9. SITE 560[1]

Shipboard Scientific Party[2]

HOLE 560

Date occupied: 16 October 1981

Date departed: 18 October 1981

Time on hole: 38 hr.

Position (latitude; longitude): 34°43.33′N; 38°50.56′W

Water depth (sea level; corrected m, echo-sounding): 3443

Water depth (rig floor; corrected m, echo-sounding): 3453

Bottom felt (m, drill pipe): 3455

Penetration (m): 421.5

Number of cores: 6

Total length of cored section (m): 48.5

Total core recovered (m): 7.81

Core recovery (%): 16

Oldest sediment cored:
Depth sub-bottom (m): 373
Nature: Dolomite
Age: Miocene

Basement:
Depth sub-bottom (m): 374.5
Nature: Serpentinized gabbros

Principal results: Hole 560 (MAR-7) was drilled on Anomaly 5D on the west flank of the Mid-Atlantic Ridge midway between the Oceanographer and Hayes fracture zones (Fig. 1). Sediments were washed down to the basement at a depth of 374.5 m sub-bottom.

Only serpentinized gabbros and serpentine with the presence of chrysotile were found with very poor recovery down to the bottom of the hole at 421.5 m sub-bottom. Failure to recover basalt can be attributed to drilling through a talus slope facing the spreading axis.

Repeated occurrence of shallow-level serpentinized gabbros (Holes 556, 558, and 560), as supported by previous drilling results at Holes 334 (Aumento, Melson, et al., 1977) and 395 (Melson, Rabinowitz, et al., 1979), seems to be a general characteristic connected with the high frequency of faulting.

Because we did not recover basalt, it was necessary to drill again in the same area.

At Site 560, no samples were taken for interstitial water analyses or for paleomagnetic measurements. No downhole measurements were taken at this site, and sediment accumulation rates could not be calculated.

OPERATIONS

Approach to Site

After completing operations at Site 559, we decided to drill on Anomaly 5D, which lies along the same flow line as Site 559 between the Oceanographer and Hayes Fracture Zones. The track of the *Challenger* followed the flow line toward the Mid-Atlantic Ridge and arrived in the general vicinity of the site on the evening of 16 October (Fig. 2). Potential drill sites were noted on a broad elevated ridge on Anomaly 6 (about 2000Z) and on a buried ridge on Anomaly 5E (about 2130Z). Both of these sites were characterized by rough basement and an irregular, fuzzy basement reflector. In the immediate vicinity of Anomaly 5D, a strong basement return was observed on the east flank of a structural high at 2250Z (Fig. 3). After profiling beyond this feature, we decided to drill on this site. Even though the slope was steeper here than on previous sites, we thought that the strong basement return indicated solid basement material. The course of the *Challenger* was reversed and the beacon dropped on Site 560 at 0039Z 17 October.

On-Site Operations

Site 560 was spudded at 0852Z 17 October, in an estimated 3443 m of water. No mudline core was taken, and sediments were washed down until basement was hit at a sub-bottom depth of 374.5 m. The first basement core was recovered at 1515Z and contained serpentinized gabbros mixed with sediments. At 0445Z, 18 October, after six cores penetrating 48.5 m failed to recover any basalt, we decided to abandon the hole (Table 1). The drill string was pulled and the *Challenger* was under way to Site 561 at 1244Z.

SEDIMENT LITHOLOGY

Site 560 was selected for basalt recovery only, to be washed to basement without coring. Because of the very steep basement topography, the site proved to be one at which apparently only a submarine talus or debris-flow deposit (as well as some of the overlying carbonate sediments) was penetrated.

Core H1, a wash core representing the sedimentary section from 0 to 373 m sub-bottom, consists of nannofossil ooze and chalk, and foraminiferal-nannofossil ooze and chalk. Core 1 (373.0–376.5 m) recovered 140 cm of

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[1] Bougault, H., Cande, S. C., et al., *Init. Repts. DSDP*, 82: Washington (U.S. Govt. Printing Office).

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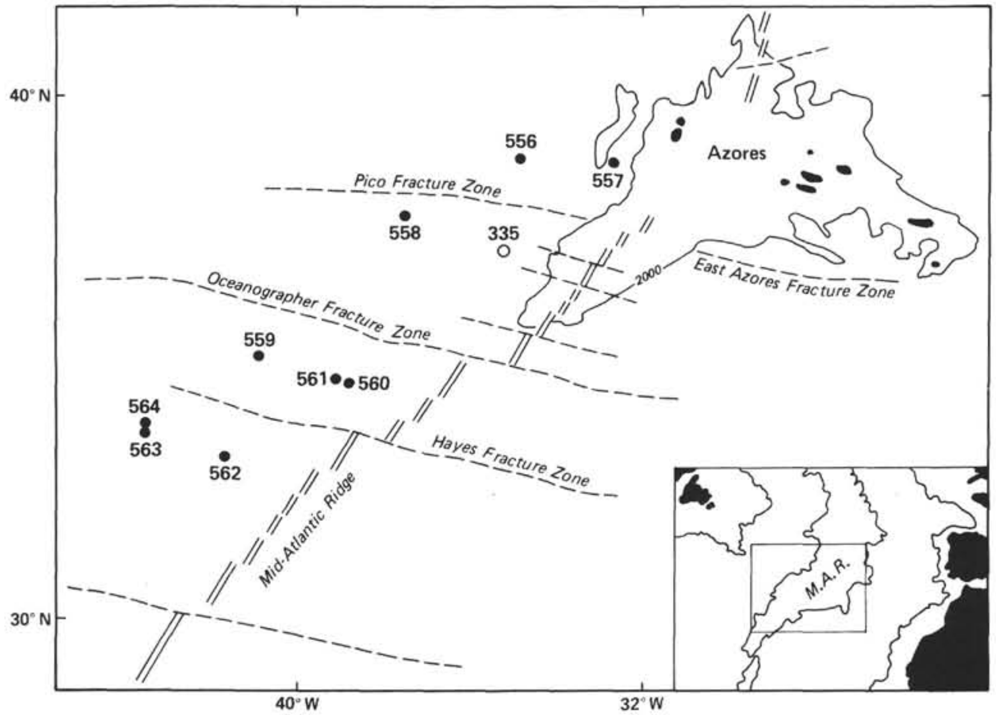


Figure 1. Site location map for Leg 82.

