JOIDES Journal

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97 cm —

112 cm —

Banded halite from Hole 546, Leg 79 (Section 18-5).

Leg 79 co-chief scientists Jerry Winterer and Karl Hinz admire the salt cored at Site 546.

Cover: Halite, banded with seams of red and green clay, cored from the upper part of a salt diapir drilled during Leg 79 (Site 546) at the foot of the continental slope off Morocco in 3958 meters of water. Besides the halite, the salt includes potash minerals such as carnallite, polyhalite and probably sylvite, suggesting its deposition during a high stage of evaporation. The halite has a cataclastic texture and no unambiguous original depositional textures or structures are preserved. The salt probably formed prior to the opening of the Atlantic, in Late Triassic or earliest Jurassic time, in the same basin as the salt formations that make diapirs at the foot of the conjugate Nova Scotian margin.

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TENTATIVE GLOMAR CHALLENGER SCHEDULE, LEGS 82-88[1]

Leg	Departs	Departure Date	Total Days	Days Opers.	Days Steaming	Terminates at	Arrival Date	Port Days	Re-entry	Objective
82	Ponta Delgada,	19 Sep 81	57	37	19	Balboa, Panama	15 Nov 81	5	No	Atlantic Mantle Heterogeneity
83	Balboa, Panama	20 Nov 81	45	39	6	Balboa, Panama	4 Jan 82	5	Yes	Costa Rica Rift -- Deepen Hole 504B
84	Balboa, Panama	9 Jan 82	46	39	7	Manzanillo, Mexico	24 Feb 82	5	Possible	Mid-America Trench
85	Manzanillo, Mexico	1 Mar 82	52	29	22	Honolulu, Hawaii	22 Apr 82	5	No	Equatorial Pacific Paleoenvironment
86	Honolulu, Hawaii	27 Apr 82	51	32	19	Hakodate, Japan	17 Jun 82	5	Yes	NW Pacific Paleoenvironment
87	Hakodate, Japan	22 Jun 82	51	47	4	Hokodate, Japan	12 Aug 82	5	Possible	Japan Trench
88	Hakodate, Japan	17 Aug 82	30	19	11	Yokohama, Japan	16 Sep 82	14	Yes	DARPA — Drydock

[1] Compiled 25 September 1981.
The schedule has not yet been reviewed by the JOIDES Planning Committee.

SHIPBOARD SCIENTIFIC PARTIES

Leg 81

D. Roberts	Co-chief scientist	UK - IOS
D. Schnitker	Co-chief scientist	USA - Univ. of Maine
J. Keene	DSDP representative/ sedimentologist	USA - SIO
A. Desprairies	Sedimentologist	France - Univ. de Paris
A. Morton	Sedimentologist	UK - IGS
H. Zimmerman	Sedimentologist	USA - Union College
R. Homrighausen	Sedimentologist/physical properties specialist	FRG - Deutsche Texaco AG
J. Baldauf	Paleontologist (diatoms)	USA - USGS
P. Huddlestun	Paleontologist (foraminifers)	USA - Georgia Geol. Survey
J. Murray	Paleontologist (foraminifers)	UK - Univ. of Exeter
J. Backman	Paleontologist (nannofossils)	Sweden - Univ. of Stockholm
J. Westberg-Smith	Paleontologist (radiolarians)	USA - SIO
K. Krumsiek	Paleomagnetist	FRG - Geol. Inst. Bonn
A. Kaltenback	Organic geochemist	USA - Marathon Oil

Leg 82

H. Bougault	Co-chief scientist	France - COB
S. Cande	Co-chief scientist	USA - L-DGO
W. Mills	DSDP representative	USA - SIO
D. Curtis	Sedimentologist	USA - Geol. Consultants
R. Neuser	Igneous petrologist	FRG - Ruhr Univ. Bochum
D. Christie	Igneous petrologist	USA - HIG
M. Rideout	Igneous petrologist	USA - URI
N. Drake	Igneous petrologist/ geochemist	USA - Univ. of Mass.
J. Brannon	Igneous petrologist/ geochemist	USA - Washington Univ.
B. Weaver	Igneous petrologist/ geochemist	UK - Univ. of Leicester
D. Echols	Paleontologist/ (foraminifers)	USA - Washington Univ.
M. Clark	Paleontologist/ (nannofossil)	USA - Florida State Univ.
M. Javed Khan	Paleomagnetist	USA - L-DGO
I. Hill	Physical properties specialist	UK - Univ. Leicester

Leg 83

R. Anderson	Co-chief scientist	USA - L-DGO
J. Honnorez	Co-cheif scientist	USA - Univ. of Miami
K. Becker	DSDP representative/ Downhole instrument specialist	USA - SIO
J. Alt	Igneous petrologist	USA - Univ. of Miami
R. Emmermann	Igneous petrologist	FRG - Univ. of Giessen
P. Kempton	Igneous petrologist	USA - Southern Methodist Univ.
C. Laverne	Igneous petrologist	France - Lab. de Geologie
M. Mottl	Inorganic geochemist	USA - WHOI
To be determined.	Sedimentologist/ Inorganic geochemist	
H. Kinoshita	Paleomagnetist/Physical properties specialist	Japan - Chiba University
To be determined	Physical properties specialist	
R. Stephen[1]	Geophysicist (Oblique seismic experiment)	USA - WHOI
D. Moos[1]	Geophysicist (sonic logging)	USA - USGS
R. Newmark	Geophysicist (sonic logging)	USA - L-DGO
J. Svitek	Televiewer specialist	USA - USGS

Leg 84

J. Aubouin	France - Univ. Pierre et Marie Curie	Co-chief scientist
R. von Huene	USA - USGS	Co-chief scientist

[1]Transferring to *Challenger* from *Conrad.*

GLOMAR CHALLENGER OPERATIONS

CRUISE SUMMARIES

Leg 79 — Mazagan Plateau[1]

Leg 79 began in Las Palmas, Canary Islands on 15 April 1981 and ended in Brest, France on 30 May 1981, 45 days later. The shipboard party spent 34 days at 4 sites (8 holes), 2 days in the Lisbon drydock, and 9 days in transit. The cruise achieved all its primary objectives.

