | +13.0                   |
| MgO                            | 7.50  | 10.29    | 10.29    |                      |                         |                         |
| CaO                            | 11.50 | 7.64     | 7.64     | Magnetic Data:       | 49-51 cm                | 99-101 cm               |
| Na <sub>2</sub> O              | 2.59  | 2.59     | 2.59     | Intensity (emu/cc)   | 5.40 x 10 <sup>-4</sup> | 1.81 x 10 <sup>-3</sup> |
| K <sub>2</sub> O               | 0.26  | 0.28     | 0.28     | Stable inclination   | +15.07                  | 14.0                    |
| TiO <sub>2</sub>               | 1.51  | 1.51     | 1.51     | Physical Properties: | 49-51 cm                | 89-91 cm                |
| P <sub>2</sub> O <sub>5</sub>  | 0.14  | 0.16     | 0.16     | Vp (km/sec)          | 5.3*                    | 5.6                     |
| MnO                            | 0.17  | 0.17     | 0.17     | Porosity (%)         | 5.5                     | ---                     |
| Loss on ignition               | -2.74 | -3.16    | -3.16    | Met Bulk Density     | 2.52                    | 2.72                    |
| H <sub>2</sub> O <sup>+</sup>  | 1.35  | 1.23     | 1.23     | Grain Density        | 2.61                    | ---                     |
| H <sub>2</sub> O <sup>-</sup>  | N.D.  | N.D.     | N.D.     |                      |                         |                         |
| CO <sub>2</sub>                | 0.31  | 0.22     | 0.22     |                      |                         |                         |
| Cr                             | 300.0 | 300.0    | 300.0    |                      |                         |                         |
| Ni                             | 138.0 | 145.0    | 145.0    |                      |                         |                         |
| Sr                             | 130.0 | 144.0    | 144.0    |                      |                         |                         |
| Zr                             | 99.0  | 94.0     | 94.0     |                      |                         |                         |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |   |   |   |      |     |
|-----|------|---|---|---|------|-----|
| LEG | SITE | H | O | L | CORE | SEC |
| 4   | 6    | 3 | 9 | 6 | B    | 0   |
| 1   | 3    | 0 | 1 | 3 | 0    | 3   |

Depth: 219.0 m to 220.5 m



**Visual Description**  
 Structure and Texture: Dominantly pillows, with 1-2 cm thick, generally fresh, glassy rinds. Some longer (10-30 cm) pieces show all transactions from sideromelane rind to more fully crystallized interiors. Vesicle generally <2 vol. %. Toward interior of pillows vesicles filled with clay and carbonate.

Mineralogy: Less than 1% olivine and plagioclase phenocrysts. Similar to previous sections.

Alteration: Ratio gray (relatively fresh groundmass, but vesicles may be filled) to brown (altered "thoroughly") basalt about 70/30. Not much different from previous cores.

**Thin Section Description**

Phenocrysts: <1% olivine (1-2 mm) and plagioclase (<1 mm)

Groundmass: olivine, <2%, 0.2 mm, anhedral, plagioclase, 60%, clinopyroxene, dendrites in mesostasis; glass, 30%, tachylite

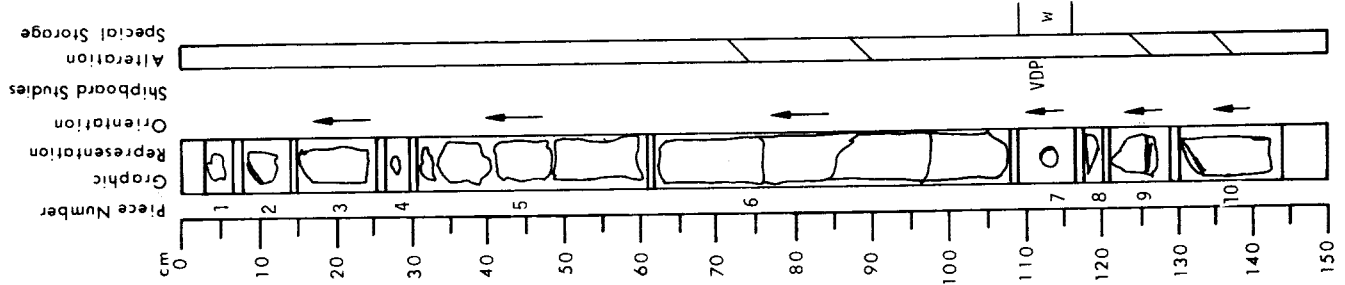
Vesicles: ~2%, 0.5 mm, partially filled

Texture: intersertal

Alteration: clay replacing glass and filling vesicles, ~1% calcite

**Shipboard Data**

|                                |       |                               |                         |
|--------------------------------|-------|-------------------------------|-------------------------|
| Bulk Analysis: 4-6 cm          |       | Magnetic Data: 4-6 cm         |                         |
| SiO <sub>2</sub>               | 50.11 | MnO                           | 0.17                    |
| Al <sub>2</sub> O <sub>3</sub> | 15.53 | Loss on Ignition              | -2.99                   |
| Fe <sub>2</sub> O <sub>3</sub> | 10.57 | H <sub>2</sub> O <sup>+</sup> | 1.36                    |
| MgO                            | 7.42  | H <sub>2</sub> O <sup>-</sup> | N.D.                    |
| CaO                            | 11.32 | CO <sub>2</sub>               | 0.15                    |
| Na <sub>2</sub> O              | 2.79  | Cr                            | 297.0                   |
| K <sub>2</sub> O               | 0.27  | Ni                            | 156.0                   |
| TiO <sub>2</sub>               | 1.67  | Sr                            | 146.0                   |
| P <sub>2</sub> O <sub>5</sub>  | 0.15  | Zr                            | 126.0                   |
|                                |       | Intensity (emu/cc)            | 1.29 x 10 <sup>-3</sup> |
|                                |       | Stable inclination            | ±55.0°                  |



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |   |   |   |      |     |
|-----|------|---|---|---|------|-----|
| LEG | SITE | H | O | L | CORE | SEC |
| 4   | 6    | 3 | 9 | 6 | B    | 0   |
| 1   | 3    | 0 | 1 | 4 | 0    | 1   |

Depth: 225.5 m to 227.0 m

**Visual Description**

Lithology: Massive basalt similar to Core 13. Vesicles are filled. Plagioclase and olivine phenocrysts are generally less abundant than Cores 6-11. Frequency of pillow rinds and glassy margins decreased about 30% compared to Core 13.

Mineralogy: Olivine and plagioclase phenocrysts present but abundance is down from above. Olivines are generally more iddingsitized than Cores 6-11.

Alteration: Width and abundance of brown alteration halos around cracks have decreased. Groundmass alteration (primarily vesicle fillings) is far more pervasive. Fractures are typically filled but thickness <2 mm. Plagioclase alteration of glass is more advanced. Ratio of fresh to altered material 80:20.

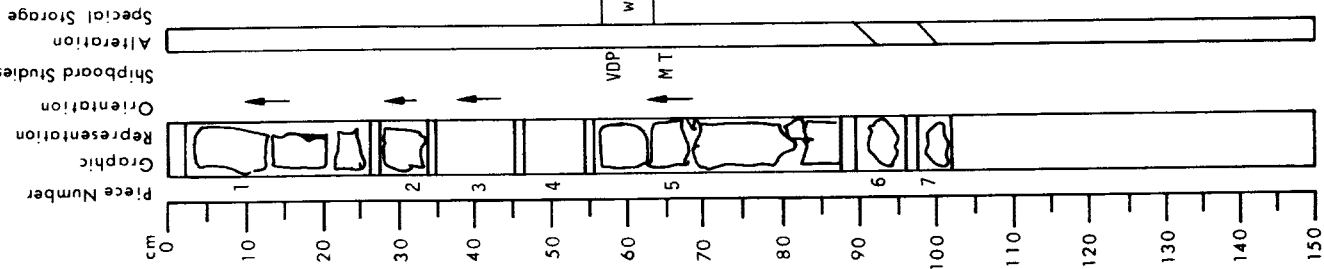
**Shipboard Data**

|                                 |      |
|---------------------------------|------|
| Physical Properties: 110-112 cm |      |
| Vp (km/sec)                     | 5.5  |
| Porosity (%)                    | 4.5  |
| Wet Bulk Density                | 2.70 |
| Grain Density                   | 2.78 |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 463 | 916  | B01  | 4012 |     |

Depth: 227.0 m to 228.5 m



Visual Description

Lithology: Massive basalt similar to Core 13. Vesicles are filled. Plagioclase and olivine phenocrysts are generally less abundant than Cores 6-11. Frequency of pillow rinds and glassy margins decreased about 30% compared to Core 13.

Mineralogy: Olivine and plagioclase phenocrysts present but abundance is down from above. Olivines are generally more iddingsitized than Cores 6-11.

Alteration: Width and abundance of brown alteration halos around cracks have decreased. Groundmass alteration (primarily vesicle fillings) is far more pervasive. Fractures are typically filled but thickness <2 mm. Palagonitization of glass is more advanced. Ratio of fresh to altered material 80:20.

Thin Section Description

Phenocrysts: <1% plagioclase (1 mm)

Groundmass: olivine, <2%, 0.1 mm, skeletal; plagioclase 25%, radiating bundles of needles; clinopyroxene, dendritic and granular; glass, partially altered tachylite

Vesicles: 1-2%, filled

Texture: spherulitic

Alteration: local clay replacing glass, vesicles filled by clay

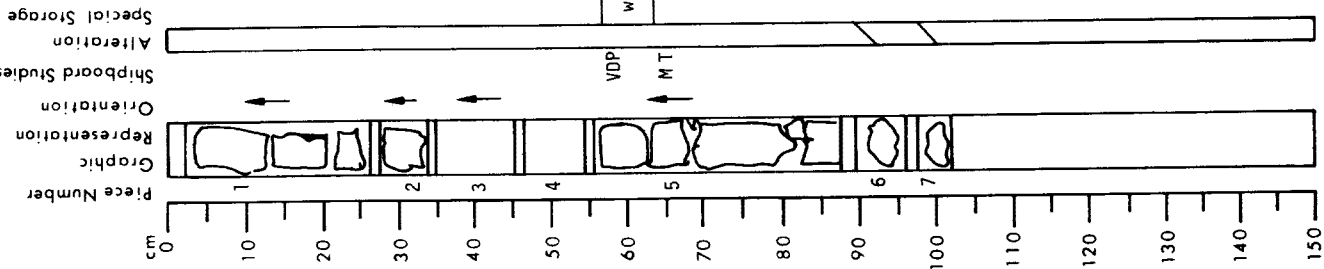
Shipboard Data

|                                |       |                               |                         |
|--------------------------------|-------|-------------------------------|-------------------------|
| Bulk Analysis: 17-19 cm        |       | Magnetic Data: 17-19 cm       |                         |
| SiO <sub>2</sub>               | 49.70 | MnO                           | 0.17                    |
| Al <sub>2</sub> O <sub>3</sub> | 15.30 | Loss on ignition              | -2.54                   |
| Fe <sub>2</sub> O <sub>3</sub> | 10.81 | H <sub>2</sub> O <sup>+</sup> | 1.08                    |
| MgO                            | 7.60  | H <sub>2</sub> O <sup>-</sup> | N.D.                    |
| CaO                            | 11.10 | CO <sub>2</sub>               | 0.14                    |
| Na <sub>2</sub> O              | 2.76  | Cr                            | 297.0                   |
| K <sub>2</sub> O               | 0.29  | Ni                            | 155.0                   |
| TiO <sub>2</sub>               | 1.64  | Sr                            | 143.0                   |
| P <sub>2</sub> O <sub>5</sub>  | 0.16  | Zr                            | 129.0                   |
|                                |       | Stable inclination            | -77.0                   |
|                                |       | Intensity (emu/cc)            | 1.40 x 10 <sup>-3</sup> |
|                                |       | Physical Properties: 80-82 cm |                         |
|                                |       | Vp (km/sec)                   | 5.7                     |
|                                |       | Porosity (%)                  | ---                     |
|                                |       | Wet Bulk Density              | 2.74                    |
|                                |       | Grain Density                 | ---                     |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 463 | 916  | B01  | 4013 |     |

Depth: 228.5 m to 230.0 m



Visual Description

Lithology: Massive basalt similar to Core 13. Vesicles are filled. Plagioclase and olivine phenocrysts are generally less abundant than Cores 6-11. Frequency of pillow rinds and glassy margins decreased about 30% compared to Core 13.

Mineralogy: Olivine and plagioclase phenocrysts present but abundance is down from above. Olivines are generally more iddingsitized than Cores 6-11.

Alteration: Width and abundance of brown alteration halos around cracks have decreased. Groundmass alteration (primarily vesicle fillings) is far more pervasive. Fractures are typically filled but thickness <2 mm. Palagonitization of glass is more advanced. Ratio of fresh to altered material 80:20.

Thin Section Description

Phenocrysts: <1% plagioclase (1.5 mm)

Groundmass: olivine, <1%, <2 mm, granular; plagioclase, 35%, 1 mm needles; clinopyroxene, 30%, dendritic, glass

Vesicles: 1-2% mostly filled

Texture: intersertal to intergranular

Alteration: clay replacing mesostasis, clay filling vesicles

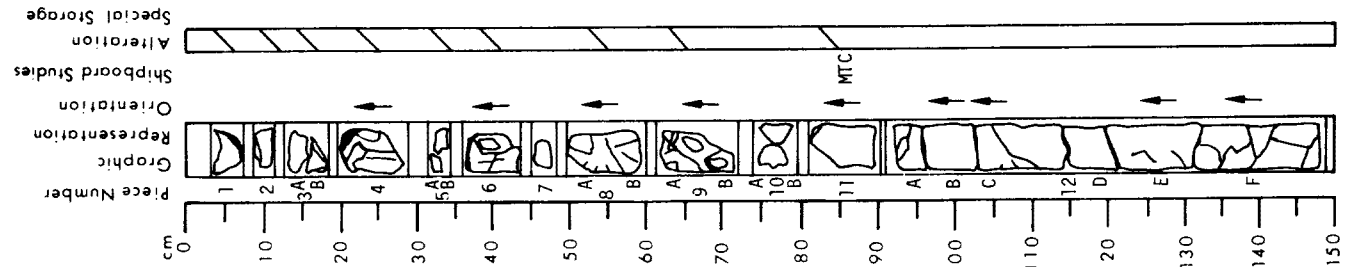
Shipboard Data

|                               |                         |
|-------------------------------|-------------------------|
| Magnetic Data: 66-68 cm       |                         |
| Intensity (emu/cc)            | 1.79 x 10 <sup>-3</sup> |
| Stable inclination            | -73.0                   |
| Physical Properties: 58-60 cm |                         |
| Vp (km/sec)                   | 5.8                     |
| Porosity (%)                  | 4.6                     |
| Wet Bulk Density              | 2.72                    |
| Grain Density                 | 2.81                    |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 4   | 396B | 015  | 01   |     |

Depth: 235.0 m to 237.5 m



Visual Description

From aphyric to sparsely phyrlic basalt with glass rinds (3) toward the top of the core, to coarser grained basalt at the bottom of the section. The transition from basalt fine to coarser grained takes place in sample #12 (bottom). The vesicularity, on the other hand, decreases from top to bottom but more rapidly than the grain size increases; sample #10 does not display vesicles anymore. Sample #9 is characterized by a sharp increase of the amount (and size?) of the iddingsitized olivine phenocrysts. The alteration progressively decreases and the 45 lowest cm of the section are a most fresh. However, white mineral secondary fillings of fissures are round down to the bottom. This section probably represents the fine-grained upper part of a thick basaltic lava unit (flow or sill?) with a few pillows on its upper surface.