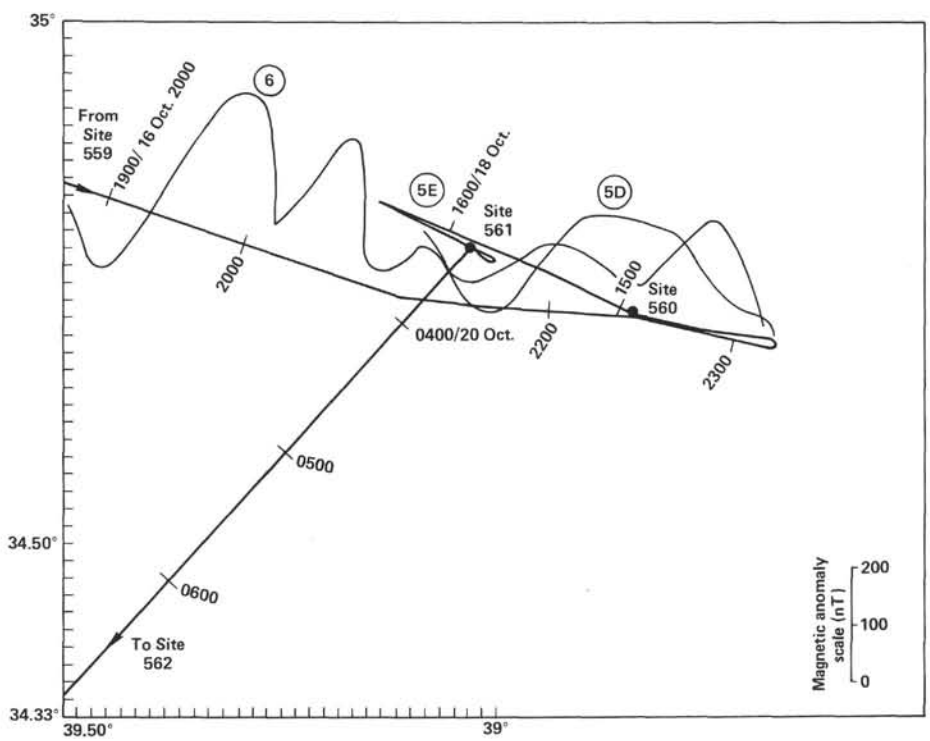


Figure 2. Approach and site survey track for Sites 560 and 561. Heavy line is the ship's track with hour marks in GMT. Thin line is magnetic anomaly line projected perpendicularly from the ship's track. Circled numbers are magnetic anomalies based on work at Lamont-Doherty Geological Observatory.

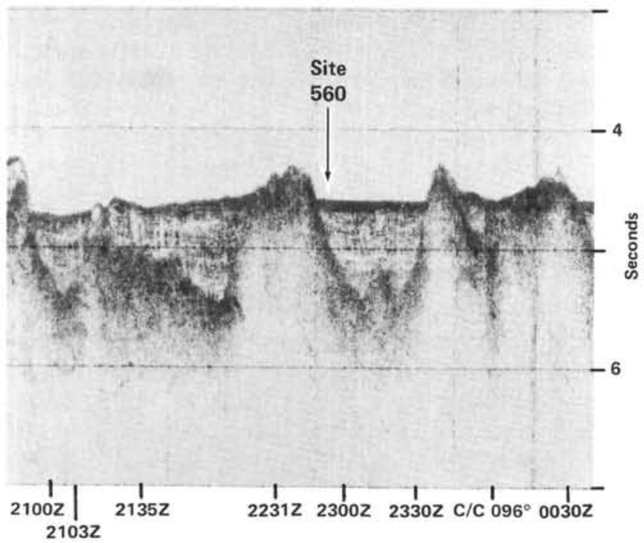


Figure 3. *Glomar Challenger* seismic profile over Site 560. For location of profile, see Figure 2. C/C = course change.

Table 1. Coring summary, Hole 560.

Core	Date (Oct. 1981)	Time (Z)	Depth from drill floor (m)	Depth below seafloor (m)	Length cored (m)	Length recovered (m)	Percent recovered
H1	17	1415	3455.0-3828.0	0.0-373.0	0.0	0.00	0
1	17	1515	3828.0-3831.5	373.0-376.5	3.5	1.55	44
2	17	1645	3831.5-3840.5	376.5-385.5	9.0	1.07	12
3	17	1920	3840.5-3853.5	385.5-398.5	13.0	0.63	5
4	17	2125	3853.5-3858.5	398.5-403.3	5.0	0.73	15
5	18	0042	3858.5-3867.5	403.5-412.5	9.0	1.13	13
6	18	0455	3867.5-3876.5	412.5-421.5	9.0	2.70	30
					48.5	7.81	16

nannofossil chalk, dolomitic nannofossil chalk, and marly dolomitic limestone, of the late early Miocene to early middle Miocene times (14 to 17 Ma), in contact with rubble or talus of serpentinized basement. Core 2 (376.5 to 385.5 m) recovered 140 cm of a mixture of limestone, polymict limestone breccia, and brecciated serpentinized basalt and gabbro, overlying a series of serpentinites and other tectonically altered basic igneous rocks.

If we had cored the sedimentary section at this site, we probably would have recognized three units: nannofossil to foraminiferal-nannofossil ooze and chalk; dolomitic nannofossil chalk to limestone; and redeposited polymict breccia.

The nannofossil and foraminiferal-nannofossil ooze and chalk (Core H1) is white (7.5YRN 8, 2.5YN 8) to pinkish white (7.5YR 8/2) to pink (2.5YR 8/4 and 5YR 8/3), with black streaks of ash (pumice). Two light brown (7.5YR 6/4) beds 10 to 20 cm thick in the lower part of Section 560-H1-6 indicate the transition upward from the dolomite and nannofossil chalk in the next core. The chalk is very mildly bioturbated, and only faint mottling is discernible. Bedding is massive. Calcareous nannofossils are the principal component of these sediments, and the carbonate content averages more than 90% (Fig. 4).