Introduction

The region of the Mazagan Plateau (Fig. 79-1) offers unique access for *Glomar Challenger* to document the Jurassic environment of rifting and the early subsidence history of a segment of passive margin bordering the proto-Atlantic Ocean. The edge of the Upper Jurassic carbonate platform bulges seaward here from its normal position beneath the present Moroccan continental shelf, and crops out along a spectacular escarpment that falls about 1 km to a broad slope leading to the abyssal sea floor (Fig. 79-2 and Fig. 79-5, below). The escarpment reveals a faulted section of Mesozoic strata, from near the base of which Oxfordian algal limestone had been dredged. By drilling a series of holes near the escarpment, we planned to piece together a composite section that would record the sequence of depositional environments and subsidence history of this thick carbonate platform, including the timing of platform drowning and the installation of pelagic conditions. The results of drilling here bear strongly on the early evolution of the deeply buried conjugate margin on the North American side.

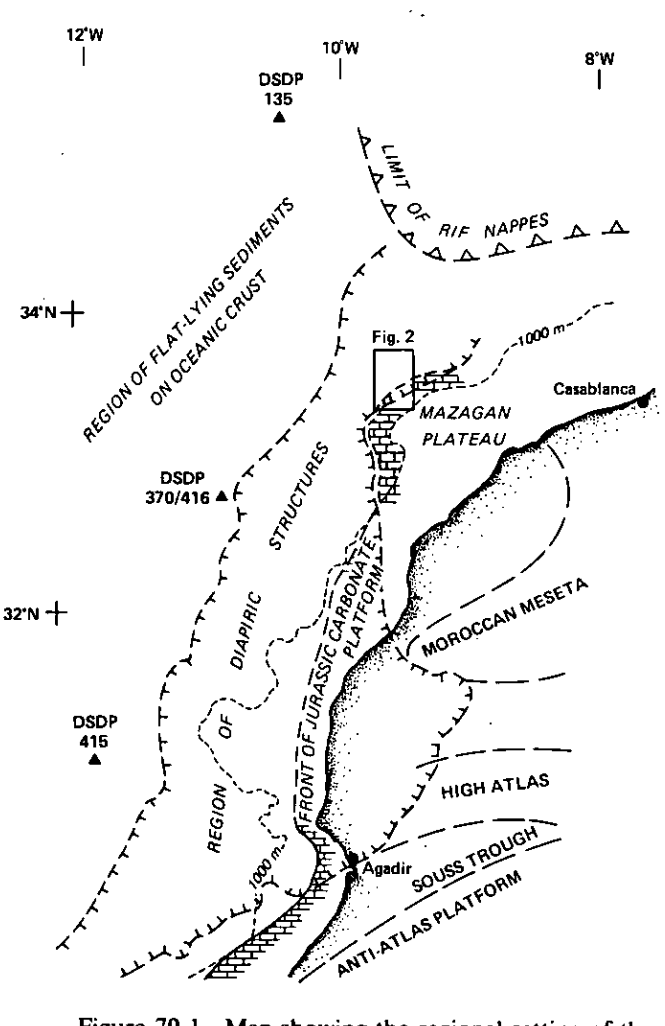


Figure 79-1. Map showing the regional setting of the Mazagan Plateau and previously drilled DSDP sites.

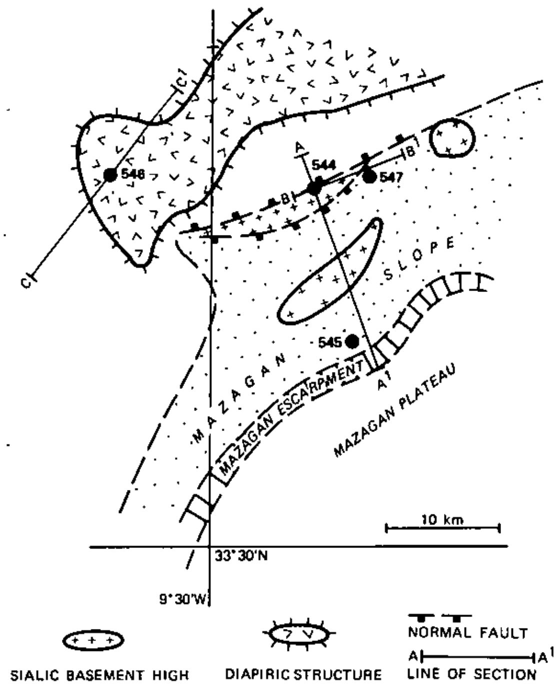


Figure 79-2. Mazagan Escarpment area, showing sites drilled during Leg 79, location of lines of cross sections, and major geologic features.

[1]Abridged from a preliminary Leg 79 report prepared by Karl Hinz, Edward L. Winterer (co-chief scientists), Peter O. Baumgartner, Martin J. Bradshaw, James E. T. Channell, Michel Jaffrezo, Lubomir F. Jansa, Robert Mark Leckie, Johnnie N. Moore, Jürgen Rullkötter, Carl Schaftenaar, Torsten H. Steiger, Vassil Vuchev, and George E. Wiegand.