Thin Section Description

Phenocrysts: <1% plagioclase (to 2 mm)

Groundmass: olivine, 1-2%, .05 mm, granular; plagioclase, fine-grained, intergrown with clinopyroxene; clinopyroxene, 35%, very fine-grained, intergrown with plagioclase and opaques

Vesicles: a few, filled

Texture: intergranular to intersertal

Alteration: olivine to iddingsite, clay and calcite filling vesicles

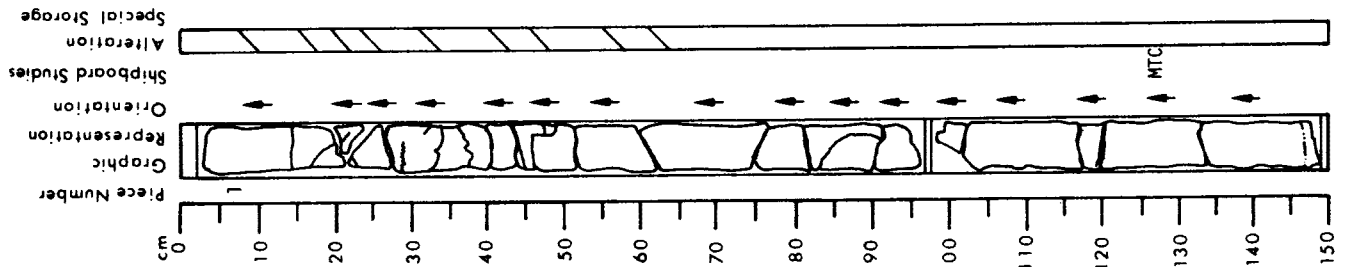
Shipboard Data

|                                |       |                               |       |                         |
|--------------------------------|-------|-------------------------------|-------|-------------------------|
| SiO <sub>2</sub>               | 49.96 | MnO                           | 0.17  | Magnetic Data: 85-87 cm |
| Al <sub>2</sub> O <sub>3</sub> | 15.14 | Loss on Ignition              | -2.88 | Intensity (emu/cc)      |
| Fe <sub>2</sub> O <sub>3</sub> | 11.01 | H <sub>2</sub> O <sup>+</sup> | 1.25  | Stable inclination      |
| MgO                            | 7.49  | H <sub>2</sub> O <sup>-</sup> | N.D.  | -58.5                   |
| CaO                            | 11.17 | CO <sub>2</sub>               | 0.34  |                         |
| Na <sub>2</sub> O              | 2.83  | Cr                            | 285.0 |                         |
| K <sub>2</sub> O               | 0.29  | Ni                            | 150.0 |                         |
| TiO <sub>2</sub>               | 1.65  | Sr                            | 146.0 |                         |
| P <sub>2</sub> O <sub>5</sub>  | 0.16  | Zr                            | 119.0 |                         |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 4   | 396B | 015  | 02   |     |

Depth: 237.5 m to 239.0 m



Visual Description

Fine- to medium-grained basalt, sparsely phyrlic, with 1-2 mm plagioclase phenocrysts (much less than 1%). Grain size appears to coarsen downwards from less than 1 mm to plagioclase laths greater than 1 mm.

Top third of section altered to grayish brown with occasional crosscutting carbonate veins. Alteration ends abruptly with change to fresh gray diabase. Last piece in end of section has light brown alteration rim at base (about 1 cm thick).

Part of large flow sill which occupies most of Core 15, Sections 1 to 5.

Thin Section Description

Phenocrysts: <1% plagioclase (to 2 mm)

Groundmass: olivine, 1-2%, to 0.1 mm, granular; plagioclase, 55%, 0.5 mm, laths and skeletal laths; clinopyroxene, 34%, to 1 mm, laths and granules; opaques, 5%, anhedral to branching skeletons

Vesicles: filled

Texture: intergranular

Alteration: clay filling vesicles

Shipboard Data

|                                |       |                               |       |                           |
|--------------------------------|-------|-------------------------------|-------|---------------------------|
| SiO <sub>2</sub>               | 49.90 | MnO                           | 0.17  | Magnetic Data: 129-131 cm |
| Al <sub>2</sub> O <sub>3</sub> | 14.98 | Loss on Ignition              | -1.70 | Intensity (emu/cc)        |
| Fe <sub>2</sub> O <sub>3</sub> | 11.20 | H <sub>2</sub> O <sup>+</sup> | 0.90  | Stable inclination        |
| MgO                            | 7.93  | H <sub>2</sub> O <sup>-</sup> | N.D.  | -65.0                     |
| CaO                            | 11.01 | CO <sub>2</sub>               | 0.13  |                           |
| Na <sub>2</sub> O              | 2.63  | Cr                            | 266.0 |                           |
| K <sub>2</sub> O               | 0.14  | Ni                            | 119.0 |                           |
| TiO <sub>2</sub>               | 1.63  | Sr                            | 142.0 |                           |
| P <sub>2</sub> O <sub>5</sub>  | 0.17  | Zr                            | 124.0 |                           |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 46  | 396  | B    | 015  | 03  |

Depth: 239.0 m to 240.5 m

Visual Description

Structure: Massive lava flow or sill, single unit.

Texture: Fine-grained dolerite (groundmass plagioclase needles: 1 mm long) in the upper portion, to medium-grained dolerite (1-2 mm) in the lower portion. Gradual grain size variation.

Mineralogy: Rare phenocryst of plagioclase (1-3 mm) and olivine (1-4 mm). Almost lacking vesicles.

Alteration: 3-33 cm: fresh - a little altered in the groundmass; 33-78 cm: little to moderately altered in the groundmass; and 78-148 cm: moderately altered with fairly abundant (5%) irregular voids filled with white secondary minerals.

Part of lava flow or sill which occupies most of Core 15, Sections 1 to 5.

Thin Section Description

Groundmass: olivine, 3-15%, 0.6 mm, subhedral; plagioclase, 50-60%, skeletal, to 2.5 mm; clinopyroxene, 30-50%, 1 mm, anhedral; opaque, 5%, 0.1 mm, skeletal; glass, <1%.

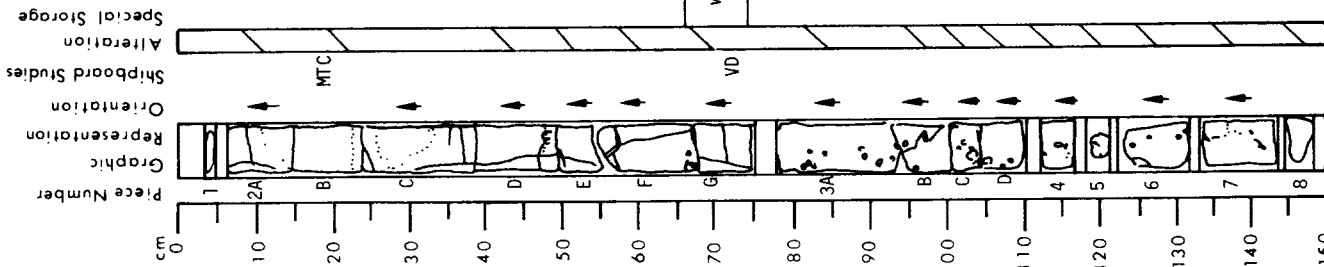
Vesicles: 1%, round, to 0.4 mm, filled

Texture: intersertal

Alteration: olivine altered to clay, glass to clay, vesicles filled with brown clay

Shipboard Data

|                                |                                     |                               |                         |
|--------------------------------|-------------------------------------|-------------------------------|-------------------------|
| Bulk Analysis: 16-19 cm        |                                     | Magnetic Data: 16-19 cm       |                         |
| SiO <sub>2</sub>               | 50.36 MnO                           | Intensity (emu/cc)            | 3.49 x 10 <sup>-3</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 15.24 Loss on ignition              | Stable Inclination            | -64.5                   |
| Fe <sub>2</sub> O <sub>3</sub> | 11.04 H <sub>2</sub> O <sup>+</sup> | Physical Properties: 69-71 cm |                         |
| MgO                            | 7.68 H <sub>2</sub> O <sup>-</sup>  | Vp (km/sec)                   | 5.5                     |
| CaO                            | 11.05 CO <sub>2</sub>               | Porosity (%)                  | ---                     |
| Na <sub>2</sub> O              | 2.66 Cr                             | Net Bulk Density              | 2.69                    |
| K <sub>2</sub> O               | 0.15 Ni                             | Grain Density                 | ---                     |
| TiO <sub>2</sub>               | 1.63 Sr                             |                               |                         |
| P <sub>2</sub> O <sub>5</sub>  | 0.16 Zr                             |                               |                         |



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 46  | 396  | B    | 015  | 04  |

Depth: 240.5 m to 242.0 m

Visual Description

Medium-grained basalt grading down to fine-grained basalt at bottom of section. Largely fresh with irregular patches of brown alteration. Sparsely phytic with plagioclase phenocrysts 1-3 mm (much less than 1%). Occasional carbonate veins in some samples.

Part of large flow or sill which occupies most of Core 15, Section 1 through 5.

Thin Section Description

Phenocrysts: <1% plagioclase (to ~2 mm)

Groundmass: olivine, 5-10%, to 0.2 mm, equant; plagioclase, 50%, to 2 mm, skeletal; clinopyroxene, 40%, to 1 mm, elongate; opaque, 1%, skeletal and plates

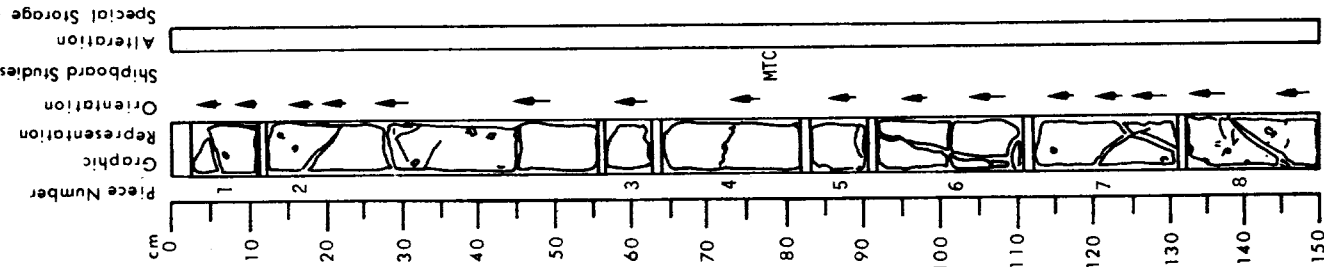
Vesicles: <1%, 0.5 mm, filled

Texture: intersertal to intergranular

Alteration: clay filling vesicles

Shipboard Data

|                                |                                     |                         |                         |
|--------------------------------|-------------------------------------|-------------------------|-------------------------|
| Bulk Analysis: 76-79 cm        |                                     | Magnetic Data: 76-79 cm |                         |
| SiO <sub>2</sub>               | 49.84 MnO                           | Intensity (emu/cc)      | 2.06 x 10 <sup>-3</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 15.01 Loss on ignition              | Stable Inclination      | -66.0                   |
| Fe <sub>2</sub> O <sub>3</sub> | 11.15 H <sub>2</sub> O <sup>+</sup> |                         |                         |
| MgO                            | 8.05 H <sub>2</sub> O <sup>-</sup>  |                         |                         |
| CaO                            | 11.00 CO <sub>2</sub>               |                         |                         |
| Na <sub>2</sub> O              | 2.66 Cr                             |                         |                         |
| K <sub>2</sub> O               | 0.15 Ni                             |                         |                         |
| TiO <sub>2</sub>               | 1.63 Sr                             |                         |                         |
| P <sub>2</sub> O <sub>5</sub>  | 0.15 Zr                             |                         |                         |

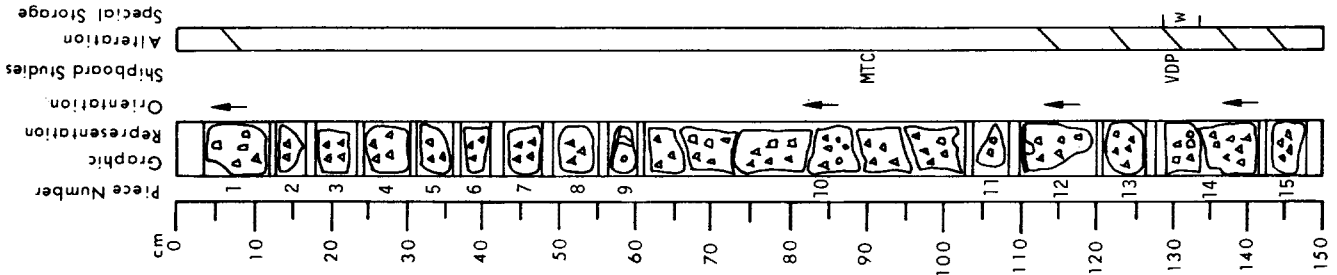




VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |   |   |   |   |      |     |
|-----|------|---|---|---|---|------|-----|
| LEG | SITE | L | H | O | E | CORE | SEC |
| 4   | 6    | 3 | 9 | 6 | B | 0    | 1   |
| 5   | 0    | 5 | 0 | 5 | 0 | 5    | 0   |

Depth: 242.0 m to 243.5 m



Visual Description

Structure: Pieces #1 to 12 (3-100 cm) - Part of single unit of massive aphyric or sparsely phryic lava flow or sill, which occupies most of Core 15, Sections 1 to 5. Pieces #13 and 14 - Porphyritic basalt.

Texture: Pieces #1 to 12 - Fine-grained basalt (no variation of groundmass grain size). Aphyric to sparsely phryic. Pieces #13 and 14 - Porphyritic basalt.

Mineralogy: Pieces #1 to 12 - Rare phenocryst of olivine (1-2 mm) and plagioclase (1-5 mm). Coarse glomerophyric aggregate of olivine and plagioclase in piece #9. Rare vesicles often filled with secondary minerals. Piece #13 - Plagioclase phenocrysts, 10-15%, 1-3 mm; olivine phenocrysts, 5%, 1-3 mm. Piece #14 - Plagioclase phenocrysts 10-15%, 2-5 mm; olivine phenocrysts 5%, 1-3 mm; rare vesicles (0.5 mm).

Alteration: Pieces #1 to 12 - Weak alteration in the groundmass throughout. Uncommon thin white veins. Piece #13 - Slight alteration of the groundmass. Piece #14 - Moderate to extensive alteration of the groundmass.

Shipboard Data

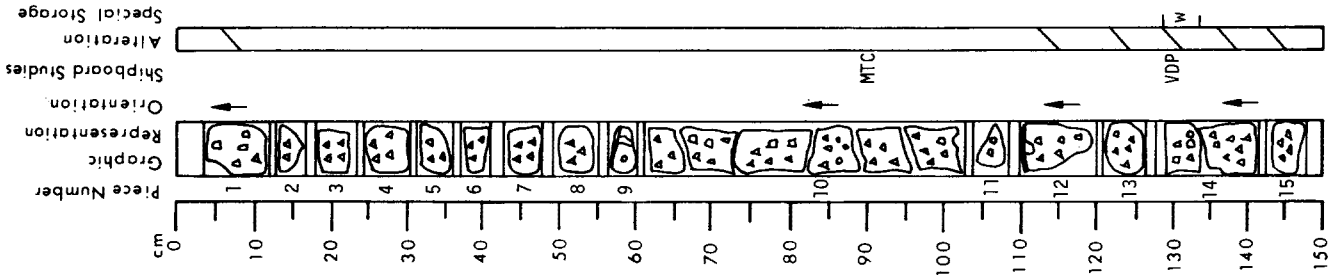
|                                |       |                               |       |
|--------------------------------|-------|-------------------------------|-------|
| Bulk Analysis: 70-73 cm        |       | Magnetic Data: 70-73 cm       |       |
| SiO <sub>2</sub>               | 49.73 | MnO                           | 0.18  |
| Al <sub>2</sub> O <sub>3</sub> | 15.11 | Loss on ignition              | -2.41 |
| Fe <sub>2</sub> O <sub>3</sub> | 11.23 | H <sub>2</sub> O <sup>+</sup> | 1.01  |
| MgO                            | 8.06  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                            | 11.17 | CO <sub>2</sub>               | 0.35  |
| Na <sub>2</sub> O              | 2.73  | Cr                            | 266.0 |
| K <sub>2</sub> O               | 0.32  | Ni                            | 149.0 |
| TiO <sub>2</sub>               | 1.61  | Sr                            | 156.0 |
| P <sub>2</sub> O <sub>5</sub>  | 0.16  | Zr                            | 111.0 |

Physical Properties: 30-32 cm  
 Vp (km/sec) 5.9  
 Porosity (%) 2.0  
 Wet Bulk Density 2.74  
 Grain Density 2.78

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |   |   |   |   |      |     |
|-----|------|---|---|---|---|------|-----|
| LEG | SITE | L | H | O | E | CORE | SEC |
| 4   | 6    | 3 | 9 | 6 | B | 0    | 1   |
| 7   | 0    | 1 | 6 | 0 | 1 | 6    | 0   |

Depth: 244.5 m to 246.0 m



Visual Description

Structure: uniform basalt - no visible pillows, no variation in texture.