The dolomitic nannofossil chalk to limestone begins in the lower part of Section 560-H1-6 and continues through 560-1-1, 107 cm, where the base of the 12-cm-thick dolostone (85% dolomite) is in distinct contact with an underlying marly dolomitic limestone (107–115 cm). The dolostone is reddish brown (5YR 4/4 to 5YR 5/4), and the marly limestone below it is yellowish brown to brownish yellow. The chalk that occurs above the dolostone grades from very pale brown (10YR 7/4) to reddish yellow (7.5YR 6/6), light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/6). The chalk is mildly to considerably bioturbated. The burrows and mottlings are a darker color than the unchurned material. Bedding is faint and parallel, and it appears to be inclined because of possible post-depositional slumping. At 560-1-1, 78–90 cm, there are indistinct microripples or flaser bedding. At 560-1-1, 107–115 cm, there is a graded, fining-upward turbidite sequence of silt-size to clay-size parti-

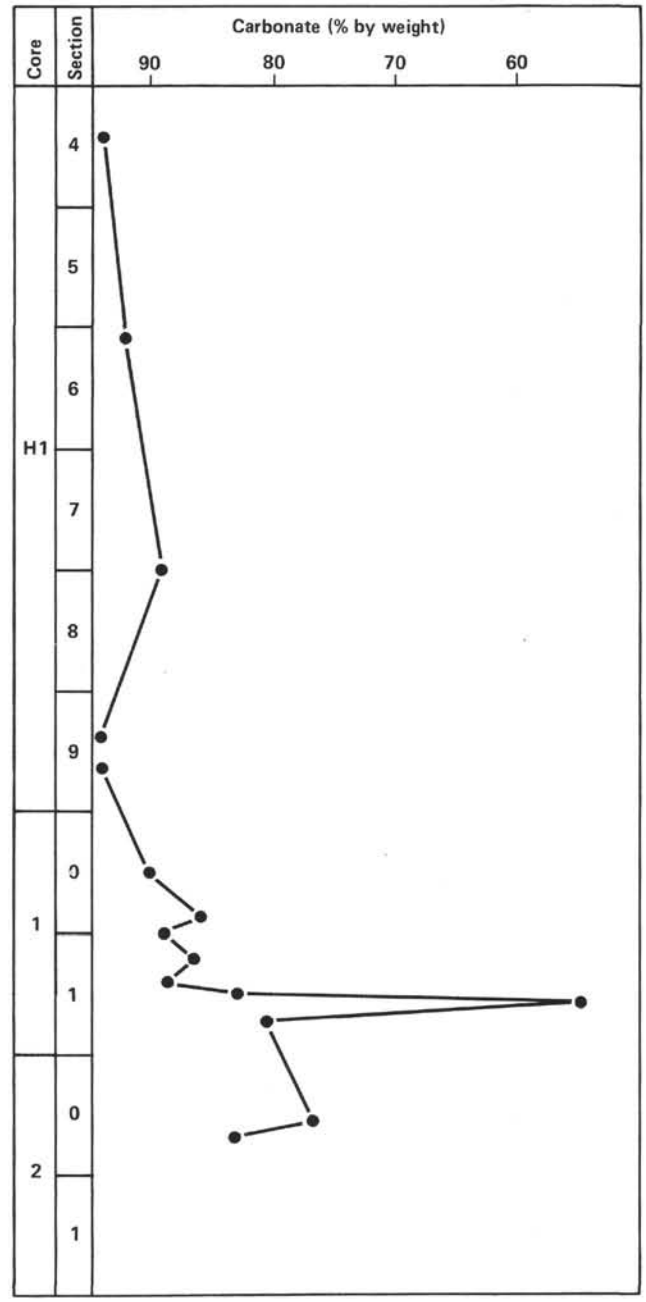


Figure 4. Carbonate curve, Hole 560.

cles, with a scour at the base. The carbonate content in this bed is 55%, whereas it is between 80 and 90% throughout the rest of the core. Dolomite increases from 3% at 560-1-1, 5 cm to 85% at 560-1-1, 100 cm, and it makes up 70% just above the sediment/basement contact. "Basement" was encountered at 374.2 m (560-1-1, 120 cm) in the form of serpentinite. This material (continuing through Core 2 and below) is part of a submarine talus or slump deposit (or debris flow), in which limestone, polymict limestone breccia, serpentinized gabbro and gabbroic breccia, and basalt are all present (probably as boulders). The turbidite described from Core 1 could be the end stage of the debris flow. The limestone (560-2-1, 8–60 cm) is a dolomitic clayey nannofossil limestone, reddish yellow (7.5YR 7/6 and 7.5YR 7/8) and light yellowish brown to olive yellow (2.5YR 6/6, 2.5Y 6/8) in color. Bedding is massive, with no obvious mottling. This micritic limestone contains more clay (15–25%), more nannofossils (40%), and less dolomite (10–15%) than that described from Core 1.

The polymict limestone breccia (560-2-1, 0–8 cm; 560-2-1, 75–90 cm; 560-2-1, 100-105 cm; and 560-2-1, 130–140 cm) consists of clasts (silt size to 15 mm) of basalt, glass, igneous lithic fragments (such as gabbro and gabbroic breccia), limestone, and volcaniclastic limestone breccia, in a pale brown to reddish brown microcrystalline limestone matrix.

The remainder of the core contains serpentinite, talc, basalt, and gabbroic breccia.

BIOSTRATIGRAPHY

Summary

Sediments recovered from 560-1-1, 20 cm are, based on the calcareous nannofossils, from the late early Miocene to early middle Miocene times. The faune is abundant and moderately well preserved.

On the other hand, the foraminifers from this part of the section, although abundant, are partially obliterated by dolomite crystals growing in and on the tests. The genera and species that could be identified indicate a middle Miocene assignment.

Calcareous Nannofossils

Hole 560 was washed down to 373.0 m and Core H1 was recovered. H1, CC contains *Discoaster neohamatus* without *D. quinqueramus* or *D. hamatus* and is placed within the *D. neohamatus* Zone CN8 (NN10) of the lower upper Miocene. Core 1, which contains the first basement material, was sampled at 560-1-1, 20 cm and 560-1-1, 117 cm. This interval is assigned to either the *Sphenolithus heteromorphus* Zone CN4 (NN5) or the *Helicosphaera ampliaperta* Zone CN3 (NN3–4) based on the occurrence of *Sphenolithus heteromorphus*. These two samples, the second of which is positioned just above basement, indicate the lower middle Miocene to upper lower Miocene.

Foraminifers

Foraminifers in Section 560-H1-6 are well preserved and from the Miocene time. Sample 560-1-1, 22–24 cm must have been a nannofossil-foraminiferal ooze before crystallization of the dolomite. In this sample, dolomite rhombs are growing in and on the foraminiferal tests and in some cases completely enclosing them. The recognizable genera and species indicate that the sample may be middle Miocene. Sample 560-1-1, 128–130 cm is a basalt rubble and rock flow. In the finest fraction, tiny microforaminifers or juveniles are present. Age could not be determined.

IGNEOUS PETROLOGY AND GEOCHEMISTRY

The cored sequence at Hole 560 passed from limestone and dolomite into serpentinite breccia at about 374 m. Below a short second interval of limestone and limestone-basalt breccia (376–378 m), the hole continued in serpentinite breccia, with increasing amounts of serpentinite mylonite until hole termination at 421.5 m.

Basement Lithologies

Basalt rocks were present as clasts in the basalt-limestone breccia. Only three clasts were sufficiently large to be of interest, each of a different lithology: zeolitized basalt ash, zeolitized variolitic basalt, and partially zeolotized fine-grained basalt. This last clast was the only rock analyzed from this hole.