Seaward of the Mazagan slope is a band about 50 km wide where diapirs punch upward into a pile of sediments about 4 km thick. Dredges and cores on the slopes of one of these structural highs, located only about 15 km from the foot of the escarpment, recovered fragments of sheared granite. We believed this structure might thus bring close to the sea floor very old sediments — those dating to the earliest stage of Atlantic evolution — and perhaps as old as lower Jurassic or upper Triassic. The dredged fragments of granite suggest that this particular structure might not be a salt diapir but a Hercynian basement high, overlain by syn-rift to early post-rift clastic or evaporitic or carbonaceous sediments. The nature of the evaporites that appear in the diapir province is an important unsolved problem, and we badly need clues as to their age and as to whether or not they formed in a deep or shallow basin.

Coring results are summarized in Table 79-1 and the following sections contain details of the sequences penetrated and our preliminary observations.

Drilling Results

Site 544 (Near MAZ-2)

Location: 33°46.0'N, 9°24.3'W
Water depth: 3607 m
Sub-bottom depth: 235 m
Recovered section: 83.1 m

Site 544 is located on the seaward (NE) margin of the structural high from which granitic fragments had been dredged, at a place where acoustic basement is covered by only about 100 meters of pelagic sediments.

We drilled three holes at the site. At the first hole (544), we took only a single core, and judged that the thickness of sediment overlying basement was insufficient to allow burial of the bottom-hole assembly. We moved the ship 250 meters upslope to the southeast and drilled Hole 544A to basement. At Hole 544B we obtained 39.3 meters of Neogene sediment using the hydraulic piston corer at the same location as Hole 544A.

The sequence at Hole 544A comprised the following units (Fig. 79-3).

Table 79-1. Leg 79 Coring Summary

Hole	Dates (1981)	Latitude	Longitude	Water Depth[1] (m)	Sub-bottom Penetration (m)	No. of Cores	Meters Cored	Meters Recovered	Per Cent Recovery
544	17-18 Apr	33°46.13'N	09°24.29'W	3666	5.0	1	5.0	5.6	100
544A	18-21 Apr	33°46.00'N	09°24.26'W	3607	235.0	28	235.0	83.1	35.5
544B	22-23 Apr	33°46.00'N	09°24.26'W	3607	39.3	12	39.3	37.0	94
545	23 Apr - 1 May	33°39.86'N	09°21.88'W	3150	701.0	75	701.0	354.0	50.5
546	1-3 May	33°46.71'N	09°33.86'W	3992	192.0	21	192.0	118.5	61.7
547	3 May	33°46.84'N	09°20.98'W	3940.5	32.0	1	3.5	3.5	100
547A	4-10 May	33°46.84'N	09°20.98'W	3940.5	744.5	73	674.5	333.5	49.4
547B	10-22 May	33°46.84'N	09°20.98'W	3940.5	1030.0	36	305.5	154.8	50.6
						247	2155.8	1090.0	50.6

[1]Water depths from sea level.