Texture: Ten to twenty percent phenocrysts - microlitic groundmass.

Mineralogy: Olivine and plagioclase phenocrysts. Plagioclase/olivine = 3/1. No systematic variation in phenocrysts. Small areas with few phenocrysts - piece #10 appears to be poorer in phenocrysts.

Alteration: 1) Brown alteration of basalt. 2) Vesicle filling with gray clay, zeolites, and carbonate. 3) Veins of carbonate and zeolite.

Thin Section Description

Phenocrysts: olivine, 5%, to 4 mm, plagioclase, 20%, to 4 mm, euhedral-skeletal groundmass: olivine, 2%, 3%; plagioclase, 25%, to 0.5 mm, skeletal; clinopyroxene, 10%, 20%, dendrites; opaque, 5%, 4b, glass, 30%

Vesicles: 3%

Texture: porphyritic-interstitial

Alteration: vesicles clay lined, glass altered

Shipboard Data

|                                |       |                               |       |
|--------------------------------|-------|-------------------------------|-------|
| Bulk Analysis: 83-85 cm        |       | Magnetic Data: 83-85 cm       |       |
| SiO <sub>2</sub>               | 49.39 | MnO                           | 0.16  |
| Al <sub>2</sub> O <sub>3</sub> | 16.88 | Loss on ignition              | -1.79 |
| Fe <sub>2</sub> O <sub>3</sub> | 9.21  | H <sub>2</sub> O <sup>+</sup> | 1.10  |
| MgO                            | 7.86  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                            | 12.16 | CO <sub>2</sub>               | 0.28  |
| Na <sub>2</sub> O              | 2.42  | Cr                            | 323.0 |
| K <sub>2</sub> O               | 0.23  | Ni                            | 129.0 |
| TiO <sub>2</sub>               | 1.20  | Sr                            | 127.0 |
| P <sub>2</sub> O <sub>5</sub>  | 0.12  | Zr                            | 78.0  |

Physical Properties: 130-132 cm  
 Vp (km/sec) 4.7  
 Porosity (%) 12.6  
 Wet Bulk Density 2.53  
 Grain Density 2.76

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|       |         |    |      |     |
|-------|---------|----|------|-----|
| LEG   | SITE    | HO | CORE | SEC |
| 46396 | B016012 |    |      |     |

Depth: 246.0 m to 247.5 m

Visual Description

Structure: Basalt pillow sequence - flow units up to at least 30 cm thick.

Texture: Primarily porphyritic with microclitic groundmass. Pillow rims have glass margin, varfolitic zone, and microclitic interior.

Mineralogy: Plagioclase and olivine phenocrysts (15-20%). No major variation, plagioclase/olivine ~3/1. Olivine (1 to 2 mm) mostly altered to iddingsite. Plagioclase (1 to 7 mm) contains abundant dark inclusions.

Alteration: 1) Basalt altered brown. 2) Veins of carbonate, zeolite(?), Fe-O-OH?, clay(?). 3) Vesicles filled with clay(?) and carbonate.

Thin Section Description

Phenocrysts: olivine, 4%, to 2 mm; plagioclase, 16%, to 3 mm, euhedral-skeletal

Groundmass: olivine, 2%, 20%; plagioclase, to 0.3 mm, skeletal; clinopyroxene, 17%, to 80μ, dendrites; opaques, 5%, 4μ; glass, 20%.

Vesicles: 5%, 100μ, some filled

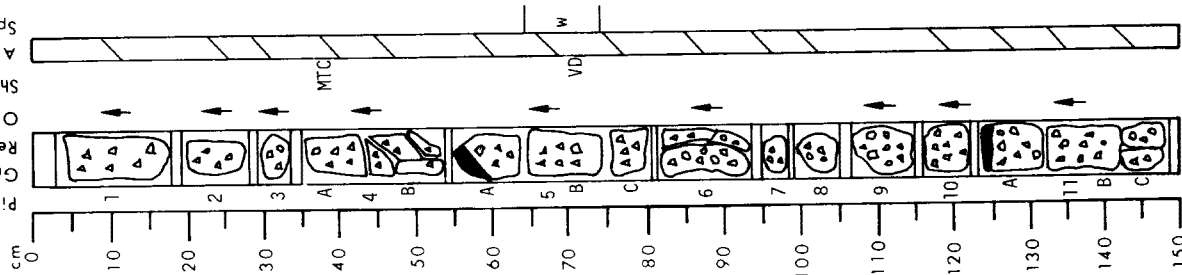
Texture: porphyritic-intersertal

Alteration: vesicles, clay and calcite filled

Shipboard Data

|                                |       |                               |                         |
|--------------------------------|-------|-------------------------------|-------------------------|
| Bulk Analysis: 40-42 cm        |       | Magnetic Data: 40-42 cm       |                         |
| SiO <sub>2</sub>               | 49.60 | MnO                           | 0.17                    |
| Al <sub>2</sub> O <sub>3</sub> | 16.69 | Loss on ignition              | -2.08                   |
| Fe <sub>2</sub> O <sub>3</sub> | 9.45  | H <sub>2</sub> O <sup>+</sup> | 1.07                    |
| MgO                            | 8.33  | H <sub>2</sub> O <sup>-</sup> | N.D.                    |
| CaO                            | 12.09 | CO <sub>2</sub>               | 0.15                    |
| Na <sub>2</sub> O              | 2.36  | Cr                            | 325.0                   |
| K <sub>2</sub> O               | 0.20  | Ni                            | 155.0                   |
| TiO <sub>2</sub>               | 1.20  | Sr                            | 133.0                   |
| P <sub>2</sub> O <sub>5</sub>  | 0.11  | Zr                            | 77.0                    |
|                                |       | Intensity (emu/cc)            | 1.77 x 10 <sup>-3</sup> |
|                                |       | Stable inclination            | -14.0                   |
|                                |       | Physical Properties: 68-70 cm |                         |
|                                |       | Vp (km/sec)                   | 5.6                     |
|                                |       | Porosity (%)                  | ---                     |
|                                |       | Wet Bulk Density              | 2.73                    |
|                                |       | Grain Density                 | ---                     |

Special Storage  
Alteration  
Shipboard Studies  
Orientation  
Graphic Representation  
Piece Number



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|       |         |    |      |     |
|-------|---------|----|------|-----|
| LEG   | SITE    | HO | CORE | SEC |
| 46396 | B016013 |    |      |     |

Depth: 247.5 m to 249.0 m

Visual Description

Structure: Basalt pillow sequence - flow units up to at least 30 cm thick.

Texture: Primarily porphyritic with microclitic groundmass. Pillow rims have glass margin, varfolitic zone, and microclitic interior.

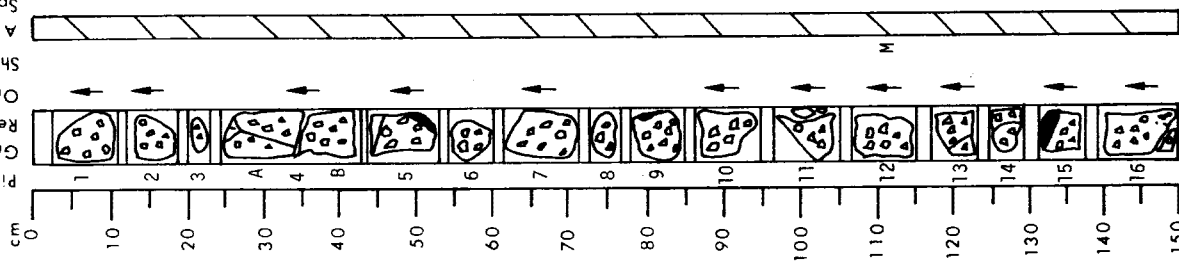
Mineralogy: Plagioclase and olivine phenocrysts (15-20%). No major variation, plagioclase/olivine ~3/1. Olivine (1 to 2 mm) mostly altered to iddingsite. Plagioclase (1 to 7 mm) contains abundant dark inclusions.

Alteration: 1) Basalt altered brown. 2) Veins of carbonate, zeolite(?), Fe-O-OH?, clay(?). 3) Vesicles filled with clay(?) and carbonate.

Shipboard Data

|                           |                         |
|---------------------------|-------------------------|
| Magnetic Data: 109-111 cm |                         |
| Intensity (emu/cc)        | 3.68 x 10 <sup>-3</sup> |
| Stable inclination        | -11.0                   |

Special Storage  
Alteration  
Shipboard Studies  
Orientation  
Graphic Representation  
Piece Number



### VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |    |   |      |     |
|-----|------|----|---|------|-----|
| LEG | SITE | H  | O | CORE | SEC |
| 46  | 396B | 01 | 6 | 04   |     |

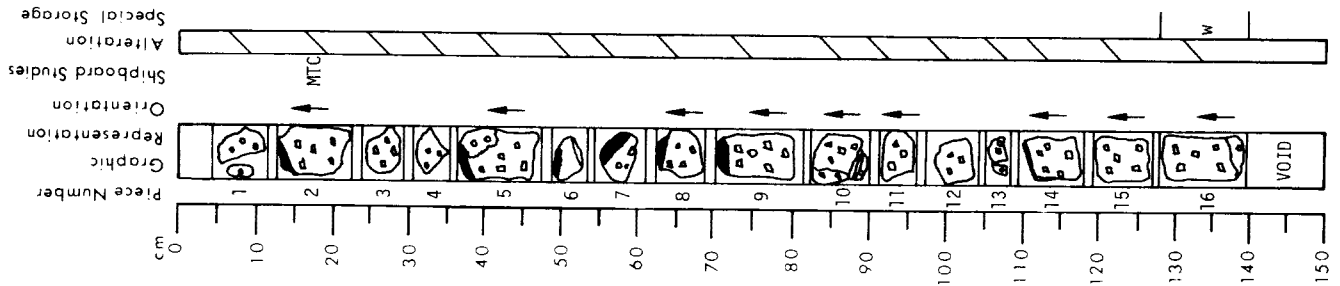
Depth: 249.0 m to 250.5 m

**Visual Description**  
 Structure: Basalt pillow sequence - flow units up to at least 30 cm thick. Many pillow margins.  
 Texture: Primarily porphyritic with microclitic groundmass. Pillow rims have glass margin, variolitic zone, and microclitic interior.  
 Mineralogy: Plagioclase and olivine phenocrysts (15-20%). No major variation, plagioclase/olivine = 3/1. Olivine (1 to 2 mm) mostly altered to fiddingsite. Plagioclase (1 to 7 mm) contains abundant dark inclusions.  
 Alteration: 1) Basalt altered brown. 2) Veins of carbonate, zeolite(?), Fe-0-OH?, clay(?). 3) Vesicles filled with clay(?) and carbonate.

**Thin Section Description**  
 Phenocrysts: olivine, 3%, to 2 mm, subhedral; plagioclase, 15%, to 6 mm, subhedral-skeletal; spine  
 Groundmass: olivine, 1-2%, anhedral-skeletal; plagioclase, 25%, to 2 mm, laths; clinopyroxene, dendrites  
 Vesicles: 1, to 0.1 mm  
 Texture: porphyritic-interstitial  
 Alteration: glass to clays; calcite vesicle filling

**Shipboard Data**  
 Bulk Analysis: 20-22 cm  
 SiO<sub>2</sub> 49.51 MnO 0.18  
 Al<sub>2</sub>O<sub>3</sub> 16.93 Loss on ignition -1.85  
 Fe<sub>2</sub>O<sub>3</sub> 9.98 H<sub>2</sub>O<sup>+</sup> 0.70  
 MgO 7.20 H<sub>2</sub>O<sup>-</sup> N.D.  
 CaO 12.72 CO<sub>2</sub> 0.26  
 Na<sub>2</sub>O 2.49 Cr 347.0  
 K<sub>2</sub>O 0.23 Ni 118.0  
 TiO<sub>2</sub> 1.33 Sr 130.0  
 P<sub>2</sub>O<sub>5</sub> 0.13 Zr 83.0

Magnetic Data: 20-22 cm  
 Intensity (emu/cc) 2.32 x 10<sup>-3</sup>  
 Stable inclination 7.0



### VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |    |   |      |     |
|-----|------|----|---|------|-----|
| LEG | SITE | H  | O | CORE | SEC |
| 46  | 396B | 01 | 6 | 05   |     |

Depth: 250.5 m to 252.0 m

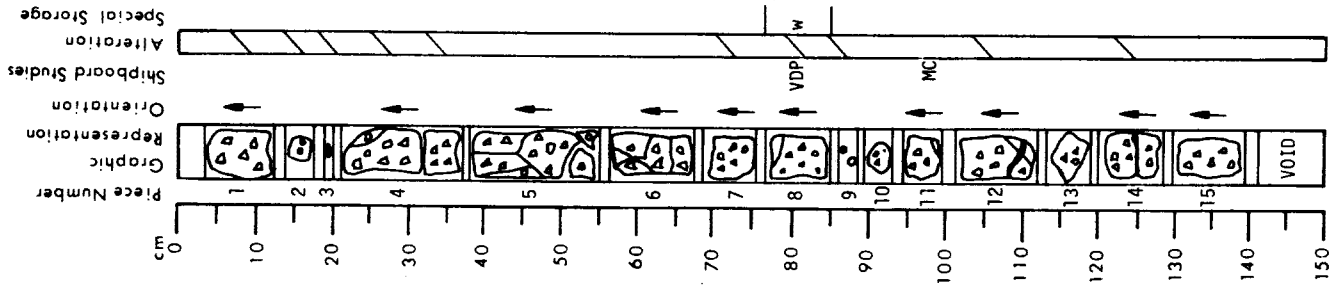
**Visual Description**  
 Structure: Basalt pillow sequence - flow units up to at least 30 cm thick. Many pillow margins.  
 Texture: Primarily porphyritic with microclitic groundmass. Pillow rims have glass margin, variolitic zone, and microclitic interior.  
 Mineralogy: Plagioclase and olivine phenocrysts (15-20%). No major variation, plagioclase/olivine = 3/1. Olivine (1 to 2 mm) mostly altered to fiddingsite. Plagioclase (1 to 7 mm) contains abundant dark inclusions.  
 Alteration: 1) Basalt altered brown. 2) Veins of carbonate, zeolite(?), Fe-0-OH?, clay(?). 3) Vesicles filled with clay(?) and carbonate.