Serpentinite breccias consist of serpentinite clasts in a bluish gray clayey matrix. The clasts are weathered brown in the upper serpentinite section and at the top of the lower section. Further downhole all clasts appear fresh. Prismatic, dark brown grains of relict pyroxene up to 5 mm long are present in all clasts in the upper part of the section, but they do not persist downhole where the serpentinization is more pervasive. Fresh serpentinite is dark greenish to black with varying degrees of foliation. Occasional large crystals of lighter green(?) antigorite are present. White crysotile veinlets increase in abundance downhole.

Below 398 m sub-bottom, bluish gray mylonite becomes the dominant lithology. This soft, highly cohesive clayey material shows a rough, near-horizontal parting when broken. It is not clear, however, whether this is a primary structure or a drilling-induced structure. In places minor compositional layering may also be present. Within the mylonite are numerous angular fragments (up to 2 cm) of dark green serpentinite and emerald green talc. Occasional large serpentinite pieces occur throughout.

Petrography

The fine-grained basalt fragment (560-2-1, 92–100 cm) has typical intersertal texture and consists of 40% randomly oriented plagioclase laths with 25% granular clinopyroxene and 25% mesostasis with up to 5% olivine and 5% magnetite. Both olivine and mesostasis are completely altered to light brown or colorless aggregates of zeolite.

Two zeolite minerals appear to be present. One occurs as relatively coarse-grained (about 0.02 mm) aggregates, especially after olivine, and is identified optically as gmelinite. The second is finer grained, but appears identical to the heulandite identified in basalts from Site 559.

The variolitic basalt fragment (560-2-1, 125–130 cm) is composed mainly of altered, devitrified glass with skeletal needles of plagioclase and altered skeletal chains of olivine. Veinlets of zeolite, probably gmelinite, occur between some of the variolites.

Only one serpentinite sample was examined. It consists almost entirely of serpentine with some fresh, relict clinopyroxene and altered orthopyroxene within the brown prismatic grains described above.

Geochemistry

Results from Sample 560-2-1, 93–96 cm are listed below.[3] The rather peculiar major element chemistry, notably with high SiO_2 and Al_2O_3, but low Fe_2O_3 relative to MgO concentrations, results in a very high Mg-value (75).

Major element	Concentration (wt. %)	Trace element	Concentration (ppm)
SiO_2	52.60	Ti	7260
TiO_2	1.21	V	268
Al_2O_3	17.26	Sr	121
Fe_2O_3	6.55	Y	29.0
MnO	0.11	Zr	73
MgO	8.51	Nb	6.2
CaO	10.59		
K_2O	0.06		
P_2O_5	0.12		
Total	97.01	Mg'-value = 75	

Qualitatively, these major element patterns may be accounted for by the zeolitization of olivine and mesostasis in this sample. The immobile trace elements, plotted on a modified Coryell-Masuda diagram, indicate a slightly depleted pattern for this sample (Fig. 5; $(Nb/Zr)_{ch} = 0.8$).

PHYSICAL PROPERTIES

During the attempt to wash down to basement, coring was started when the drilling rate slowed at 373 m sub-bottom. Through a cored depth of 48 m, recovery was very poor, and it was inferred that the hole was passing through a talus formation. Some pieces of lithified sediment were recovered, particularly in Cores 1 and 2. Velocity and density measurements were made on three samples from these cores and show variable but generally high velocity and density (Table 2). These values are high for calcareous sediments of this age and depth of burial, and the density of 2.46 g/cm^3 is compatible with the effect of dolomitization reported by the sedimentologists.

[3] On-board measurements were made on ignited samples. Onshore analyses showed loss on ignition to be less than 1% in most cases. Compiled data tables at the end of this volume (Appendix) include volatile components. Total Fe as Fe_2O_3. Mg' is the atomic ratio of 100 × $Mg/(Mg + Fe^{2+})$ (calculated using an assumed Fe_2O_3/FeO ratio of 0.15).

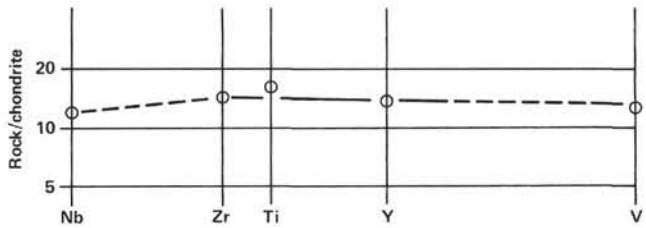


Figure 5. Extended Coryell-Masuda diagram for Sample 560-2-1, 93–96 cm.

SUMMARY AND CONCLUSIONS

Hole 560 was drilled on Anomaly 5D midway between the Oceanographer and Hayes fracture zones. Sediments were washed down to the basement at 374.5 m sub-bottom. The cored sequence passed from limestone and dolomite into serpentinite breccia at about 374 m. A second interval of limestone and limestone basalt breccia (376–378 m) was found, and then the serpentinite breccia continued. Because of the steep basement topography, this finding was interpreted as a submarine talus or debris-flow deposit. To obtain basalt samples at this site we had to choose between continuous drilling, which might get through this talus (as at Site 395), or abandoning the site immediately and drilling a short distance away. Because the necessary time for a round trip of the drill string and a short survey would result in cancellation of a planned future site, we decided to continue drilling at Site 560. Unfortunately only serpentinite breccias and serpentinite clasts in a bluish clayey matrix were recovered down to 47 m into the basement when it was estimated that future drilling would cancel another site of the program, so Hole 560 was terminated.

Only three basalt clasts were large enough to be of interest. A zeolitized fine-grained basalt was analyzed and, to the extent that the zeolitization process had not fractionated the magmaphile element abundances, this sample shows a flat or slightly depleted magmaphile element pattern.

REFERENCES

Aumento, F., Melson, W. G., et al., 1977. *Init. Repts. DSDP*, 37: Washington (U.S. Govt. Printing Office).

Melson, W. G., Rabinowitz, P. D., et al., 1979. *Init. Repts. DSDP*, 45: Washington (U.S. Govt. Printing Office).

Table 2. Physical properties measurements, Hole 560.