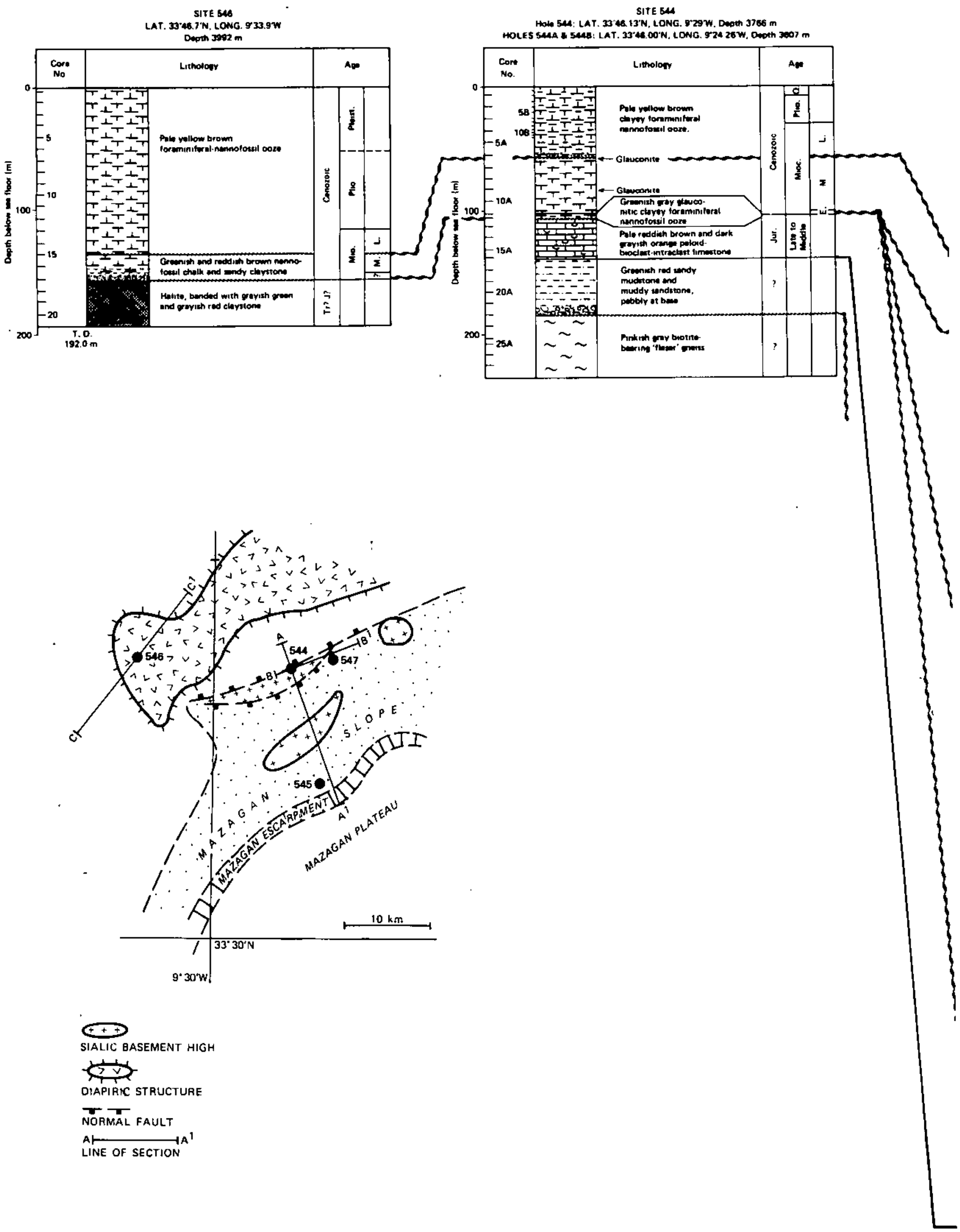
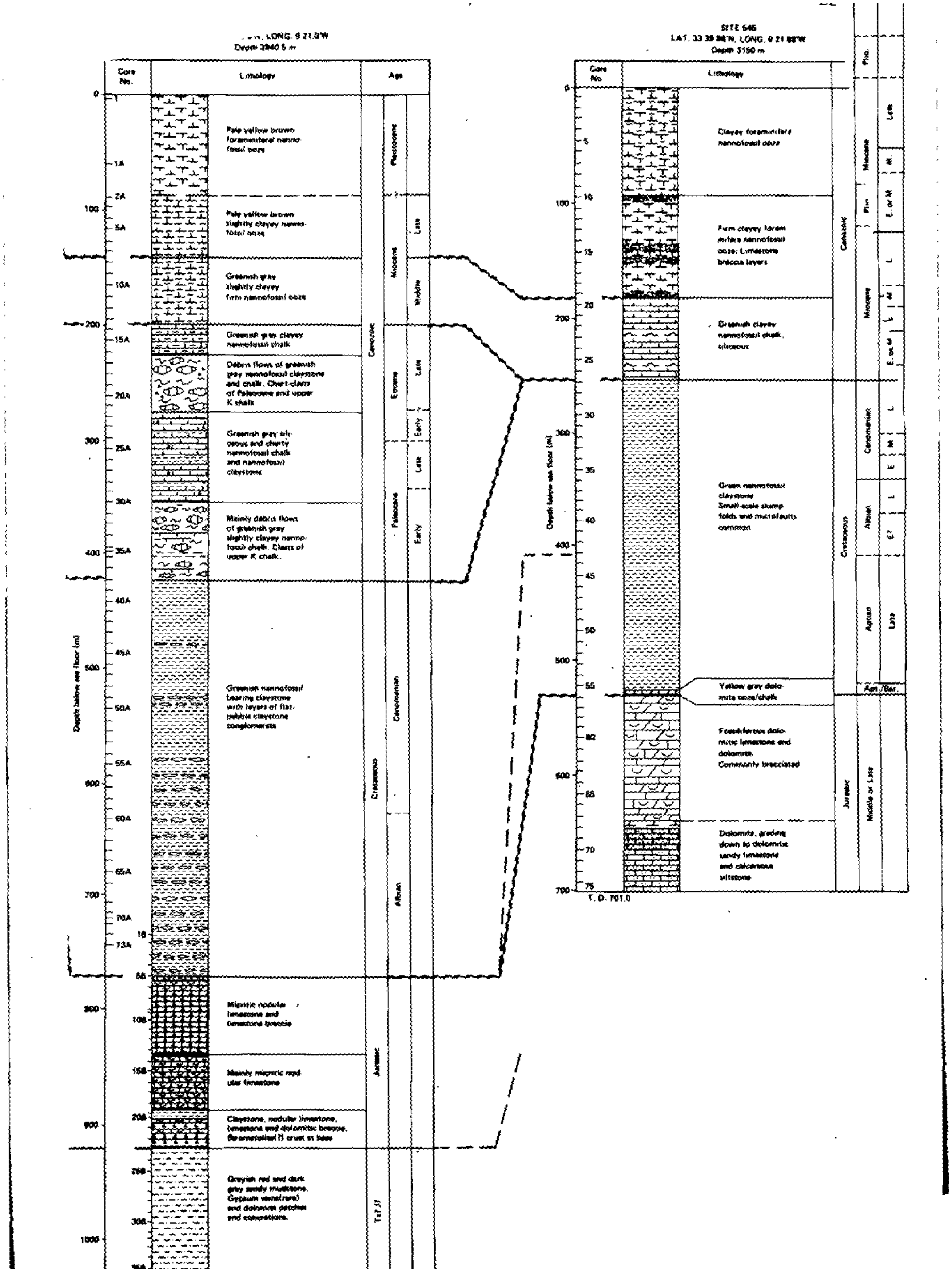


Figure 79-3. Lithologic columns drilled at Leg 79 Sites 544, 545, 546, and 547.