**Shipboard Data**

Bulk Analysis: 96-98 cm  
 SiO<sub>2</sub> 49.80 MnO ----  
 Al<sub>2</sub>O<sub>3</sub> 17.05 Loss on ignition -2.26  
 Fe<sub>2</sub>O<sub>3</sub> 9.19 H<sub>2</sub>O<sup>+</sup> 1.05  
 MgO 7.80 H<sub>2</sub>O<sup>-</sup> N.D.  
 CaO 12.36 CO<sub>2</sub> 0.53  
 Na<sub>2</sub>O 2.53 Cr 320.0  
 K<sub>2</sub>O 0.22 Ni 133.0  
 TiO<sub>2</sub> 1.21 Sr 135.0  
 P<sub>2</sub>O<sub>5</sub> 0.11 Zr 81.0

Magnetic Data: 96-98 cm  
 Intensity (emu/cc) 2.78 x 10<sup>-3</sup>  
 Stable inclination -10.5

Physical Properties: 79-81 cm  
 Vp (km/sec) 5.8  
 Porosity (%) 4.3  
 Wet Bulk Density 2.7  
 Grain Density 2.77



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

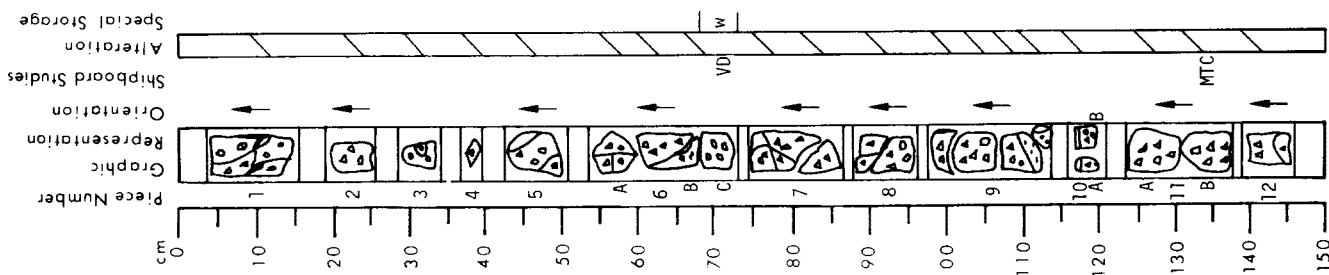
|         |       |      |      |     |
|---------|-------|------|------|-----|
| LEG     | SITE  | HOLE | CORE | SEC |
| 463916B | 01701 |      |      |     |

Depth: 267.5 m to 269.0 m

**Visual Description**  
 Structure: Basalt pillow sequence with interbedded well-lithified carbonate ooze.  
 Texture: Limestone - dense, fine-grained. Basalt - primarily microplitic. Pillow margins have glassy rim and variolitic zone with microplitic interior. Basalt is porphyritic.  
 Mineralogy: Plagioclase and olivine phyric - 20% phenocrysts. Plagioclase/olivine - 2.5/1. Olivine 1 to 2 mm, plagioclase 1 to 5 mm. Plagioclase with abundant dark inclusions. A few olivines with Cr-spinel inclusions.  
 Alteration: 1) Basalt altered brown along cracks. 2) Vesicles filled with dark clay, zeolites(?) and carbonate. 3) Olivine altered to iddingsite. 4) Veins filled with carbonate and pink zeolite(?).  
**Thin Section Description**  
 Phenocrysts: olivine, 2%, to 2 mm; plagioclase, 15% to 5 mm, euhedral to rounded.  
 Groundmass: olivine, 1%, 0.05 mm; plagioclase, 35%, to 1 mm, skeletal laths; clinopyroxene, 30%, to 0.5 mm, dendrites, opaque, 5%, 5-10 $\mu$ , glass, 10%  
 Vesicles: 2%, to 1 mm  
 Texture: porphyritic-interstitial  
 Alteration: glass altering to clay

**Shipboard Data**  
 Bulk Analysis: 132-134 cm  
 SiO<sub>2</sub> 49.75 MnO 0.17  
 Al<sub>2</sub>O<sub>3</sub> 16.85 Loss on ignition -2.49  
 Fe<sub>2</sub>O<sub>3</sub> 9.52 H<sub>2</sub>O<sup>+</sup> 0.93  
 MgO 7.78 H<sub>2</sub>O<sup>-</sup> N.D.  
 CaO 12.38 CO<sub>2</sub> 0.58  
 Na<sub>2</sub>O 2.39 Cr 335.0  
 K<sub>2</sub>O 0.22 Ni 144.0  
 TiO<sub>2</sub> 1.21 Sr 142.0  
 P<sub>2</sub>O<sub>5</sub> 0.11 Zr 79.0

Magnetic Data: 132-134 cm  
 Intensity (emu/cc) 2.11 x 10<sup>-3</sup>  
 Stable Inclination -7.0  
 Physical Properties: 69-71 cm  
 Vp (km/sec) 5.2  
 Porosity (%) ---  
 Wet Bulk Density 2.64  
 Grain Density ---



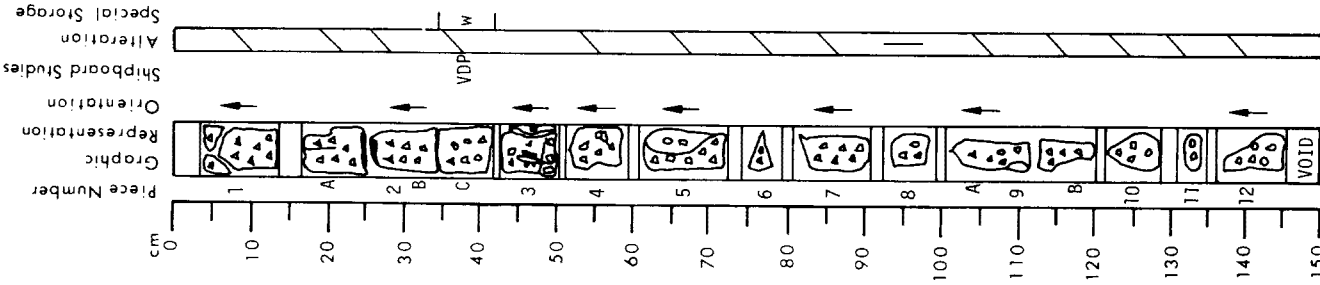
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|         |       |      |      |     |
|---------|-------|------|------|-----|
| LEG     | SITE  | HOLE | CORE | SEC |
| 463916B | 01701 |      |      |     |

Depth: 269.0 m to 270.5 m

**Visual Description**  
 Structure: Basalt pillow sequence.  
 Texture: Basalt - primarily microplitic. Pillow margins have glassy rim, and variolitic zone, with microplitic interior. Basalt is porphyritic.  
 Mineralogy: Plagioclase and olivine phyric - 20% phenocrysts. Plagioclase/olivine - 2.5/1. Olivine 1 to 2 mm, plagioclase 1 to 5 mm. Plagioclase with abundant dark inclusions. A few olivines with Cr-spinel inclusions.  
 Alteration: 1) Basalt altered brown along cracks. 2) Vesicles filled with dark clay, zeolites(?) and carbonate. 3) Olivine altered to iddingsite. 4) Veins filled with carbonate and pink zeolite(?).

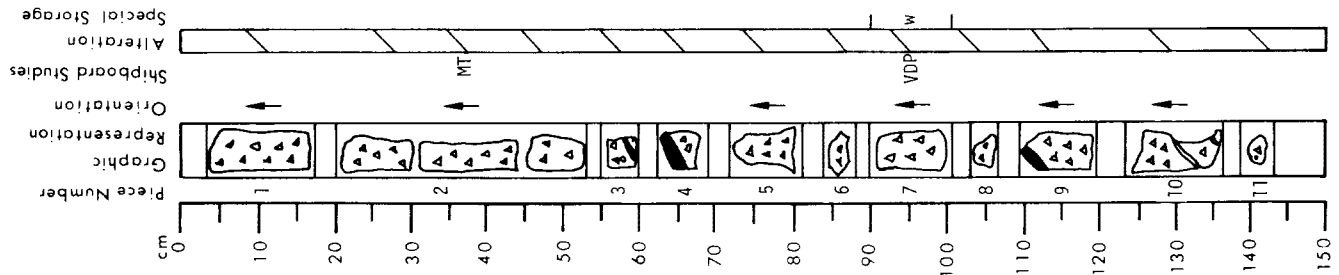
**Shipboard Data**  
 Physical Properties: 36-38 cm  
 Vp (km/sec) 5.5  
 Porosity (%) 4.8  
 Wet Bulk Density 2.68  
 Grain Density 2.76



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|       |         |      |      |     |
|-------|---------|------|------|-----|
| LEG   | SITE    | HOLE | CORE | SEC |
| 46396 | B017013 |      |      |     |

Depth: 270.5 m to 272.0 m



Visual Description

Structure: Basalt pillow sequence with interbedded well-lithified carbonate ooze.  
 Texture: Limestone - dense, fine-grained. Basalt - primarily microclitic. Pillow margins, have glassy rim, and variolitic zone, with microclitic interior. Basalt is porphyritic.

Mineralogy: Plagioclase and olivine phryic - 20% phenocrysts. Plagioclase/olivine ~2.5/1. Olivine 1 to 2 mm, plagioclase 1 to 5 mm. Plagioclase with abundant dark inclusions. A few olivines with Cr-spinel inclusions.

Alteration: 1) Basalt altered brown along cracks. 2) Vesicles filled with dark clay, zeolites(?) and carbonate. 3) Olivine altered to iddingsite. 4) Veins filled with carbonate and pink zeolite(?).

Thin Section Description

Phenocrysts: olivine, 2%, to 2 mm, anhedral; plagioclase, 20%, to 7 mm, euhedral to rounded

Groundmass: olivine, 3%, 0.3 mm, anhedral; plagioclase, 25%, to 1 mm, skeletal laths; clinopyroxene, 25%, to 1 mm; opaque, 5%; glass 15%

Texture: porphyritic-intersertal

Alteration: glass to clay, calcite filling cracks

Shipboard Data

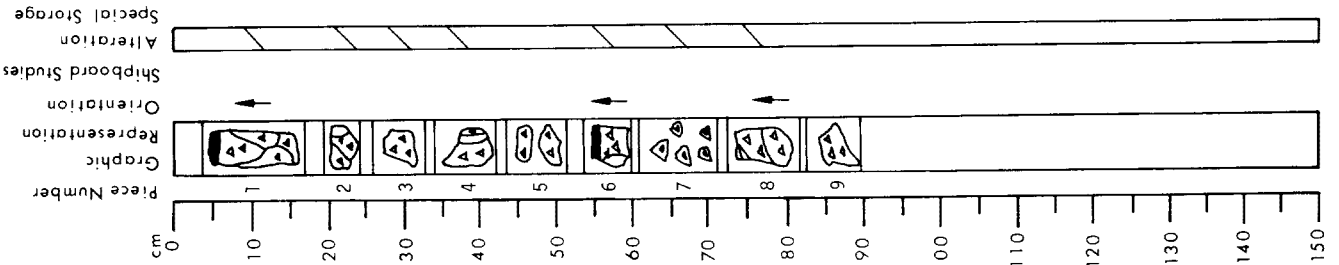
Magnetic Data: 33-35 cm  
 Intensity (emu/cc) 2.78 x 10<sup>-3</sup>  
 Stable inclination -7.5

Physical Properties: 95-97 cm  
 Vp (km/sec) 4.8  
 Porosity (%) 13.4  
 Wet Bulk Density 2.52  
 Grain Density 2.76

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|       |         |      |      |     |
|-------|---------|------|------|-----|
| LEG   | SITE    | HOLE | CORE | SEC |
| 46396 | B017014 |      |      |     |

Depth: 272.0 m to 273.0 m



Visual Description

Structure: Basalt pillow sequence.

Texture: Basalt - primarily microclitic. Pillow margins, have glassy rim, and variolitic zone, with microclitic interior. Basalt is porphyritic.

Mineralogy: Plagioclase and olivine phryic - 20% phenocrysts. Plagioclase/olivine ~2.5/1. Olivine 1 to 2 mm, plagioclase 1 to 5 mm. Plagioclase with abundant dark inclusions. A few olivines with Cr-spinel inclusions.

Alteration: 1) Basalt altered brown along cracks. 2) Vesicles filled with dark clay, zeolites(?) and carbonate. 3) Olivine altered to iddingsite. 4) Veins filled with carbonate and pink zeolite(?).

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 46  | 396  | B01  | 1801 | 1   |

Depth: 273.0 m to 274.5 m

Visual Description

Lithology and Mineralogy: Core 18 consists of plagioclase-olivine phyrlic basalts which are very similar to those in Core 17. Plagioclase is larger (1-7 mm) and more abundant than olivine. Glassy crusts are present sporadically.

Alteration: The degree of alteration varies but some olivine in the samples is replaced by iddingsite. Where the groundmass is oxidized brown, the olivines are all totally replaced. The glass is generally fresh but the areas nearby are typically brown.

Thin Section Description

Phenocrysts: olivine, 3%, to 2 mm, euhedral-subhedral; plagioclase, 20%, 1-5 mm, euhedral-subhedral; spinel, <1%, 0.4 mm

Groundmass: olivine, ~5%; plagioclase, 30%; 0.5 mm; clinopyroxene; glass

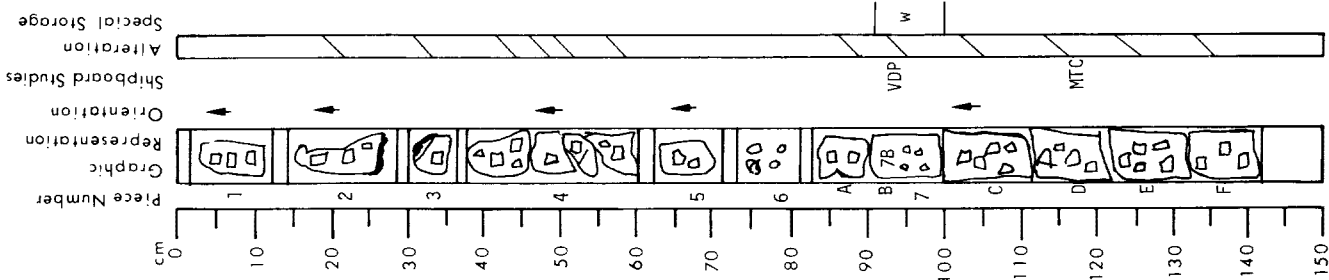
Vesicles: 1%, ~0.5 mm

Texture: porphyritic-interstitial

Alteration: olivine to clay, glass to clay, clay filling vesicles

Shipboard Data

|                                |       |                               |       |
|--------------------------------|-------|-------------------------------|-------|
| Bulk Analysis: 117-119 cm      |       | Magnetic Data: 117-119 cm     |       |
| SiO <sub>2</sub>               | 49.94 | MnO                           | 0.17  |
| Al <sub>2</sub> O <sub>3</sub> | 17.04 | Loss on Ignition              | -2.08 |
| Fe <sub>2</sub> O <sub>3</sub> | 9.36  | H <sub>2</sub> O <sup>+</sup> | 1.03  |
| MgO                            | 7.69  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                            | 12.35 | Cr                            | 0.20  |
| Na <sub>2</sub> O              | 2.11  | Co                            | 0.20  |
| K <sub>2</sub> O               | 0.20  | Ni                            | 119.0 |
| TiO <sub>2</sub>               | 1.21  | Sr                            | 131.0 |
| P <sub>2</sub> O <sub>5</sub>  | 0.12  | Zr                            | 81.0  |
|                                |       | Stable Inclination            | 0     |
|                                |       | Physical Properties: 94-96 cm |       |
|                                |       | Vp (km/sec)                   | 5.9   |
|                                |       | Porosity (%)                  | 1.8   |
|                                |       | Wet Bulk Density              | 2.72  |
|                                |       | Grain Density                 | 2.75  |



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

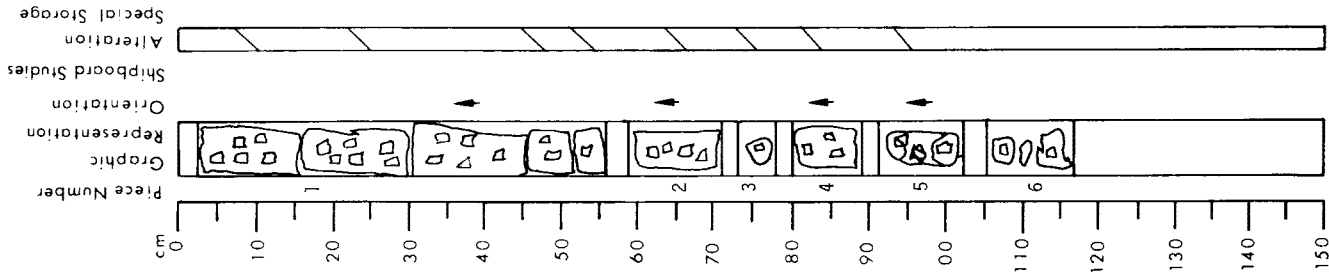
| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 46  | 396  | B01  | 1802 | 2   |

Depth: 274.5 m to 276.0 m

Visual Description

Lithology and Mineralogy: Core 18 consists of plagioclase-olivine phyrlic basalts which are very similar to those in Core 17. Plagioclase is larger (1-7 mm) and more abundant than olivine. Glassy crusts are present sporadically.

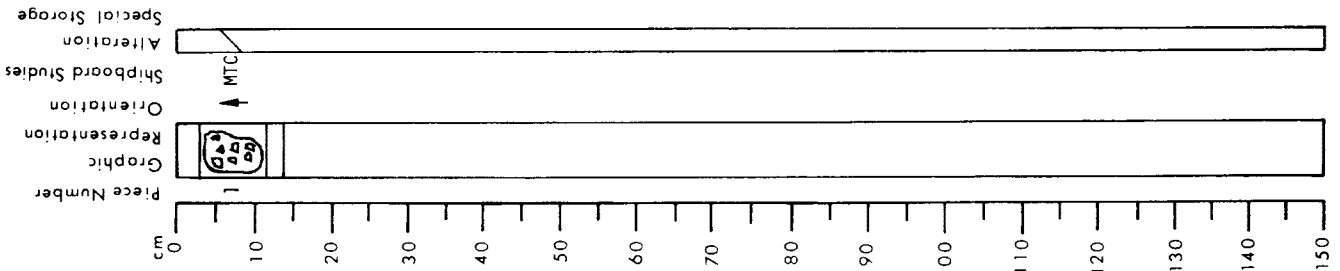
Alteration: The degree of alteration varies but some olivine in the samples is replaced by iddingsite. Where the groundmass is oxidized brown, the olivines are all totally replaced. The glass is generally fresh but the areas nearby are typically brown.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 4   | 6396 | B    | 019  | 01  |

Depth: 277.0 m to 278.5 m



Visual Description

Plagioclase-olivine phryic basalt, lava, the same unit as Core 18, Section 2. Olivine phenocryst: 1-2 mm, 3%; plagioclase phenocrysts: 2-7 mm, 10%. Vesicles: <1%, 1 mm.