Core-Section (interval in cm)	Sub-bottom depth (m)	Sonic velocity (km/s) V.	Sonic velocity (km/s) H.	Temperature (°C)	GRAPE density (g/cm^3) V.	GRAPE density (g/cm^3) H.	Gravimetric density: Wet-bulk density (g/cm^3)	Gravimetric density: Water content (%)	Gravimetric density: ϕ (%)	Acoustic impedance (× 10^5 g/[cm·s])	Lithology or remarks
1-1, 33–38	373.4		2.01	22.0		2.19	2.14	17	36	4.4	Marly limestone
1-1, 99–103	374.0		3.20	22.0		2.46	2.47	8	20	7.9	Siltstone (?)
2-1, 27–31	376.8		1.99	22.0		2.13	2.09	18	37	4.2	Marly limestone

Note: V. = vertical, H. = horizontal; water content is corrected; ϕ = porosity. All values measured at laboratory temperature and pressure. For details of techniques, see Explanatory Notes chapter (this volume).

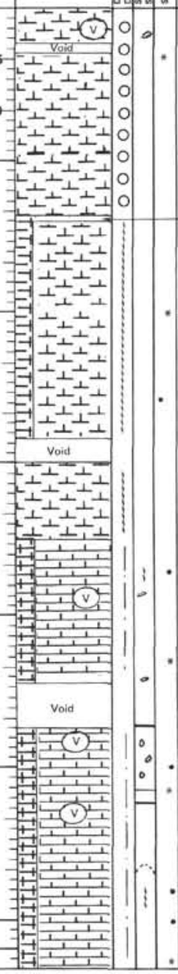
SITE 560 HOLE CORE H1 CORED INTERVAL 0.0–373.0 m

TIME-ROCK UNIT: Miocene

BIOSTRATIGRAPHIC ZONE: CN8 (NN10) *Discoaster neohamatus* zone (early late Miocene)

FOSSIL CHARACTER: FORAMINIFERS: AG, AG; NANNOFOSSILS: AM

SECTIONS: 1, 2, 3, 4, 5, 6, 7, CC — METERS: 0.5, 1.0



7.5YR N8
void
7.5YR 8/4
7.5YR 8/2
mixed pink and white
2.5Y N8
pumice streak
black streak
7.5YR 8/2
5G 7/1
7.5YR 8/4
black streak
5YR 8/3
7.5YR 6/4
7.5YR 8/4
7.5YR 6/4
7.5YR 8/4

LITHOLOGIC DESCRIPTION

DOMINANT LITHOLOGY:

(1) *NANNOFOSSIL OOZE/CHALK TO FORAM NANNO OOZE*

White (7.5YN N8–2.5Y N8) to gray (5G 7/1) in Section 6 with black 1–2 m pellet of glass (pumice).

Soft to firm; soupy, brecciated, and badly disturbed.

Very mildly bioturbated; slightly mottled; massive bedding; distinct to indistinct contacts between white and pink layers.

In Section 6, clasts of pink chalk (drilling breccia?) are incorporated in gray (5G 7/1) ooze.

(2) FORAM-NANNOFOSSIL CHALK/OOZE

Pinkish white to pink to light brown (intervals in Section 6), with black (pumice) streak (as at Section 6, 35 cm).

Soft to firm to hard; very to moderately disturbed.

Very mildly bioturbated, slightly mottled (very faint); massive bedding; distinct to indistinct contacts with white layers.

Minor lithology:
Volcanic glass (pumice) Section 6, 25 cm, dark particles.

(V) = volcanic glass

SMEAR SLIDE SUMMARY (%):

	1-50	3-36	5-48	6-25	CC
	D	D	D	M	D
Composition:					
Feldspar	Tr	Tr	Tr	15	Tr
Clay	–	6	8	–	5
Volcanic glass	–	–	–	82	–
Palagonite	–	–	Tr	–	–
Opaques	1	–	–	–	Tr
Carbonate unspec.	1	12	–	–	10
Foraminifers	5	11	10	–	11
Calc. nannofossils	93	71	81	3	74

Carbonate Bomb (%):
3, 90–91 = 94   6, 125–126 = 94
4, 110–111 = 92   7, 5–6 = 94
6, 5–6 = 89

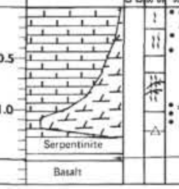
SITE 560 HOLE CORE 1 CORED INTERVAL 373.0–376.5 m

TIME-ROCK UNIT: middle Miocene

BIOSTRATIGRAPHIC ZONE: CN3–4 (NN =5) *Helicosphaera ampliaperta* (early middle M10 to late early M10) *Sphenolithus heteromorphus*; late early to early middle Miocene

FOSSIL CHARACTER: FORAMINIFERS: AP, RP; NANNOFOSSILS: AM

SECTIONS: 1, 2 — METERS: 0.5, 1.0



10YR 8/4
7.5YR 6/6
7.5YR 6/8
10YR 7/4
10YR 6/4
5YR 4/4
10YR 5/6
void

LITHOLOGIC DESCRIPTION

DOMINANT LITHOLOGIES:

(1) NANNOFOSSIL CHALK TO DOLOMITIC NANNOFOSSIL CHALK (0–95 cm and 107–118 cm).

Very pale brown (10YR 8/4), light yellowish brown (10YR 6/4) and reddish yellow (7.5YR 6/6 to 6/8)

Firm to hard

Highly bioturbated, current or flasher bedding at 78 cm and possibly extending to 90 cm

Probable graded bedding with scoured base from 107–118 cm

(2) MARLY DOLOSTONE

Reddish brown (5YR 4/4)

SMEAR SLIDE SUMMARY (%):

	1, 5	1, 12	1, 100	1, 118
	D	D	D	D
Composition:				
Feldspar	2	Tr	1	Tr
Clay	8	12	12	15
Volcanic glass	–	–	–	2
Palagonite	Tr	2	2	Tr
Pyrite	–	–	–	2
Carbonate unspec.	5	5	–	–
Foraminifers	2	5	–	–
Calc. nannofossils	80	66	–	10
Dolomite	3	10	85	73

Carbonate Bomb (%):
1, 5–6 = 90   1, 100 = 83
1, 30–31 = 87   1, 110 = 55
1, 42 = 86   1, 118 = 81

SITE 560 HOLE CORE 2 CORED INTERVAL 376.5–385.5 m

TIME – ROCK UNIT	BIOSTRATIGRAPHIC ZONE	FOSSIL CHARACTER: FORAMINIFERS	NANNOFOSSILS	RADIOLARIANS	DIATOMS	SECTION	METERS	GRAPHIC LITHOLOGY	DRILLING DISTURBANCE	SEDIMENTARY STRUCTURES	SAMPLES		LITHOLOGIC DESCRIPTION
						1	0.5, 1.0				• • •	gabbroic breccia; Basalt; Basalt; gabbroic breccia; Basalt; void	
						2		brecciated igneous rock, serpentinite talc, etc.					
						3							
						4							
						5							