LONG. 9 21.0'W
Depth 3940.5 m
Core No.
Lithology
Age
Pale yellow brown foraminiferal nannofossil ooze
Pale yellow brown slightly clayey nannofossil ooze
Greenish gray slightly clayey firm nannofossil ooze
Greenish gray clayey nannofossil chalk
Debris flows of greenish gray nannofossil claystone and chalk. Chert-clasts of Paleocene and upper K chalk
Greenish gray siliceous and cherty nannofossil chalk and nannofossil claystone
Mainly debris flows of greenish gray slightly clayey nannofossil chalk. Clasts of upper K chalk.
Greenish nannofossil bearing claystone with layers of flat-pebble claystone conglomerate
Micritic nodular limestone and limestone breccia
Mainly micritic nodular limestone
Claystone, nodular limestone, limestone and dolomitic breccia. Stromatolite(?) crust at base
Greyish red and dark gray sandy mudstone. Gypsum veins(rare) and dolomite patches and concretions.
Pleistocene
Late
Miocene
Middle
Cenozoic
Eocene
Late
Early
Paleocene
Late
Early
Cretaceous
Cenomanian
Albian
Jurassic
Depth below sea floor (m)
SITE 546
LAT. 33 35.86'N, LONG. 9 21.88'W
Depth 3150 m
Core No.
Lithology
Clayey foraminifera nannofossil ooze
Firm clayey foraminifera nannofossil ooze; Limestone breccia layers
Greenish clayey nannofossil chalk, siliceous
Green nannofossil claystone
Small-scale slump folds and microfaults common
Yellow gray dolomite ooze/chalk
Fossiliferous dolomitic limestone and dolomite.
Commonly brecciated
Dolomite, grading down to dolomitic sandy limestone and calcareous siltstone
T. D. 701.0
Cenozoic
Cretaceous
Jurassic
Plio.
Miocene
Late
Cenomanian
Albian
Aptian
Apt./Bar.
Middle or Late
Depth below sea floor (m)

Neogene sediments (0-103.8 m)

0-56 m — Pale yellowish brown clayey foraminifer nannofossil ooze; lower Pleistocene to upper Miocene (Zone N17). A hiatus separates these beds from the next unit below.

56-102.6 m — Greenish clayey foraminifer nannofossil ooze and chalk; middle Miocene (N14) to upper lower Miocene (N9).

102.6-103.8 m — Greenish glauconitic nannofossil chalk and nannofossil-bearing claystone; lower Miocene (N7). A major unconformity separates the Neogene from the Jurassic.

Mesozoic rocks (103.8-184.2 m)

103.8-139.2 m — Limestone: pale reddish brown and orange skeletal intraclast peloid packstone with patches of grainstone. Contains "*Posidonia*", *Protoglobigerina*, ammonites, echinoids, crinoids, ostracodes, foraminifers, terebratulids, bivalves, sponge fragments, serpulids, bryozoans, Fe/Mn encrusted hardgrounds. Oxfordian(?).

139.2-184.2 m — Grayish red sandy mudstone and muddy sandstone. Pebbly at base. Age unknown.

Basement (184.2-235.0 m)

184.2-235.0 m — Pinkish gray biotite-bearing granitic "flaser" gneiss. Age unknown.

Our attempt to obtain hydraulic piston cores was disappointing and raises a possible problem for future HPC work on continental margins. We tried (Hole 544B) to obtain a set of hydraulic piston cores that would core at least through the upper Miocene sediments to recover samples for paleomagnetic studies and to document any faunal and isotopic changes that might be associated with the events that occurred at the Miocene/Pliocene transition. Site 544 had been close to the Mediterranean which was reflooded during the latest Miocene/earliest Pliocene after being emptied by evaporation during the Messinian. The attempt was only partly successful because the HPC would not extend more than half its 4.5-meter stroke length or penetrate beyond a depth of 39 meters. This, in spite of the sediments having a vane shear strength (40 kPa) far less than the limiting strength for cores in more biogenous oozes (~200-300 kPa). The behavior of the HPC is probably related to the high clay content (30%-45%) of the Neogene sediments at Site 544 and we would urge DSDP to gather data on HPC performance in various sediment types as a guide for shipboard scientists and JOIDES planners.

Site 545 (1 km west of MAZ-4

Location: 33°39.9'N, 9°21.9'W
Water depth: 3150 m
Sub-bottom depth: 701 m
Recovered section: 354 meters

Site 545 is located near the foot of the steep part of the Mazagan Escarpment at a place where older Mesozoic strata are blanketed by only a thin wedge of Cenozoic slope sediments, and where seismic data suggested that the drill might reach basement at perhaps 1000 meters depth.

The sequence (0-701 m) at Site 545 (Fig. 79-3) comprised the following units.

0-86 m — Yellowish brown clayey foraminifer nannofossil ooze. Lower Pleistocene.

86-180 m — Yellowish brown firm clayey nannofossil ooze with a few layers of breccia, and with clasts from Jurassic carbonate platform rocks. One clast of Senonian pelagic limestone encloses peloids of calpionellid (Berriasian or Tithonian) limestone. Pliocene to upper Miocene (N16/17). The unit rests unconformably on the clayey chalk below.

180-253 m — Greenish clayey radiolarian-bearing nannofossil chalk. Middle Miocene (N15) to middle (NN5 or 6) or lower Miocene (N5/6). Rests unconformably on the unit below.

253-531 m — Green nannofossil claystone and claystone with abundant slump folds and microfaults; cut by low-angle slide surfaces that result in both repetition and omission of the stratigraphic section. The basal few meters are dolomitized nannofossil chalk. Upper Cenomanian through lower Aptian/upper Barremian. The unit rests unconformably on the dolomitized limestone below.

531-635 m — Dolomitized limestone with characteristics of shallow-water, high-energy deposition, containing coral debris, algal fragments, miliolids, mollusks, echinoderms and ooids. Locally brecciated, with iron-stained fissure fillings. Upper Jurassic. Grades downward to the unit below.

635-701 m — Dolomitized sandy limestone with ammonites. The sandy component, which includes angular quartz and fresh feldspar grains up to granule size, increases to 90 per cent in the deepest core. An ammonite from a core at 638 meters, identified by O. Renz shortly after the cruise as *Sowerbiceras* sp., indicates an Oxfordian age.

We stopped drilling at Site 545 because the bit would turn no more. After 80 hours of rotation it had lost all 4 cones, leaving only the jagged and twisted cone supports.