Slightly to moderately altered. Olivine altered to iddingsite in the moderately altered zone.

Thin Section Description

Phenocrysts: olivine, <1%, to 1.6 mm, subhedral; plagioclase, 22%, to 3.2 mm, euhedral-skeletal; spinel, <1%, 0.3 mm

Groundmass: plagioclase, 30%, 0.1-0.4 mm; clinopyroxene, 28%, microlites; glass, <1%

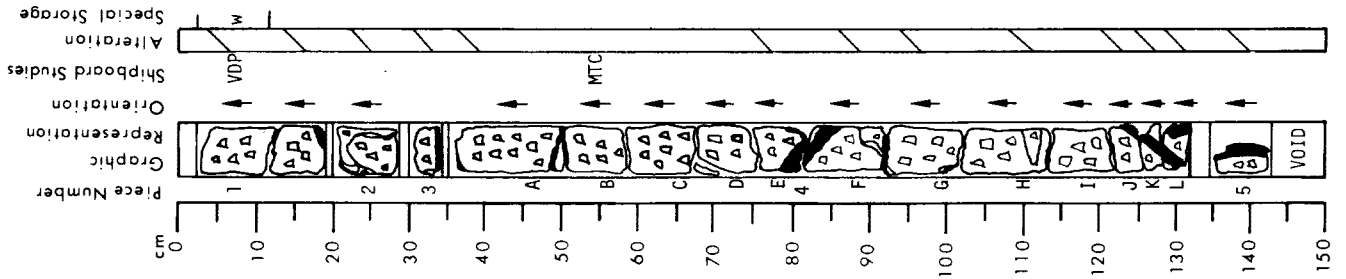
Vesicles: 0.4 to 1.0 mm

Texture: porphyritic-intergranular

Alteration: olivine and glass to clay

Shipboard Data

| Bulk Analysis: 4-6 cm          |       | Magnetic Data: 4-6 cm         |       |
|--------------------------------|-------|-------------------------------|-------|
| SiO <sub>2</sub>               | 47.91 | MnO                           | 0.19  |
| Al <sub>2</sub> O <sub>3</sub> | 19.10 | Loss on ignition              | -3.10 |
| Fe <sub>2</sub> O <sub>3</sub> | 10.46 | H <sub>2</sub> O <sup>+</sup> | 1.25  |
| MgO                            | 4.31  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                            | 13.25 | CO <sub>2</sub>               | 0.25  |
| Na <sub>2</sub> O              | 2.83  | Cr                            | 359.0 |
| K <sub>2</sub> O               | 0.22  | Ni                            | 102.0 |
| TiO <sub>2</sub>               | 1.33  | Sr                            | 143.0 |
| P <sub>2</sub> O <sub>5</sub>  | 0.18  | Zr                            | 88.0  |



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 4   | 6396 | B    | 020  | 01  |

Depth: 286.5 m to 288.0 m

Visual Description

Seven phryic basalt pillows and pillow fragments. Ten to fifteen per cent plagioclase phenocrysts (2-5 mm) and 1-2% olivine phenocrysts (1-2 mm). No complete pillow cross-sections with matrix in between at preserved contact. The pillows are up to 60 cm thick, are moderately altered for about 5-10 cm around their margins, with fresh cores and about 2% vesicles near their margins. Fresh glass has unaltered olivine and plagioclase. A few carbonate veins cross-cut the pillows.

Thin Section Description

Phenocrysts: olivine, 3%, 0.1-0.5 mm, euhedral; plagioclase, 25%, 0.5 to 5 mm, euhedral; spinel, <1%, subhedral

Groundmass: plagioclase, 35%, 0.1-0.2 mm, laths; clinopyroxene, 30%, very fine-grained, opaque, 3%, euhedral-anhedral

Vesicles: 2%, filled

Texture: porphyritic-intergranular

Alteration: olivine to iddingsite, vesicles filled with clay

Shipboard Data

| Bulk Analysis: 53-55 cm        |       | Magnetic Data: 53-55 cm       |       |
|--------------------------------|-------|-------------------------------|-------|
| SiO <sub>2</sub>               | 49.92 | MnO                           | 0.16  |
| Al <sub>2</sub> O <sub>3</sub> | 17.64 | Loss on ignition              | -2.41 |
| Fe <sub>2</sub> O <sub>3</sub> | 8.81  | H <sub>2</sub> O <sup>+</sup> | .88   |
| MgO                            | 7.39  | H <sub>2</sub> O <sup>-</sup> | N.D.  |
| CaO                            | 12.79 | CO <sub>2</sub>               | 0.23  |
| Na <sub>2</sub> O              | 2.42  | Cr                            | 326.0 |
| K <sub>2</sub> O               | 0.21  | Ni                            | 119.0 |
| TiO <sub>2</sub>               | 1.04  | Sr                            | 148.0 |
| P <sub>2</sub> O <sub>5</sub>  | 0.11  | Zr                            | 74.0  |

| Physical Properties: 5-7 cm |      |
|-----------------------------|------|
| Yp (km/sec)                 | 5.7  |
| Porosity (%)                | 4.0  |
| Wet Bulk Density            | 2.84 |
| Grain Density               | 2.92 |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 416 | 319  | 6B   | 020  | 012 |

Depth: 288.0 m to 289.5 m

Visual Description

Structure: Mesoscopically the same plagioclase-olivine phyric pillow basalt unit as in previous cores. Glassy rinds found in pieces #1 (3-5 cm), #5B (64-65 cm), and #9G (139-141 cm).

Texture: Glassy to intersertal, porphyritic texture. Vesicles: 0.5 mm, <0.5%.

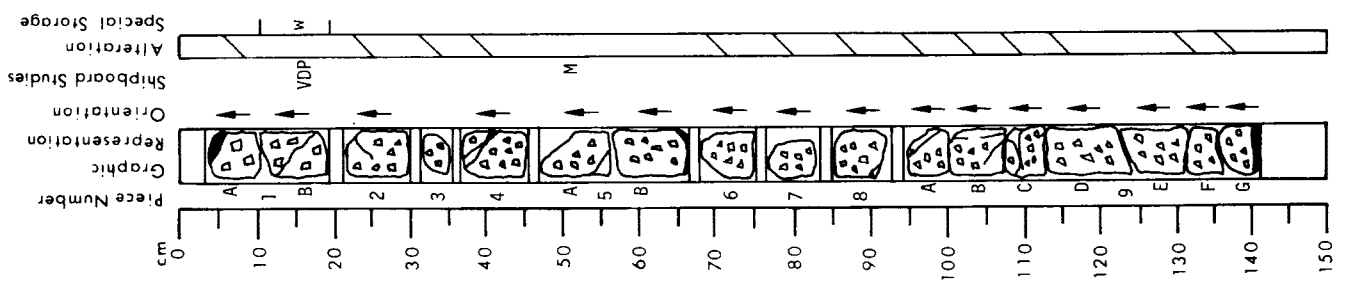
Mineralogy: Olivine phenocryst: 1-2 mm, 2-3%; Plagioclase phenocrysts: 2-4 mm (max. 10 mm), 15-20%.

Alteration: There are two alteration units except for alteration zone next to glassy rinds (#1, #5B, #9G). Pieces #2 to #4: slightly to moderately altered in groundmass; olivine phenocrysts are altered to iddingsite. Pieces #6 to #9B: moderately altered in groundmass, olivine phenocrysts are altered to iddingsite; abundant calcite + Mn-oxide vein (up to 5 mm thick).

Shipboard Data

Magnetic Data: 51-53 cm  
Intensity (emu/cc) 3.15 x 10<sup>-3</sup>  
Stable inclination -0.5

Physical Properties: 14-16 cm  
Vp (km/sec) 5.8  
Porosity (%) 4.6  
Wet Bulk Density 2.82  
Grain Density 2.91



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 416 | 319  | 6B   | 020  | 013 |

Depth: 289.5 m to 291.0 m

Visual Description

Structure: Pillow lavas alternating with indurated carbonate oozes.

Texture and Mineralogy: From glassy to phyric with 15 to 25% plagioclase phenocrysts (up to 6.5 mm) and with 5 to 10%, generally iddingsitized, olivine phenocrysts, (up to 4 mm) set in an aphanitic matrix. A few small (rarely up to 1 mm) round and hollow vesicles.

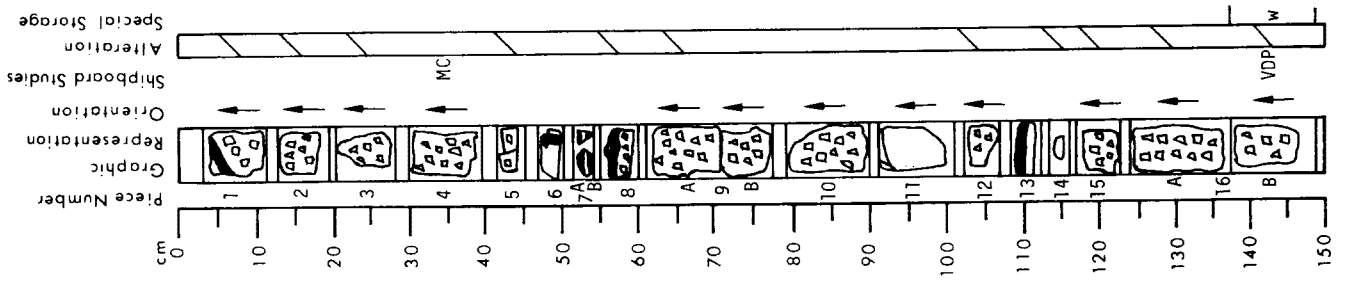
Alteration: Generally moderately to weakly altered but never really fresh. Few zones are more altered with carbonate and/or zeolites filling narrow fissures. Olivine is generally altered to "iddingsite."

Shipboard Data

Bulk Analysis: 33-35 cm  
SiO<sub>2</sub> 49.28 MnO 0.16  
Al<sub>2</sub>O<sub>3</sub> 17.30 Loss on ignition -3.14  
Fe<sub>2</sub>O<sub>3</sub> 8.69 H<sub>2</sub>O<sup>+</sup> 0.91  
MgO 7.53 H<sub>2</sub>O<sup>-</sup> N.D.  
CaO 12.66 CO<sub>2</sub> 0.24  
Na<sub>2</sub>O 2.42 Cr 347.0  
K<sub>2</sub>O 0.21 Ni 139.0  
TiO<sub>2</sub> 1.10 Sr 141.0  
P<sub>2</sub>O<sub>5</sub> 0.10 Zr 66.0

Magnetic Data: 33-35 cm  
Intensity (emu/cc) 2.67 x 10<sup>-3</sup>  
Stable inclination -5.0

Physical Properties: 142-144 cm  
Vp (km/sec) 5.5  
Porosity (%) 3.6  
Wet Bulk Density 2.80  
Grain Density 2.87

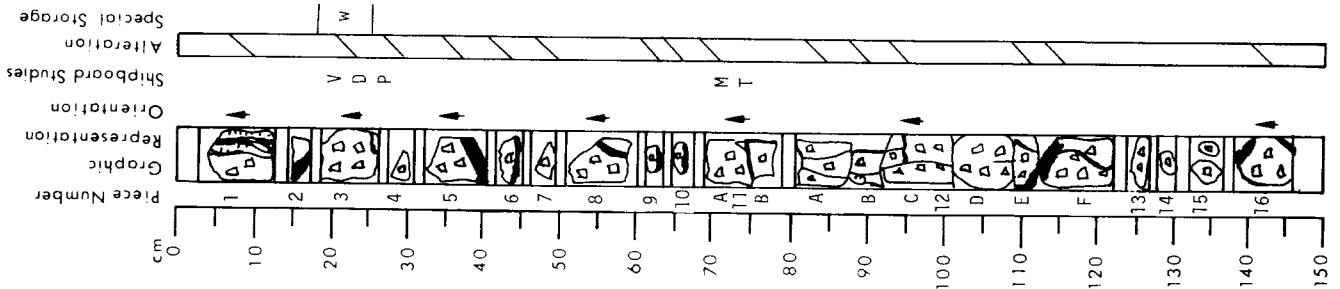




VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 4   | 6    | 3    | 9    | 6   |
| 0   | 2    | 0    | 0    | 4   |

Depth: 291.0 m to 292.5 m



**Visual Description**  
 Structure: Basalt pillow sequence, at least 9 flow units. Maximum size up to at least 30 cm. Numerous fractures filled by carbonate sediment or veins.  
 Texture: Sediment or veins very fine-grained. Basalt: pillows have glassy rims, variolitic zone, and microplitic interiors. Some glass palagonitized.  
 Mineralogy: Plagioclase and olivine phenocrysts (15-20%). Plagioclase/olivine 4/1. Olivine iddingsitized. Plagioclase has numerous dark inclusions.  
 Alteration: 1) Basalt browned up. 2) Carbonate and clay vein fillings.

**Thin Section Description**  
 Phenocrysts: olivine, 4%, to 3 mm, subhedral to anhedral; plagioclase, 20%, to 5 mm, euhedral-rounded-skeletal  
 Groundmass: olivine, 1% to 0.3 mm, anhedral; plagioclase, 15%, to 0.5 mm, skeletal laths; clinopyroxene, 20%, to 0.4 mm, dendrites; opaque, 5%, 4-10μ, skeletal, glass, 30%  
 Vesicles: 5%, to 3 mm, some filled with devitrified glass

Texture: porphyritic-interstitial  
 Alteration: zeolite fills vesicles

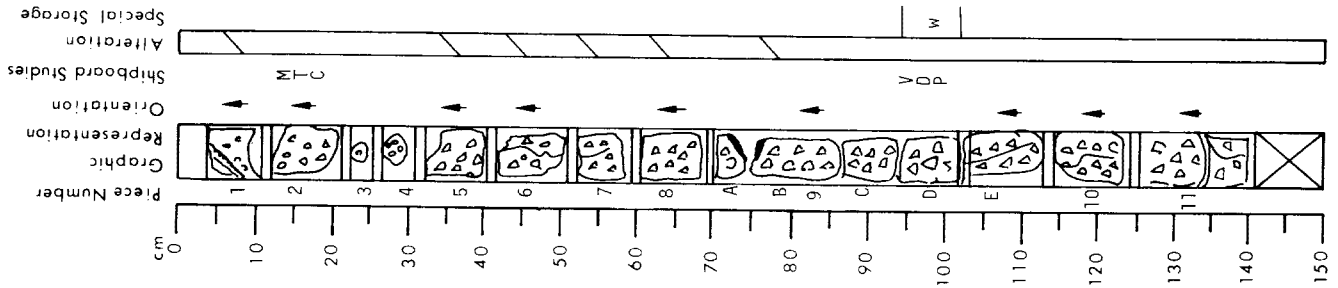
**Shipboard Data**  
 Magnetic Data: 71-73 cm  
 Intensity (emu/cc)  $2.19 \times 10^{-3}$   
 Stable inclination -1.5?

**Physical Properties:** 21-23 cm  
 Vp (km/sec) 5.3  
 Porosity (%) 5.0  
 Wet Bulk Density 2.80  
 Grain Density 2.89

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 4   | 6    | 3    | 9    | 6   |
| 0   | 2    | 0    | 0    | 5   |

Depth: 292.5 m to 294.0 m



**Visual Description**  
 Structure: Basalt pillow sequence, few rinds.  
 Texture: Porphyritic with microplitic groundmass. Pillows have glass rim, variolitic zone, microplitic interior.  
 Mineralogy: Plagioclase and olivine phenocrysts (15-20%). Plagioclase/olivine 4/1. Olivine iddingsitized. Plagioclase has numerous dark inclusions.  
 Alteration: 1) Basalt browned up. 2) Carbonate and clay vein fillings.