DOMINANT LITHOLOGIES:

(1) LIMESTONE (dolomitic clayey nannofossil limestone to clayey dolomitic nannofossil limestone)

Reddish yellow (7.5YR 7/6, 7.5YR 7/8) and light yellowish brown (2.5Y 6/6 and olive yellow (2.5Y 6/8)

Massive bedding; no visible bioturbation or mottling

Contains 25% clay, 40% nannofossils, 10–15% dolomite

(2) POLYMICT LIMESTONE BRECCIA

Pale brown to reddish brown (10YR 6/3–5YR 4/4) limestone with dark brown to light gray clasts

Clasts include basalt, glass, igneous lithic fragments; also volcaniclastic limestone clasts enclosing clasts of volcaniclastic limestone breccia

Clasts range from silt-size to 15 mm

(3) GABBROIC BRECCIA (autoclastic)

Brown to dark brown (7.5YR 5/2–7.5YR 4/2) with dark clasts of basic igneous rock with bronzy pyroxene.

In Piece 10, approximately 112–122 cm the two types of breccia are "welded" into one fragment.

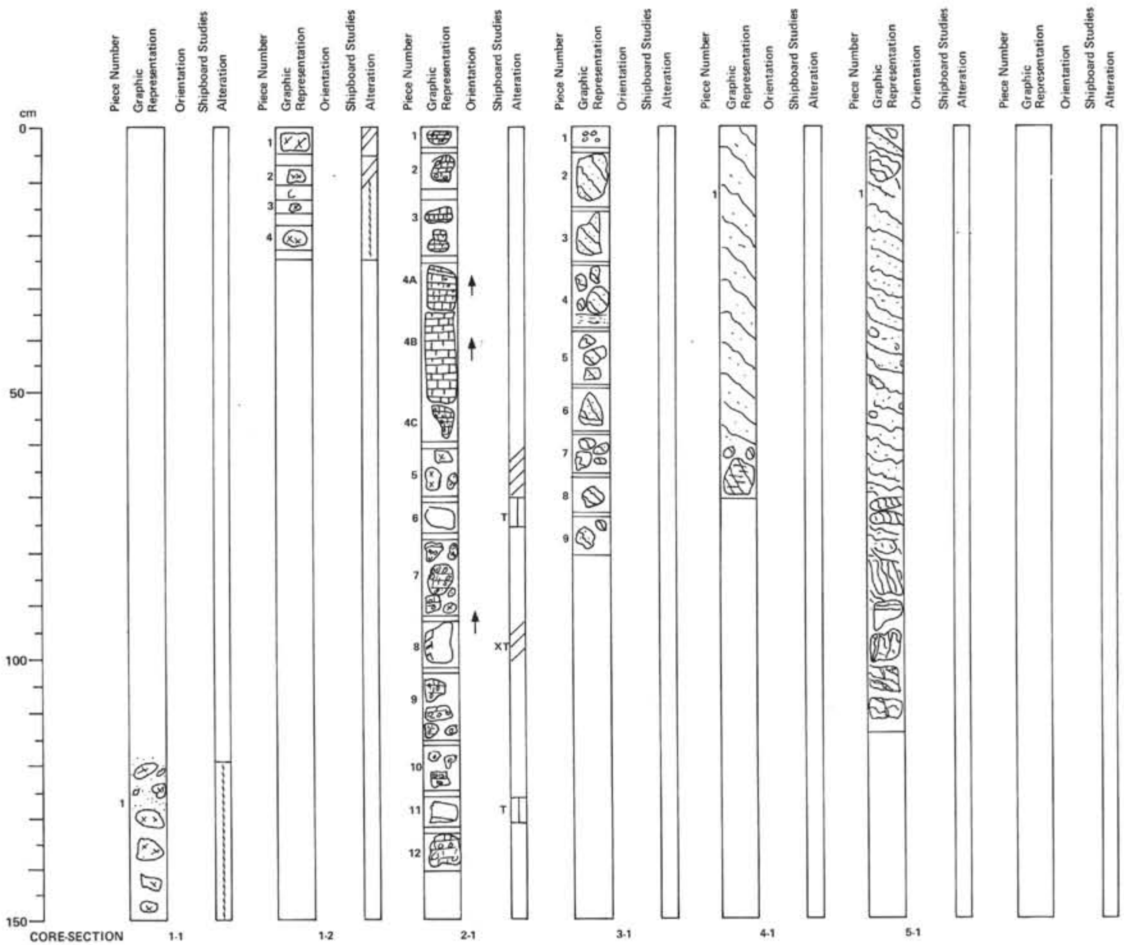
Note: Entire sequence may be a debris flow or submarine talus, in which the basalt and gabbro etc. are boulders as well.

SMEAR SLIDE SUMMARY (%):

Composition:	1, 20	1, 55
Feldspar	Tr	1
Heavy minerals	Tr	1
Clay	25	25
Volcanic glass	–	Tr
Palagonite	–	Tr
Micronodules	1	–
Carbonate unspec.	10	20
Foraminifers	8	2
Calc. nannofossils	40	40
Dolomite	15	10

Carbonate Bomb (%):

1, 11–20 = 77 1, 25–26 = 83



SITE 560, CORE 1 — Depth 373.0–376.5 m

SECTION 1

CALCAREOUS BIOGENIC SEDIMENT AND BRECCIA

0–118 cm: Calcareous biogenic sediment.

118–143 cm: Serpentinized gabbro breccia, dusky blue (5PB 3/2) clayey matrix. Clasts are serpentinite showing relict pyroxene as dark brown prisms.

SECTION 2

SERPENTINITE (GABBRO)

0–23 cm: Serpentinized gabbro, very dark gray (7.5YR N3/0) with 2–5 cm orthopyroxene, brown (7.5YR 5/4), 30%.

SITE 560, CORE 2 — Depth 376.5–385.5 m

SECTION 1

CLAYEY DOLOMITIC NANNOFOSSIL LIMESTONE, BRECCIA, GABBRO

0–58, 78–92, 103–124, and 133–139 cm: Clay dolomitic nannofossil limestone with breccia clasts in all pieces except 4B (33–50 cm). Clast range from 1 mm to 1 cm and are angular.

At 121–122 cm there is a sharp contact in the breccia.

60–70 cm: Gabbro, very dark gray (7.5YR N3/0) with orthopyroxene, 30%, brown (7.5YR 5/4) 2–5 cm.

70–75 cm: Ash. Indurated and zeolitized, grayish green (10GY 5/2).

92–100 cm: Fine grained aphyric basalt.

126–130 cm: Variolitic basalt altered grayish blue green (5BG 5/2).