Site 546

Location: 33°46.7′N, 9°33.9′W
Water depth: 3992 m
Sub-bottom depth: 192 m
Recovered section: 118.5 m

Site 546 is on the next structural high seaward of Site 544. We chose this location in order to test a structure that appeared from seismic data to be more certainly diapiric after discovering gneissic basement at Site 544. Permission to drill was given by DSDP on the grounds that acoustic basement at Site 546 (as at Site 544) is above the level of the surrounding deep-sea floor, and is covered by only a thin mantle of pelagic sediment.

Drilling penetrated the following sequence at Site 546 (Fig. 79-3):

0-134 m — Yellowish brown slightly clayey foraminifer nannofossil ooze; upper Pleistocene to upper Miocene (N17). Rests unconformably on the middle Miocene ooze and clay below.

134-147 m — Greenish clayey stiff nannofossil ooze and reddish brown clay. Glauconite is common. Middle Miocene (N10-13).

147-149 m — Greenish and grayish red sandy clay with layers rich in gypsum crystals. The red layers are barren but the greenish layers contain Lower Cretaceous and Upper Jurassic radiolarians and Lower Cretaceous nannofossils, mixed with middle Miocene radiolrians, foraminifers, and nannofossils.

149-156.5 m — Barren grayish red gypsiferous sandy clay.

156.5-192 m — Halite, banded with grayish red, grayish green, and gray clayey streaks and cut by a few veins of anhydrite. Sylvite occurs in minute reddish specks. Most banding dips gently, but single unbroken core lengths show considerable variation in dips, suggesting folding. Some limpid halite crystals are as much as 1 cm in diameter. The core recovery was excellent both in terms of the per cent recovered (68%) and in the diameter of the core retrieved (typically 4 or 5 cm).

The salinity of the interstitial waters increased steadily from 34 to 217 mil in the Neogene sediments above the halite, but we did not detect any dissolved hydrocarbons.

A geologic cross-section through the site (Fig. 79-4) shows the diapiric structure and documents an early salt-pillow stage and several episodes of diapiric rise. It also shows a possible solution basin over the top of the structure in which the sediments with mixed Cretaceous and Miocene fossils were deposited.

Site 547 (Near MAZ-9)

Location: 33°46.8′N, 9°21.0′W
Water depth: 3940.5 m
Sub-bottom depth: 1030 m
Recovered section: 649 meters

Site 547 is located down the plunge of the same structure drilled at Site 544, but at a place where the sedimentary section overlying acoustic basement is much thicker.

At this re-entry site, we washed the bit through the upper 32.5 meters to test conditions

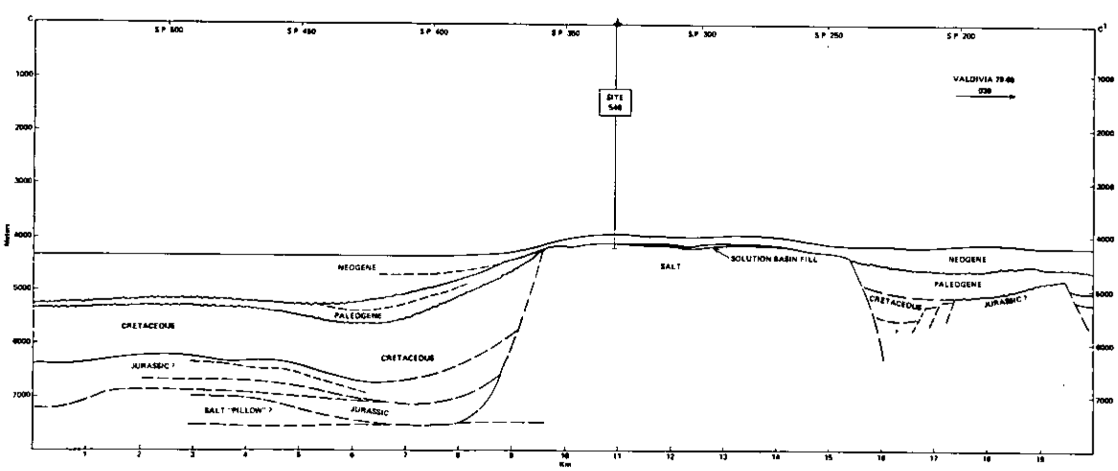


Figure 79-4. Geologic cross-section along *Valdivia* seismic profile 79-05, through Site 546.

for setting the re-entry cone the and 16-inch surface casing. Then we spot cored Hole 547A to 89 meters and continuously cored it to 7445 meters sub-bottom. We continuously cored Hole 547B, the re-entry hole, from 724.5 to 1030 meters, with three re-entries.

The drill penetrated the following sequence at Site 547 (Fig. 79-3):

0-141 m — Pale yellowish brown, slightly clayey foraminifer-nannofossil ooze and nannofossil ooze; Quaternary (N23) to upper Miocene (N17). Rests unconformably on the Miocene ooze, below.

141-205 m — Greenish gray nannofossil ooze; middle Miocene (N15) to lower Miocene (N4).

205-225 m — Greenish gray, slightly clayey nannofossil ooze and chalk; upper Eocene. Rests unconformably on the conglomeratic beds below.

225-269 m — Conglomerate beds (interpreted as debris flows) made of clasts — up to 4.2 m, but typically 5 cm in diameter — largely of claystone, nannofossil claystone, clayey chalk, nannofossil chalk and porcelanite. The clasts float in a nannofossil chalk matrix. Contains resedimented Eocene, Paleocene and Upper Cretaceous fossils. The youngest fossils are upper Eocene.

269-355 m — Greenish gray clayey nannofossil chalk, with commonly occurring radiolarians and porcelanite nodules. Lower Eocene to lower Paleocene (P1, NP5).