**Thin Section Description**  
 Phenocrysts: olivine, 2-3%, to 1 mm, subhedral; plagioclase, 20%, to 2 mm, subhedral to anhedral; spinel, trace, to 2.5 mm

Groundmass: olivine, trace, to 0.01 mm, anhedral; plagioclase, 20%, to 0.2 mm, laths; clinopyroxene; opaque, to .01 mm, skeletal  
 Vesicles: 1%, to 0.5 mm, round

Texture: porphyritic-intergranular  
 Alteration: glass and olivine to clay, calcite and clay fill vesicles

**Shipboard Data**  
 Bulk Analysis: 16-18 cm  
 SiO<sub>2</sub> 49.88 MnO 0.16  
 Al<sub>2</sub>O<sub>3</sub> 17.65 Loss on Ignition -3.01  
 Fe<sub>2</sub>O<sub>3</sub> 9.06 H<sub>2</sub>O<sup>+</sup> 1.08  
 MgO 7.44 H<sub>2</sub>O<sup>-</sup> N.D.  
 CaO 12.70 CO<sub>2</sub> 0.24  
 Na<sub>2</sub>O 2.42 Cr 364.0  
 K<sub>2</sub>O 0.21 Ni 139.0  
 TiO<sub>2</sub> 1.16 Sr 144.0  
 P<sub>2</sub>O<sub>5</sub> 0.11 Zr 73.0

Magnetic Data: 16-18 cm  
 Intensity (emu/cc)  $2.75 \times 10^{-3}$   
 Stable inclination -7.5  
 Physical Properties: 96-98 cm  
 Vp (km/sec) 5.6  
 Porosity (%) 3.2  
 Wet Bulk Density 2.84  
 Grain Density 2.90

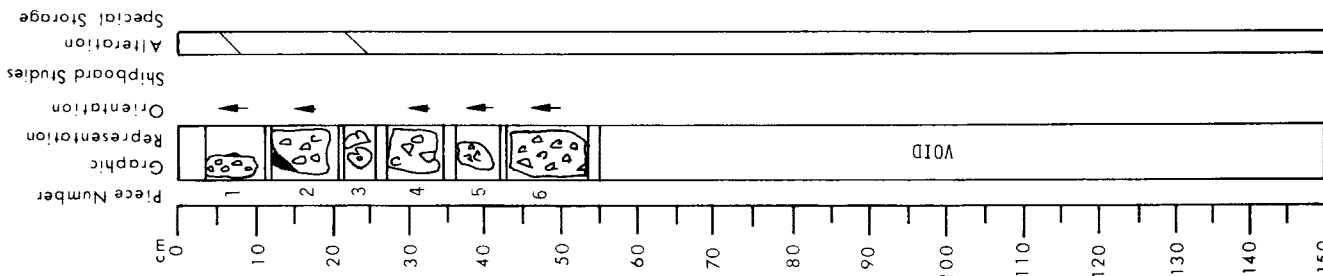
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG    | SITE | HOLE | CORE | SEC |
|--------|------|------|------|-----|
| 46396B | 020  | 016  |      |     |

Depth: 294.0 m to 295.5 m

Visual Description

Structure: Basalt pillow sequence, at least 9 flow units. Maximum size up to at least 30 cm. Numerous fractures filled by carbonate sediment or veins.  
 Texture: Sediment or veins very fine-grained. Basalt: pillows have glassy rims, variolitic zone, and microlitic interiors. Some glass palagonitized.  
 Mineralogy: Plagioclase and olivine phenocrysts (15-20%). Plagioclase/olivine 4/1. Olivine iddingsitized. Plagioclase has numerous dark inclusions.  
 Alteration: 1) Basalt browned up. 2) Carbonate and clay vein fillings.



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG    | SITE | HOLE | CORE | SEC |
|--------|------|------|------|-----|
| 46396B | 021  | 011  |      |     |

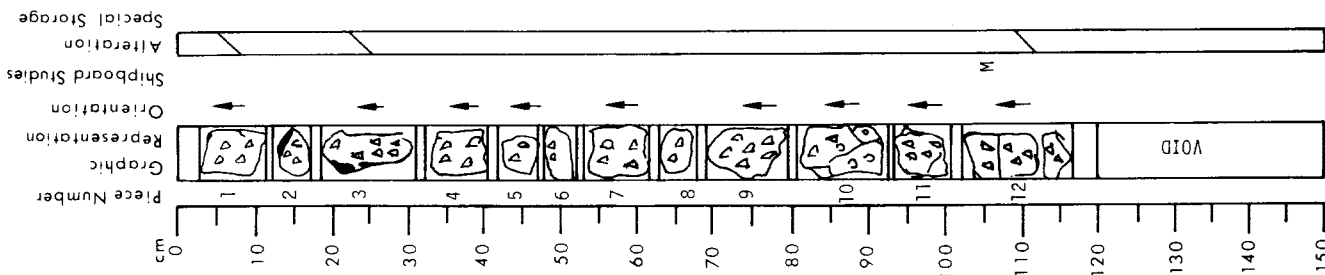
Depth: 296.0 m to 297.5 m

Visual Description

Structure: Basalt pillow sequence. Some fracturing.  
 Texture: Primarily microlitic. Pillow margins have glass, variolitic zone, and microlitic interior.  
 Mineralogy: Plagioclase and olivine phyrlic =20% total phenocrysts. Plagioclase/olivine =4/1. Plagioclase ~7 mm, olivine to 4 mm. Plagioclase has abundant dark inclusions.  
 Alteration: Plagioclase altered blue-green. Olivine iddingsitized. Basalt altered brown. Carbonate, clay(?), and zeolite veins.

Shipboard Data

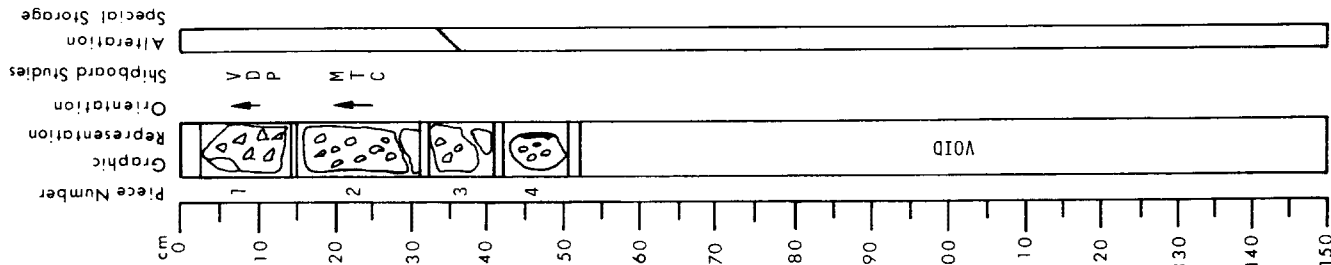
Magnetic Data: 107-109 cm  $2.61 \times 10^{-3}$   
 Intensity (emu/cc)  
 Stable inclination -8.5



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 46  | 39   | 6B   | 012  | 102 |

Depth: 297.5 m to 299.0 m



Visual Description

Structure: Basalt pillow sequence. Some fracturing.

Texture: Primarily microclitic. Pillow margins have glass, variolitic zone, and microclitic interior.

Mineralogy: Plagioclase and olivine phryic ≈20% total phenocrysts. Plagioclase/olivine = 4/1. Plagioclase ≈7 mm, olivine to 4 mm. Plagioclase has abundant dark inclusions.

Alteration: Plagioclase altered blue-green. Olivine iddingsitized. Basalt altered brown. Carbonate, clay(?), and zeolite veins.

Thin Section Description

Phenocrysts: olivine, 3%, to 1.5 mm, anhedral; plagioclase, 20%, to 8 mm, anhedral-subhedral; spinel, trace

Groundmass: olivine, 1%, to 0.1 mm, anhedral-skeletal, plagioclase, 15-20%, to 0.4 mm, laths; clinopyroxene, dendrites; opaque, to 0.01 mm, skeletal

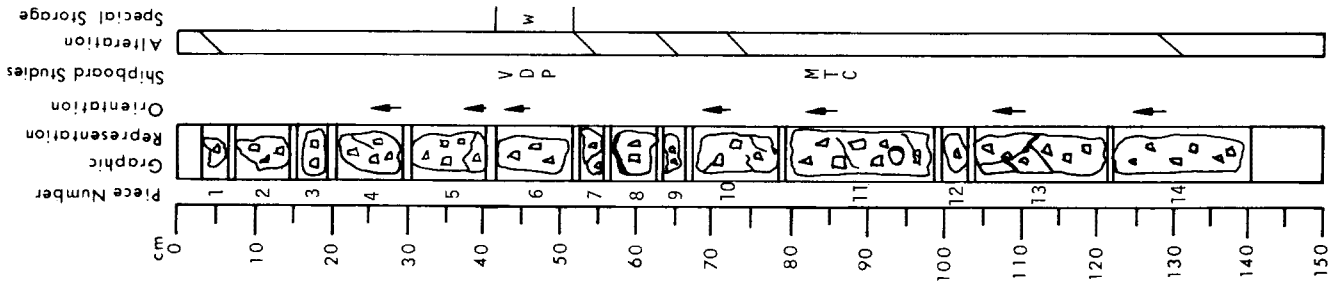
Vesicles: 1%, filled with clay or mesostasis

Texture: porphyritic-intergranular

Alteration: clay replacing olivine and glass

Shipboard Data

|                                |                                    |                         |                                            |
|--------------------------------|------------------------------------|-------------------------|--------------------------------------------|
| Bulk Analysis: 24-26 cm        |                                    | Magnetic Data: 24-26 cm |                                            |
| SiO <sub>2</sub>               | 49.67 MnO                          | 0.15                    | Intensity (emu/cc) 3.79 x 10 <sup>-3</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 17.73 Loss on ignition             | -2.95                   | Stable inclination -5.0                    |
| Fe <sub>2</sub> O <sub>3</sub> | 8.59 H <sub>2</sub> O <sup>+</sup> | 0.95                    | Physical Properties: 8-10 cm               |
| MgO                            | 8.43 H <sub>2</sub> O <sup>-</sup> | N.D.                    | $\bar{V}_p$ (km/sec) 5.5                   |
| CaO                            | 12.60 CO <sub>2</sub>              | 0.16                    | Porosity (%) 4.6                           |
| Na <sub>2</sub> O              | 2.26 Cr                            | 356.0                   | Wet Bulk Density 2.79                      |
| K <sub>2</sub> O               | 0.18 Ni                            | 157.0                   | Grain Density 2.88                         |
| TiO <sub>2</sub>               | 1.01 Sr                            | 124.0                   |                                            |
| P <sub>2</sub> O <sub>5</sub>  | 0.11 Zr                            | 68.0                    |                                            |



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC |
|-----|------|------|------|-----|
| 46  | 39   | 6B   | 012  | 01  |

Depth: 305.5 m to 307.0 m

Visual Description

Mineralogy and Lithology: Plagioclase-olivine porphyritic basalt. Spinel is also present as inclusions in both phenocryst phases and in groundmass. Plagioclase/olivine ≈1:1. Plagioclase up to 5 mm - olivine up to 3 mm. Plagioclase shows a characteristic glomerophytic texture. Glassy margins (fresh) are present throughout core.

Alteration: Basalts are generally fresh but vesicles are nearly always filled with a blue-green clay(?) phase. Fractures and sometimes olivine are filled and replaced by the same material. However, olivine is generally not replaced. Brown halos around fractures are up to 1 cm in width.

Thin Section Description

Phenocrysts: olivine, <5%, to 2.5 mm; plagioclase, 30%, <3 mm, spinel, <1%.

Groundmass: olivine, <1%; plagioclase, 5%, glass, 60%, tachylite

Vesicles: <2%, <1 mm, filled

Texture: porphyritic-interstitial

Alteration: clay filling vesicles and replacing olivine

Shipboard Data

|                                |                                    |                         |                                            |
|--------------------------------|------------------------------------|-------------------------|--------------------------------------------|
| Bulk Analysis: 93-95 cm        |                                    | Magnetic Data: 93-95 cm |                                            |
| SiO <sub>2</sub>               | 49.39 MnO                          | 0.16                    | Intensity (emu/cc) 3.78 x 10 <sup>-3</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 17.96 Loss on ignition             | -2.84                   | Stable inclination -2.5                    |
| Fe <sub>2</sub> O <sub>3</sub> | 8.49 H <sub>2</sub> O <sup>+</sup> | 1.30                    | Physical Properties: 45-47 cm              |
| MgO                            | 8.41 H <sub>2</sub> O <sup>-</sup> | N.D.                    | $\bar{V}_p$ (km/sec) 5.4                   |
| CaO                            | 12.54 CO <sub>2</sub>              | 0.17                    | Porosity (%) 3.5                           |
| Na <sub>2</sub> O              | 2.29 Cr                            | 363.0                   | Wet Bulk Density 2.83                      |
| K <sub>2</sub> O               | 0.18 Ni                            | 154.0                   | Grain Density 2.89                         |
| TiO <sub>2</sub>               | 0.99 Sr                            | 121.0                   |                                            |
| P <sub>2</sub> O <sub>5</sub>  | 0.09 Zr                            | 63.0                    |                                            |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG    | SITE  | HO | CORE | SEC |
|--------|-------|----|------|-----|
| 46396B | 02202 |    |      |     |

Depth: 307.0 m to 308.5 m

Visual Description

Mineralogy and Lithology: Plagioclase-olivine porphyritic basalt. Spinel is also present as inclusions in both phenocryst phases and in groundmass. Plagioclase/olivine = 5:1. Plagioclase up to 5 mm - olivine up to 3 mm. Plagioclase shows a characteristic glomerophyric texture. Glassy margins (fresh) are present throughout core.

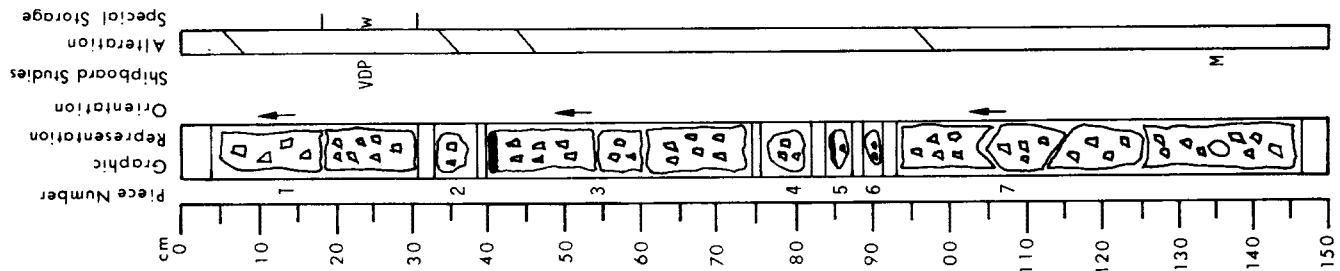
Alteration: Basalts are generally fresh but vesicles are nearly always filled with a blue-green clay(?) phase. Fractures and sometimes olivine are filled and replaced by the same material. However, olivine is generally not replaced. Brown halos around fractures are up to 1 cm in width.

Shipboard Data

Magnetic Data: 34-36 cm  
 Intensity (emu/cc)  $10.09 \times 10^{-3}$   
 Stable inclination -4.5

Physical Properties: 21-23 cm

Vp (km/sec) 5.6  
 Porosity (%) 2.8  
 Wet Bulk Density 2.81  
 Grain Density 2.86



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG    | SITE  | HO | CORE | SEC |
|--------|-------|----|------|-----|
| 46396B | 02203 |    |      |     |

Depth: 308.5 m to 310.0 m

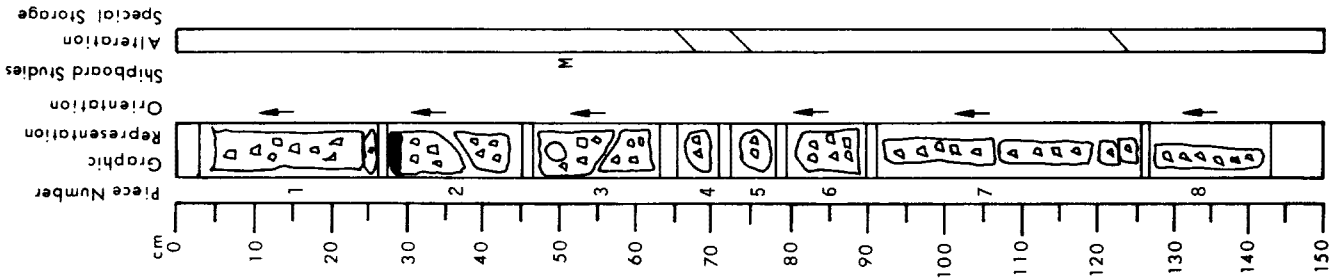
Visual Description

Mineralogy and Lithology: Plagioclase-olivine porphyritic basalt. Spinel is also present as inclusions in both phenocryst phases and in groundmass. Plagioclase/olivine = 5:1. Plagioclase up to 5 mm - olivine up to 3 mm. Plagioclase shows a characteristic glomerophyric texture. Glassy margins (fresh) are present throughout core.