SITE 560, CORE 3 — Depth 385.5–398.5 m

SECTION 1

SERPENTINITE (BRECCIA) FRAGMENTS

Rock looks rather fresh, color from very dark gray (2.5Y N3/0) to dark green (5G 4/1).

5–14 cm: Rock appears to be very coarse-grained (≤3 cm).

27–45 cm: Some very fine grained, light gray (2.5Y N2/0) rock occurs.

Pieces 3, 6, 7, 8, and 9 are brecciated; size of clasts < 6 mm. Clasts and matrix are both serpentine?

SITE 560, CORE 4 — Depth 398.5–403.5 m

SECTION 1

SERPENTINITE AND BRECCIA (MYLONITE)

0–60 cm: Clayey, very deformed gray (2.5Y N6/0) to white (2.5Y N8/0) serpentinite. Some clasts of black to dark green (5G 4/1) serpentinite occur.

60–70 cm: Clasts of serpentinite with narrow veins, filled with white chrysotile.

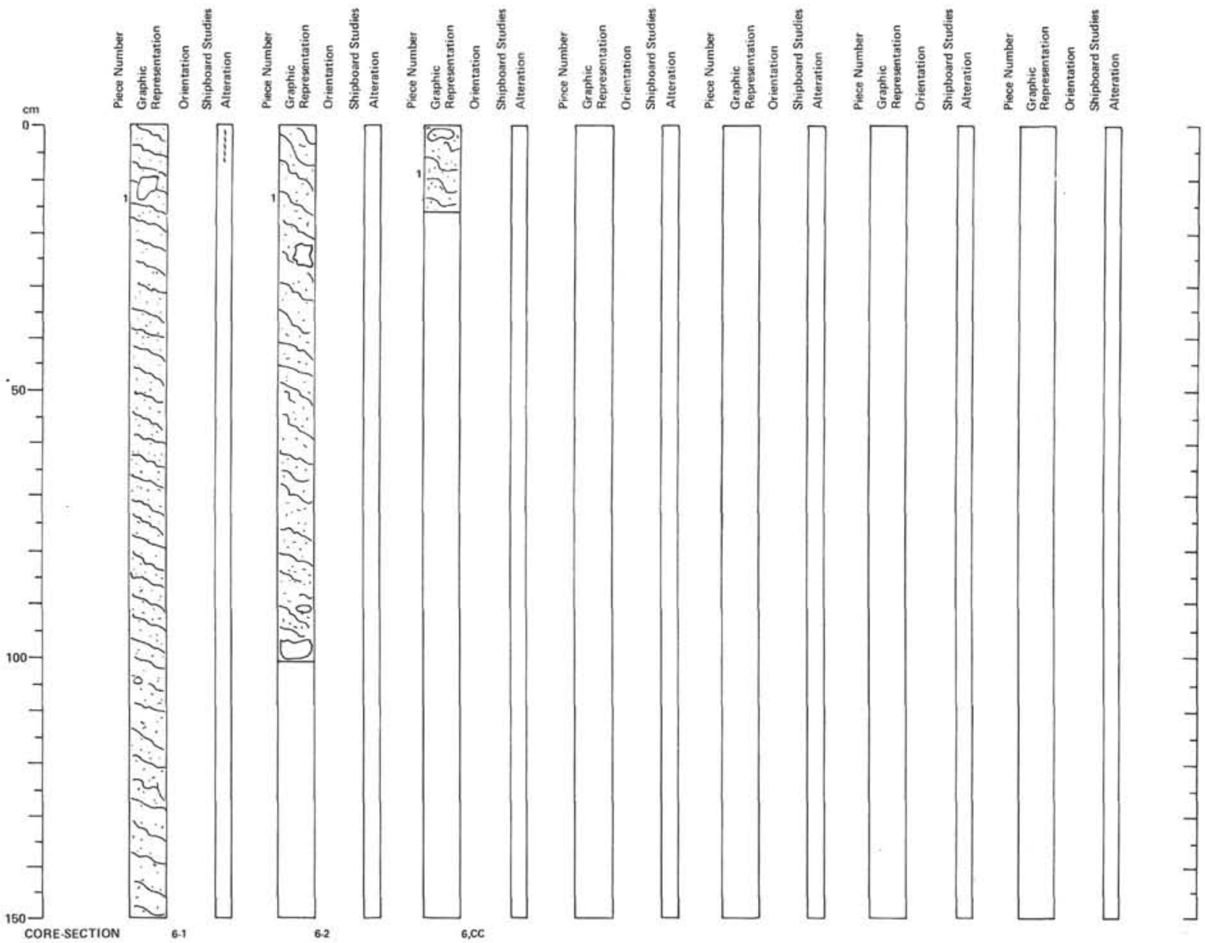
SITE 560, CORE 5 — Depth 403.5–412.5 m

SECTION 1

SERPENTINITE BRECCIA

0–81 cm: Mylonite clayey, very deformed gray (2.5Y N6/0) to white (2.5Y N8/0) serpentine. Some clasts of black to dark green (5G 4/1) serpentine occur. Size of clast ranges from 1–5 cm in diameter; some chrysotile veins.

81–111 cm: Clasts of serpentine occur, contain narrow veins of white chrysotile. Clasts are up to 6 cm in length.



SITE 560, CORE 6 Depth 412.5–421.5 m

SECTION 1

SERPENTINITE (BRECCIA)

Highly altered, sheared serpentinite breccia. Color of serpentine ranging from gray green (5GY 6/1 to lighter green (5G 5/2). A few clasts are present, ranging in size from 1–5 cm in diameter. Matrix is clayey and very deformed.

SECTION 2

SERPENTINITE BRECCIA (MYLONITE)