355-422 m — Mainly debris flows of greenish gray nannofossil chalk. Probably lower Paleocene (P1), but reworked Maestrichtian chalk is the most common material. Rests unconformably (at the regional seismic "red" reflector) on the underlying unit.

422-773 m — Grayish green nannofossil-bearing claystone and mudstone with commonly occurring intraformational flat-pebble mudstone conglomerate layers. Slump structures, and repeated sections suggest deposition as slide sheets. Middle Cenomanian (*Rotalipora cushmani* Zone) to upper Albian (*Ticinella breggiensis* Zone).

773-775 m — Greenish gray claystone, pale greenish white micritic limestone and graded pebbly limestone beds. Foraminifers in the upper claystone beds are Lower Cretaceous (Valanginian-Aptian), and calpionellids in the limestone pebble beds are upper Tithonian.

775-791 m — Red and green nodular limestone and limestone pebble and breccia beds.

The nodular limestone resembles Upper Jurassic nodular limestones known from outcrops in Tethys. Ossicles of the pelagic crinoid *Saccocoma* occur in these beds along with radiolarians, aptychi, and a few ammonite phragmocones. An aptychus identified by O. Renz as *Lamellaptychus sparcilamellosus* (Kimmeridgian) occurs at 784.2 meters. *Saccocoma* occur in the upper part of the unit.

The typically 10- to 30-cm thick breccia and pebbly beds are both mud- and grain-supported. The clasts, up to 15 cm in size, are reddish and greenish biomicrite and peloidal grainstone, some with coated grains, ooids and skeletal debris.

791-795 m — Beneath a 7-cm thick layer of dark reddish brown claystone lay red and greenish nodular limestone, as above. This limestone, however, contains abundant shells of the pelagic lamellebranch "*Posidonia*" (*Bositra*), some of which are current sorted.

795-846 m — Limestone breccia, as above, with a few reddish and greenish nodular limestone interbeds. The breccia beds, 20 to 40 cm thick, are clast supported and the clasts, up to 18 cm in diameter, are light gray limestone containing oncoids, ooids, coated grains, *Bositra*, sponge spicules, fragments of thick-shelled mollusks, and ammonites. The beds are separated by *in situ* crusts. Detrital quartz appears at 805 meters and increases in abundance downward, accompanied by clasts of feldspathic sandstone. An ammonite at 821.5 meters was identified by O.Renz as *Lytoceras* sp. aff. *L. fimbriatum* (Middle Jurassic-Oxfordian).

846-891 m — Mainly yellowish brown nodular limestone, with micritic limestone nodules floating in a darker brown clay matrix. A 25-cm layer of burrowed black shale, containing nearly 7 per cent organic carbon occurs at 847.1 meters. We could not identify age-diagnostic fossils aboard ship.

891-924 m — Olive-black and olive-gray mudstone, dolomitic limestone-mudstone breccia, calcareous wackestone breccia. Near the base is a layer of laminated micrite with fenestral fabric, resembling stromatolites; a bed of dolomitized limestone breccia occurs at the very base. The claystone at 891 meters contains a very diversified and well preserved benthic foraminifer fauna, which, owing to the lack of Jurassic literature, we could not date aboard ship. Nannofossils very tentatively dated as Pliensbachian occur in this unit.

924-1030 m — Grayish red sandy mudstone, interbedded in the upper part with dark gray sandy mudstone. Sand grains and granules of quartz and feldspar occur as floating grains and pods or ill-defined laminae, constituting 5 to 20 per cent of the rock. A few veins of gypsum and dolomitic concretions and patches occur. Poorly rounded pebbles of dolomite are abundant at the very base of the cored section, from 1027.5-1030 meters. We found no fossils — other than a few plant fibers — in this unit aboard ship. Seismic data suggest the drill was very close to basement when we were forced to abandon the hole. This occurred when the weighted bit would not turn.

The bit, however, arrived on deck with all 4 cones still attached, leaving the hole open and free of junk. It can be re-entered, deepened to basement and logged at a later date.

General Remarks

Until we have better paleontological control in the Jurassic, interpretations must be tentative; nonetheless, a few remarks on how the data from the individual sites fit together are warranted.

- Neogene sedimentation was mainly hemipelagic, and was above the CCD at all sites. A regional hiatus between Messinian and Serravalian beds occurs at all sites and corresponds to the hiatus at this level at other sites on the continental margin of the eastern Atlantic.

- Cretaceous sedimentation is remarkably like that at an analogously located site (415) drilled on Leg 50 low on the continental slope. Site 415 is about 200 km SW of the Mazagan area. As at most sites in the eastern Atlantic, post-Cenomanian Upper Cretaceous sediments are entirely absent (except as clasts in Cenozoic debris flows); the Middle Cretaceous is represented by claystone deposits replete with small- and large-scale slump structures, microfaults, and intraformational conglomerate beds. The sequence is riven by low-angle faults — probably the bases of gravity-driven slide sheets — that repeat the section.

  Taken together, the Cretaceous and Cenozoic strata record episodic defacing of the Mazagan slope, with successively older rocks being laid bare: the Middle Cretaceous conglomerates are intraformational; the Paleogene debris flows contain older Cenozoic and Upper Cretaceous clasts, and the Neogene breccias contain Jurassic clasts.

- Jurassic sedimentation shows great diversity of facies. Tithonian and Kimmeridgian rocks comprise calpionellid limestone and nodular limestone, and including limestone breccia with probable Oxfordian and Doggerian clasts (pelagic facies). Oxfordian rocks include *in situ* shallow-water and perhaps moderate-depth limestone at Sites 544 and 545, and resedimented (deeper water?) breccias at Site 547. Somewhat sandy Oxfordian limestone occurs at Site 545. The lower part of the carbonate section at Site 547 contains evidence for deposition in very shallow-water, but deposits may have been transported downslope. We dated only very tentatively as Liassic.