Alteration: Basalts are generally fresh but vesicles are nearly always filled with a blue-green clay(?) phase. Fractures and sometimes olivine are filled and replaced by the same material. However, olivine is generally not replaced. Brown halos around fractures are up to 1 cm in width.

Shipboard Data

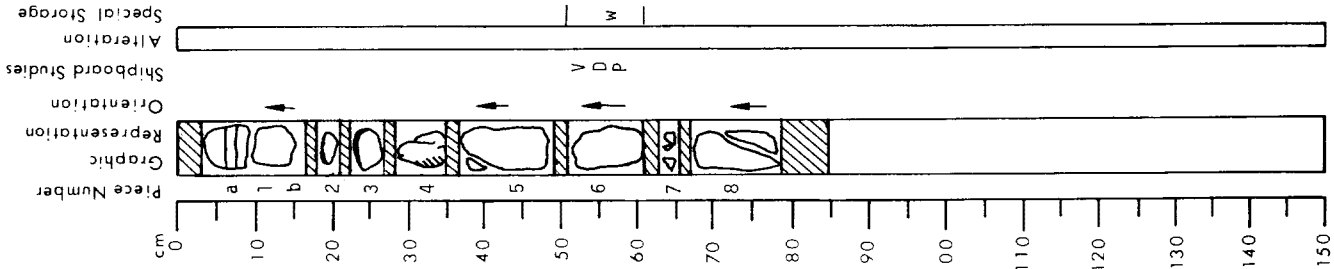
Magnetic Data: 50-52 cm  
 Intensity (emu/cc)  $3.16 \times 10^{-3}$   
 Stable inclination -5.0



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC   |
|-----|------|------|------|-------|
| 4   | 6    | 39   | 6B   | 02204 |

Depth: 310.0 m to 311.5 m



Visual Description

Mineralogy and Lithology: Plagioclase-olivine porphyritic basalt. Spinel is also present as inclusions in both phenocryst phases and in groundmass. Plagioclase/olivine = 3:1. Plagioclase up to 5 mm - olivine up to 3 mm. Plagioclase shows a characteristic glomerophyric texture. Glassy margins (fresh) are present throughout core.

Alteration: Basalts are generally fresh but vesicles are nearly always filled with a blue-green clay(?) phase. Fractures and sometimes olivine are filled and replaced by the same material. However, olivine is generally not replaced. Brown halos around fractures are up to 1 cm in width.

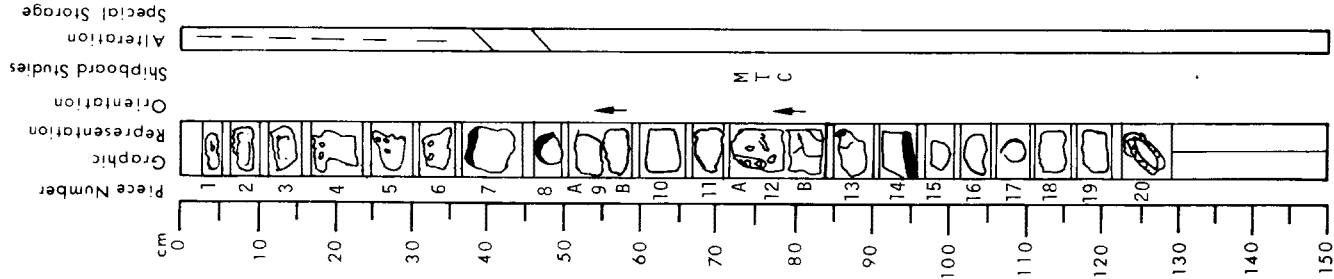
Shipboard Data

Physical Properties: 55-57 cm  
 Vp (km/sec) 5.4  
 Porosity (%) 5.0  
 Wet Bulk Density 2.81  
 Grain Density 2.91

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE | CORE | SEC   |
|-----|------|------|------|-------|
| 4   | 6    | 39   | 6B   | 02301 |

Depth: 315.0 m to 316.5 m



Visual Description

Lithology: A) 0-50 cm rather irregular vesicular basalt fragments. B) 50-78 cm partly palagonitized sideromelane pillow-rind breccia cemented by zeolites. C) 78-127 cm more massive, fine-grained basalt (some pillow margins) some with breccia adhering.

Mineralogy: In strong contrast to previous units, basalt is only sparsely phyrlic (<1%) with olivine more abundant than plagioclase, both generally <1 mm.

Alteration: 0-50 cm much more altered (pervasively) than most previous rocks, probably "weathered" top of new lithologic unit. "Holes" may not be (in part) original vesicles, but "weathered-out" cavernous holes. Abundant coating: manganese crust and globules as lining of cavities; abundant zeolites, carbonate, some clay, silica? The most unusual rock is the palagonitized sideromelane breccia, the upper part of which appears clearly bedded, reflecting a process of fragmentation (spalling-off of pillow rinds? granulation due to thermal shock?) followed by sorting and sedimentation. On the whole the section is still part of a pillow basalt sequence.

Thin Section Description

Phenocrysts: olivine, <1%, 0.2 mm, euhedral; plagioclase, <1%, 1 mm, rounded

Groundmass: olivine, <5%; plagioclase, 30%; microclites; glass

Vesicles: <5%, mostly unfilled

Texture: intersertal

Alteration: clay, calcite, and zeolite fill vesicles, glass to clay and Fe-hydroxides

Shipboard Data

Bulk Analytists: 87-89 cm  
 SiO<sub>2</sub> 49.08 MnO 0.18  
 Al<sub>2</sub>O<sub>3</sub> 16.01 Loss on ignition -1.50  
 Fe<sub>2</sub>O<sub>3</sub> 10.58 H<sub>2</sub>O<sup>+</sup> 0.76  
 MgO 7.37 H<sub>2</sub>O<sup>-</sup> N.D.  
 CaO 11.74 CO<sub>2</sub> 0.17  
 Na<sub>2</sub>O 2.59 Cr 346.0  
 K<sub>2</sub>O 0.35 Ni 140.0  
 TiO<sub>2</sub> 1.58 Sr 163.0  
 P<sub>2</sub>O<sub>5</sub> 0.17 Zr 106.0

Magnetic Data: 80-82 cm  
 Intensity (emu/cc) 2.27 x 10<sup>-3</sup>  
 Stable inclination +54.0

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG | SITE | HOLE  | CORE | SEC |
|-----|------|-------|------|-----|
| 46  | 396  | B0240 | 01   | 1   |

Depth: 324.5 m to 326.0 m

Visual Description

Core 24 is similar in lithology to Core 23: fine-grained basalt, pillow-rind fragments, palagonitized sideromelane pillow-rind breccia cemented by zeolite to non-glassy basalt. Vesicles partly filled by carbonate - but generally open(!) except for bluish clay lining. Fewer breccias and pillow rinds than in Core 23. Olivine with spinel inclusions and plagioclase phenocrysts with <1 vol. % but slightly more abundant and slightly larger than in Core 23. Alteration moderate, as in lower Core 23. Olivine and plagioclase phenocrysts generally fresh. Sideromelane in breccias is 50% palagonitized. Carbonate and zeolite dominant alteration products.

Thin Section Description

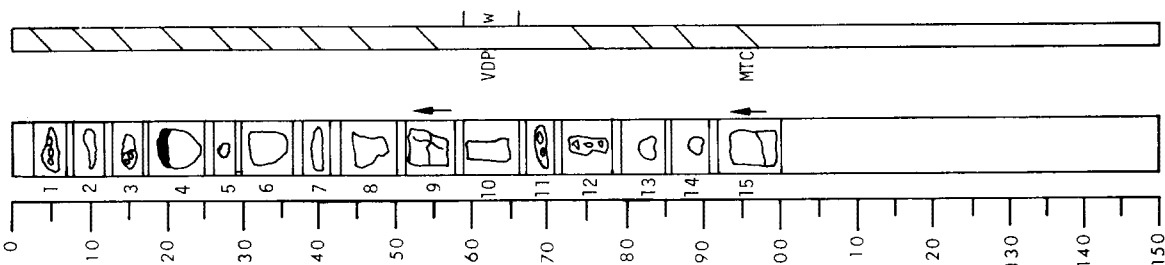
Phenocrysts: olivine, <1%, <2 mm; plagioclase, <1%, <1.5 mm, rounded  
Groundmass: olivine, <2%, plagioclase, 20-30%, glass, 70%, tachylite  
Vesicles: 1%, some filled by glass  
Texture: intersertal

Shipboard Data

Bulk Analysis: 94-96 cm  
 SiO<sub>2</sub> 48.83 MnO 0.18  
 Al<sub>2</sub>O<sub>3</sub> 16.06 Loss on ignition -1.81  
 Fe<sub>2</sub>O<sub>3</sub> 10.45 H<sub>2</sub>O<sup>+</sup> 0.77  
 MgO 7.92 H<sub>2</sub>O<sup>-</sup> N.D.  
 CaO 11.63 CO<sub>2</sub> 0.09  
 Na<sub>2</sub>O 2.59 Cr 345.0  
 K<sub>2</sub>O 0.28 Ni 133.0  
 TiO<sub>2</sub> 1.54 Sr 161.0  
 P<sub>2</sub>O<sub>5</sub> 0.16 Zr 109.0

Magnetic Data: 94-96 cm  
 Intensity (emu/cc) 2.17 x 10<sup>-3</sup>  
 Stable inclination +16.0  
 Physical Properties: 62-63 cm  
 Vp (km/sec) 5.7  
 Porosity (%) 3.8  
 Wet Bulk Density 2.83  
 Grain Density 2.90

Piece Number  
 Graphical Representation  
 Orientation  
 Shipboard Studies  
 Alteration  
 Special Storage



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

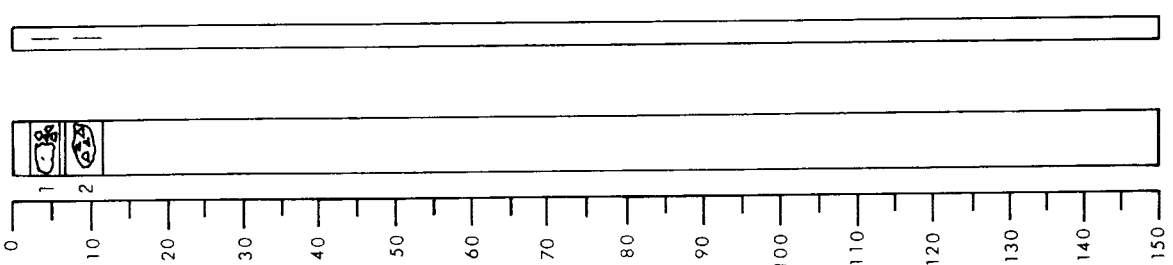
| LEG | SITE | HOLE  | CORE | SEC |
|-----|------|-------|------|-----|
| 46  | 396  | B0250 | 01   | 1   |

Depth: 334.0 m to 335.5 m

Visual Description

Partly palagonitized sideromelane (fresh, dense) breccia cemented by zeolite crusts. As in Core 24, some angular more crystallized basalt pieces, sometimes but not always representing pillow rinds. Thus, there must have been unusually violent processes of fragmentation (rapid extrusion? high pile, or pillows?) Perhaps fewer and smaller phenocrysts than in Core 24. Low recovery in Cores 23-25 may be due to abundance of breccias and/or bad weather.

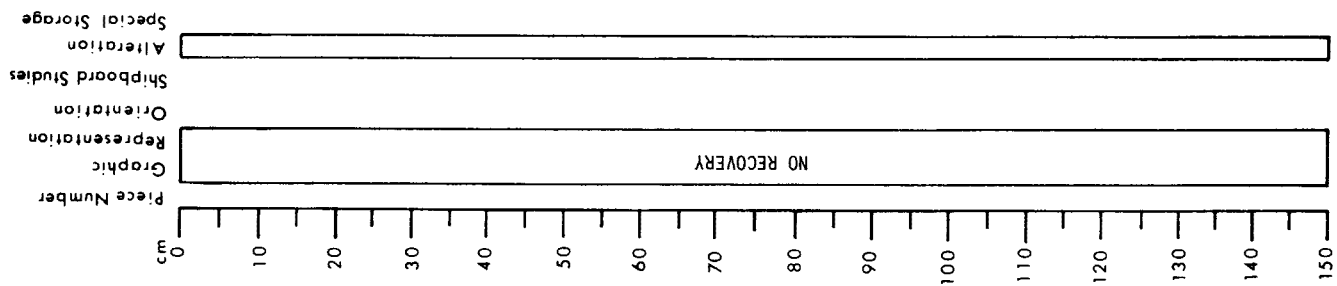
Piece Number  
 Graphical Representation  
 Orientation  
 Shipboard Studies  
 Alteration  
 Special Storage



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|        |        |      |      |     |
|--------|--------|------|------|-----|
| LEG    | SITE   | HOLE | CORE | SEC |
| 46396B | 027018 |      |      |     |

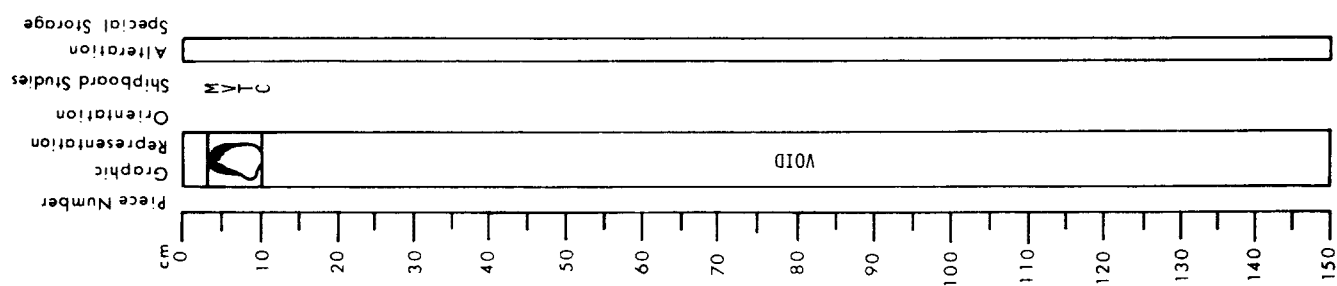
Depth: \_\_\_\_\_ m to \_\_\_\_\_ m



VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|        |        |      |      |     |
|--------|--------|------|------|-----|
| LEG    | SITE   | HOLE | CORE | SEC |
| 46396B | 026011 |      |      |     |

Depth: 343.0 m to 344.5 m



Visual Description

One piece - basalt pillow margin. Sparsely olivine and plagioclase and phryic olivine/plagioclase =1/1. One percent total phenocrysts. Olivine mostly altered - some fresh. Plagioclase with abundant dark inclusions. Glass margins with some variolites. Interior coalesced spherulites. One percent vesicles and euhedral vugs. Some clay filled. Some zeolite filled, some partially filled.