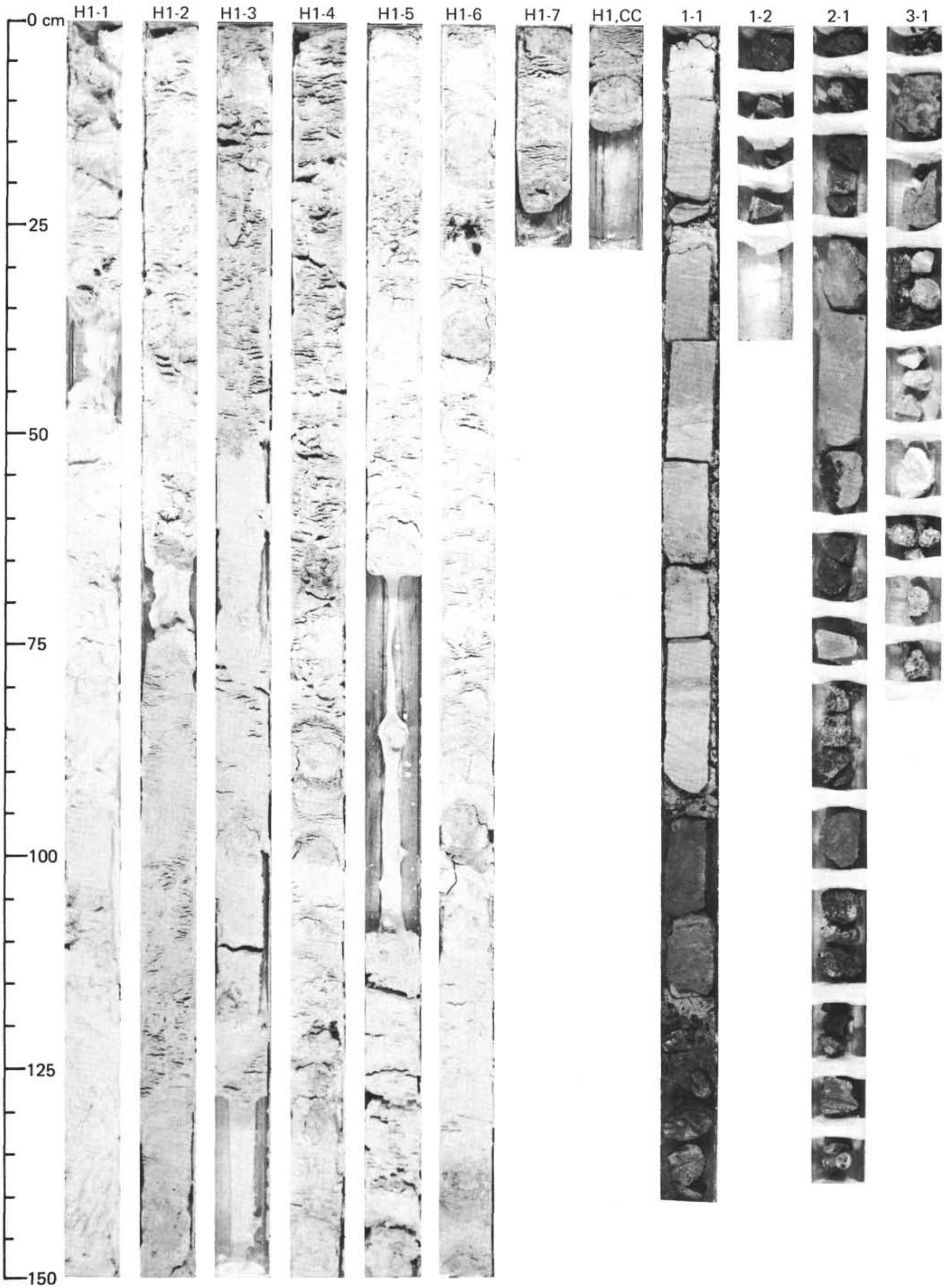
0–87 cm: Sheared serpentinite breccia as in Section 1. Color ranges from gray green (5G 6/1) to lighter green (5G 6/2). Highly deformed clayey matrix.

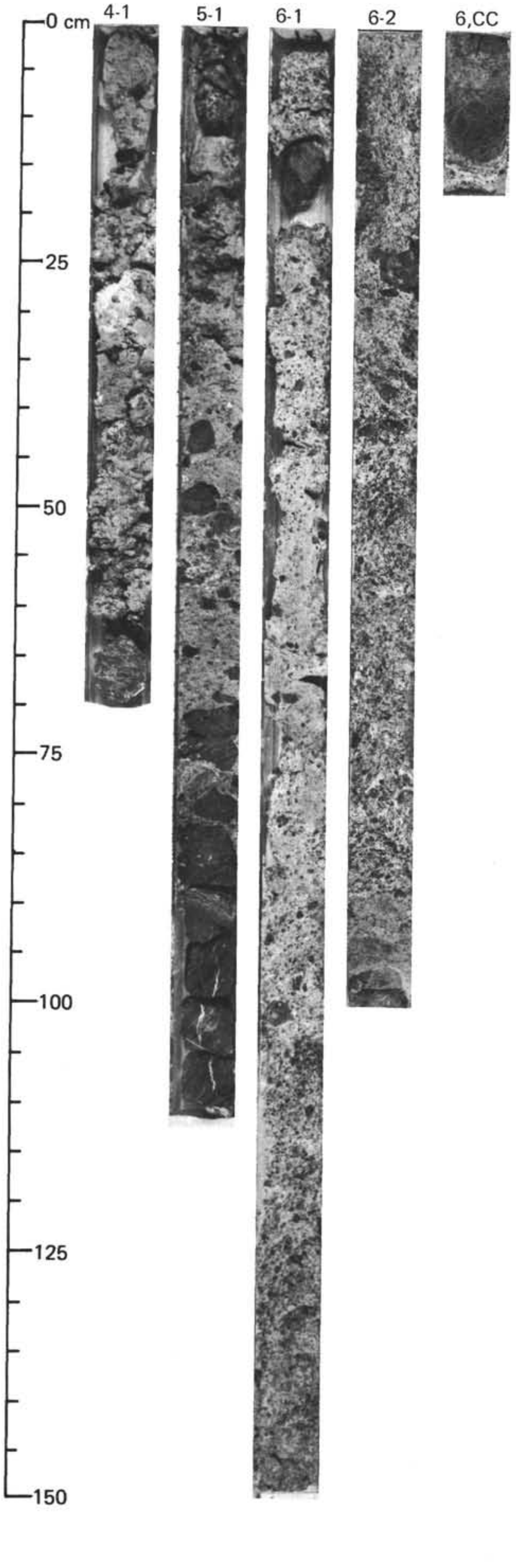
87–101 cm: Distinct change in color of matrix; more of an olive gray green (5G 5/2). Breccia as in above unit. Large clast 4 cm in diameter on bottom. Clays appear more consolidated and packed; fewer microclasts in the matrix.

CORE-CATCHER

SERPENTINITE BRECCIA (MYLONITE)

Highly deformed and clayey as in Sections 1 and 2; more consolidation of clays as in lower centimeters of Section 2. Colors tend to be more of an olive green, roughly 5G 5/2 on chart, ranging down to 5G 7/2. Small veins of chrysotile can be observed in bottom of this section.


0 cm
25
50
75
100
125
150
H1-1
H1-2
H1-3
H1-4
H1-5
H1-6
H1-7
H1,CC
1-1
1-2
2-1
3-1


0 cm
25
50
75
100
125
150
4-1
5-1
6-1
6-2
6,CC