Thin Section Description

Phenocrysts: <1% olivine and plagioclase  
Groundmass: olivine and plagioclase is spherulites, glass, 10%  
Vesicles: to 1.5 mm round

Texture: holohyaline to variolitic (pillow rind)

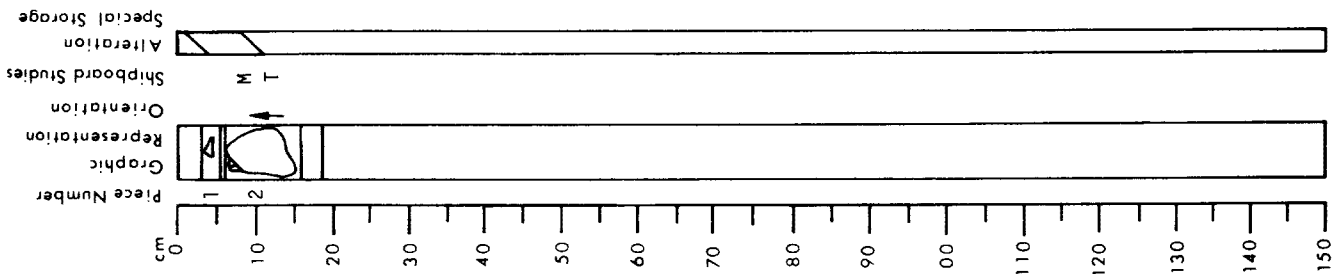
Shipboard Data

|                                |                                     |                       |                                            |
|--------------------------------|-------------------------------------|-----------------------|--------------------------------------------|
| Bulk Analysis: 7-10 cm         |                                     | Magnetic Data: 3-5 cm |                                            |
| SiO <sub>2</sub>               | 49.42 MnO                           | 0.19                  | Intensity (emu/cc) 1.10 x 10 <sup>-3</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 15.86 Loss on ignition              | -0.40                 | Stable inclination +22.0                   |
| Fe <sub>2</sub> O <sub>3</sub> | 10.33 H <sub>2</sub> O <sup>+</sup> | 0.53                  | Physical Properties: 3-5 cm                |
| MgO                            | 8.16 H <sub>2</sub> O <sup>-</sup>  | N.D.                  | $\bar{V}_p$ (km/sec) (5.3)                 |
| CaO                            | 11.26 CO <sub>2</sub>               | 0.26                  | Porosity (%) ---                           |
| Na <sub>2</sub> O              | 2.73 Cr                             | 358.0                 | Wet Bulk Density ---                       |
| K <sub>2</sub> O               | 0.21 Ni                             | 139.0                 | Grain Density ---                          |
| TiO <sub>2</sub>               | 1.49 Sr                             | 157.0                 |                                            |
| P <sub>2</sub> O <sub>5</sub>  | 0.15 Zr                             | 115.0                 |                                            |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG    | SITE    | HO | L | CORE | SEC |
|--------|---------|----|---|------|-----|
| 463916 | B028101 |    |   |      |     |

Depth: 358.0 m to 359.5 m



Visual Description

Structure: One weathered basalt fragment and one small chip or variolitic pillow rind.

Mineralogy: Olivine and plagioclase sparsely phyrlic basalt. A few olivine phenocrysts, 0.3-1 mm, and frequent plagioclase phenocrysts, 0.5-4 mm with rounded shapes. Glass fragment contains a few olivine and plagioclase phenocrysts, 1-0.5 mm and 1 mm respectively totaling less than 3%.

Alteration: Basalt fragment has a weathered appearance, is brownish green-gray in color, and has frequent vesicles filled with fibrous zeolites and a second white mineral (calcite?). Olivine is altered to iddingsite. In the glassy pillow margin the glass between the varioles appears quite fresh, while the varioles are altered to palygonite at the surface.

Thin Section Description

Phenocrysts: olivine, 3%, 0.2-1.5 mm, euhedral; plagioclase, 5%, 0.2-2 mm, subhedral; spinel, <1%, 40 $\mu$  subhedral

Groundmass: plagioclase, 50%, variolitic; clinopyroxene, 20-30%, granules and microlites; opaque, 6%, 10-50 $\mu$ , anhedral-dendritic

Vesicles: filled

Texture: porphyritic-intergranular

Alteration: olivine to iddingsite, groundmass to clay, calcite filling vesicles

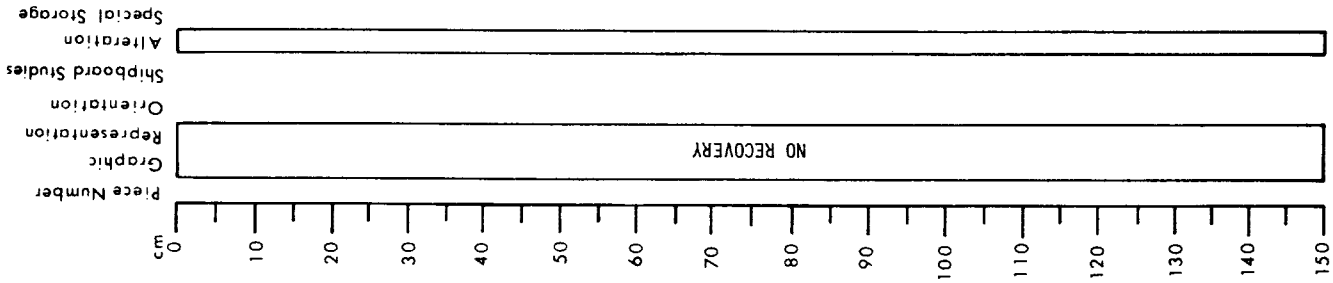
Shipboard Data

Magnetic Data: 10-12 cm  
Intensity (emu/cc) 2.46 x 10<sup>-3</sup>  
Stable inclination -6.57

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

| LEG   | SITE    | HO | L | CORE | SEC |
|-------|---------|----|---|------|-----|
| 46316 | B029100 |    |   |      |     |

Depth: \_\_\_\_\_ m to \_\_\_\_\_ m



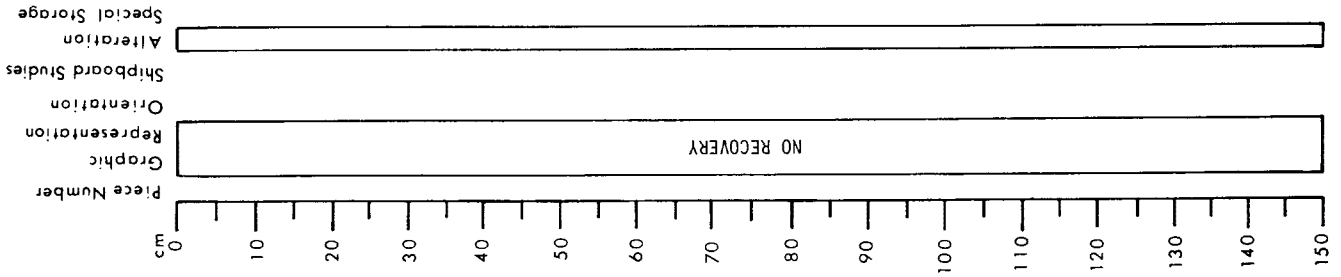


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|       |      |    |      |     |
|-------|------|----|------|-----|
| LEG   | SITE | HO | CORE | SEC |
| 46396 | B031 | 00 | 00   | 00  |

Depth: \_\_\_\_\_ m to \_\_\_\_\_ m

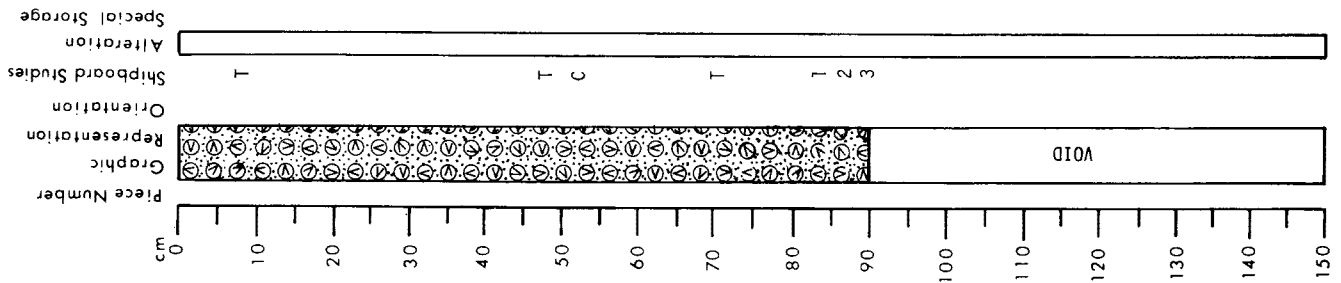
VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS



|       |        |    |      |     |
|-------|--------|----|------|-----|
| LEG   | SITE   | HO | CORE | SEC |
| 46396 | B03001 | 00 | 00   | 01  |

Depth: 377.5 m to 379.0 m

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS



Visual Description

Basaltic sand and gravel with one basalt pillow and two pieces of basaltic sandstone. Some sand ranges from about 1 mm at the top to about 4 mm at bottom. Sixty per cent angular to subrounded fragments of crystalline basalt, 40% angular fragments of fine basaltic glass, about 1% olivine and plagioclase grains. Basalt pillow is 5 cm in diameter, with a broad crust rind and 2 cm central cavity. Greenish sandstone are same as the loose sand. Piece #2 is bedded with one fine and one medium bed. Piece #3 is uniform sandstone.

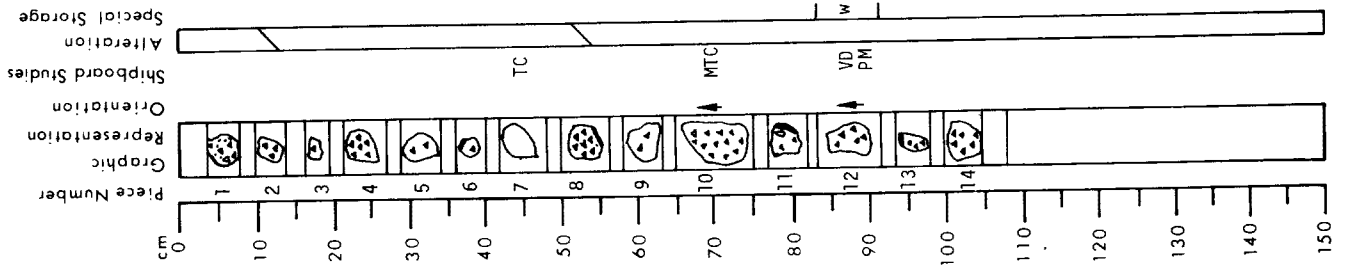
Shipboard Data

|                                |         |         |
|--------------------------------|---------|---------|
| Bulk Analysis:                 | 60.0 cm | 60.0 cm |
| SiO <sub>2</sub>               | 48.96   | 49.15   |
| Al <sub>2</sub> O <sub>3</sub> | 15.83   | 15.51   |
| Fe <sub>2</sub> O <sub>3</sub> | 10.86   | 10.27   |
| MgO                            | 7.53    | 8.07    |
| CaO                            | 11.58   | 11.19   |
| Na <sub>2</sub> O              | 2.56    | 2.73    |
| K <sub>2</sub> O               | 0.25    | 0.18    |
| TiO <sub>2</sub>               | 1.49    | 1.50    |
| P <sub>2</sub> O <sub>5</sub>  | 0.16    | 0.15    |
| MnO                            | 0.19    | 0.19    |
| Loss on ignition               | -0.80   | +0.16   |
| H <sub>2</sub> O <sup>+</sup>  | 0.46    | 0.76    |
| H <sub>2</sub> O <sup>-</sup>  | N.D.    | N.D.    |
| CO <sub>2</sub>                | 0.22    | 0.62    |
| Cr                             | 336.0   | 358.0   |
| Mn                             | 138.0   | 137.0   |
| Sr                             | 156.0   | 150.0   |
| Zr                             | 80.0    | 103.0   |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 416 | 396  | B03  | 201  | 1   |

Depth: 386.5 m to 388.0 m



Visual Description

Structure: Probably several basalt pillows. Phenocryst content varies irregularly from the top to the bottom.

Texture: Aphyric - phyrlic. Glassy - varfolitic - fine-grained intersertal texture. Vesicles, usually 0.2-0.5 mm, 1-3%, max. 7 mm, 5%.

Mineralogy: Olivine phenocryst, 1-3 mm, 0-3%, plagioclase phenocryst, 1-5 mm, 0-12%. Olivine/plagioclase ratio, 2-10, average 4.

Alteration: Little alteration in the groundmass of some samples. Olivine is partly altered to iddingsite. Botrioidal secondary minerals in vesicles and cracks, not common. Coating along crack surface: Mn-oxides, smectite.

Thin Section Description

Phenocrysts: <1% olivine and plagioclase

Groundmass: olivine, 10%, 0.1 mm, granular; plagioclase, 50%, 0.1-0.3 mm, lathis; clinopyroxene, 20%, 0.1 mm, granular; opaque, fine-grained

Vesicles: 2%, 0.4 mm

Texture: intergranular

Alteration: olivine to iddingsite, zeolite vesicle filling

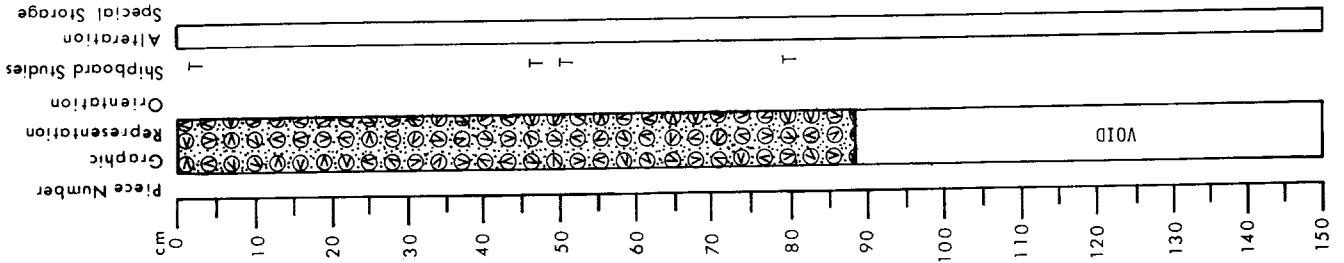
Shipboard Data

|                                |          |          |                      |                         |                         |
|--------------------------------|----------|----------|----------------------|-------------------------|-------------------------|
| Bulk Analysis:                 | 45-47 cm | 69-71 cm | Magnetic Data:       | 69-71 cm                | 85-87 cm                |
| SiO <sub>2</sub>               | 49.17    | 49.60    | Intensity (emu/cc)   | 2.59 x 10 <sup>-3</sup> | 3.15 x 10 <sup>-3</sup> |
| Al <sub>2</sub> O <sub>3</sub> | 15.88    | 17.97    | Stable inclination   | +43.0                   | -14.5 (-20.5)           |
| Fe <sub>2</sub> O <sub>3</sub> | 10.13    | 8.23     | Physical Properties: | 85-87 cm                |                         |
| MgO                            | 7.48     | 7.20     | Vp (km/sec)          | 5.7                     |                         |
| CaO                            | 11.66    | 12.14    | Porosity (%)         | ---                     |                         |
| Na <sub>2</sub> O              | 2.63     | 2.59     | Wet Bulk Density     | 2.85                    |                         |
| K <sub>2</sub> O               | 0.34     | 0.24     | Grain Density        | ---                     |                         |
| TiO <sub>2</sub>               | 1.45     | 1.22     |                      |                         |                         |
| P <sub>2</sub> O <sub>5</sub>  | 0.16     | 0.12     |                      |                         |                         |
| MnO                            | 0.18     | 0.14     |                      |                         |                         |
| Loss on Ignition               | -0.95    | -2.88    |                      |                         |                         |
| H <sub>2</sub> O <sup>+</sup>  | 0.67     | 1.38     |                      |                         |                         |
| H <sub>2</sub> O <sup>-</sup>  | N.D.     | N.D.     |                      |                         |                         |
| CO <sub>2</sub>                | 0.30     | 0.54     |                      |                         |                         |
| Cr                             | 350.00   | 348.0    |                      |                         |                         |
| Ni                             | 122.0    | 155.0    |                      |                         |                         |
| Sr                             | 154.0    | 162.0    |                      |                         |                         |
| Zr                             | 108.0    | 85.0     |                      |                         |                         |

VISUAL CORE DESCRIPTION FOR IGNEOUS ROCKS

|     |      |      |      |     |
|-----|------|------|------|-----|
| LEG | SITE | HOLE | CORE | SEC |
| 416 | 396  | B03  | 301  | 1   |

Depth: 395.0 m to 397.5 m



Visual Description

Basaltic gravel, fragments from 2 mm to 1 1/2 cm. Mostly basalt and glass. Also olivine and plagioclase crystals, zeolite spherules, and fine-grained basalt. Not bedded.