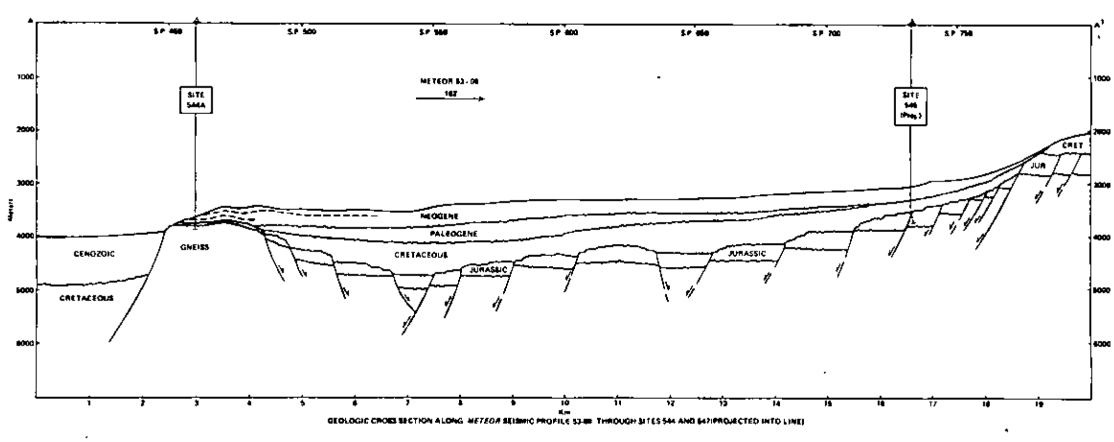


Figure 79-5. Geologic cross-section along *Meteor* seismic profile 53-08, through Site 544 and 547 (projected into line).

The diversity of lithofacies suggests a diversity of environments, and the contrasts in the Jurassic rocks between Sites 544 and nearby Site 547 suggest that considerable relief existed during Oxfordian times. The Jurassic successions at Sites 544, 545, and 547 all show an upsection decrease in terrigenous detrital influence and increasing depositional water depths.

The unconformity separating Tithonian-Berriasian limestone from Aptian claystone contrasts strongly with the condition at Site 416, about 80 km to the SW in the Morocco Basin. At site 416, the lower Cretaceous consists of about 700 meters of flysch.

- Cross-section A-A′ (Fig. 79-5) shows many normal faults, but this is but one of many possible interpretations of the structural style. We show the faults as cutting the Jurassic but not the Cretaceous, but possibly there are fewer faults which predate much of the Jurassic carbonate accumulation.
- We drilled continental red-bed sediments below Jurassic limestone at Sites 544 and 547, and they may be present at Site 545 below the level cored. The deepest rocks sampled at Site 545 are calcareous sandstone. The red beds are lithologically similar to Triassic(?) red beds onshore in Morocco. The Mazagan red beds include slumps, breccias, and mud-flow deposits, suggesting nearby relief.
- The salt was deposited under very desiccated conditions, as indicated by the presence of sylvite. Seismic data show diapiric structures extending seaward some 50 km from Site 546, but mixed with other structural highs not clearly diapiric (Fig. 79-6). Possibly the sialic horsts and salt diapirs are interspersed in this province; indeed, the diapirism may have been abetted by the faulting that accompanied attenuation of the seaward edge of the continental crust. Only by drilling some of the candidate sialic blocks can we establish whether or not the salt was deposited on oceaanic or continental crust, or on some mixture of these two crustal types.

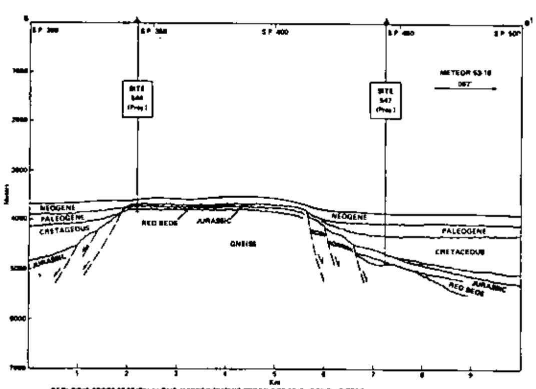


Figure 79-6. Geologic cross-section along *Meteor* seismic profiles 53-10, through Sites 544 and 547 (projected into line).

We suspect an age correspondence between the salt at Site 546 and the red beds at 544 and 547. The gypsum at 547 suggests deposition in an arid environment and the map relations suggest that the red beds may be a marginal facies bordering the salt. The implications of this possibility are profound, inasmuch as the structural relief between the original salt layer next to the diapir at Site 546, and the red beds at Site 544 is about 4 km. We will be working hard to extract palynomorphs from these rocks.

- The gneissic basement rocks at Site 544 are overlain by a very thin stratigraphic sequence containing an unconformity which separates Oxfordian(?) from Miocene beds. The relations are similar to those on "outer highs," so common on other passive margins at the boundary between oceanic and continental crust.

Leg 80 — Goban Spur[1]

Owing to space limitations we could not reproduce the very long Leg 80 Preliminary Report in its entirety. We have included here only the Summary and Conclusions section and some supplemental material from other parts. The complete Leg 80 report is available from the Deep Sea Drilling Project. Ed.

Leg 80 began 7 June 1981 in Brest, France and ended on 22 July 1981 in Southampton, U.K. The Leg 80 team drilled a transect of four sites (548-551) across the sediment-starved Goban Spur located 250 km southwest of Ireland in the northern part of the Bay of Biscay in order to document the structural evolution and environmental history of the region.

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[1]Extracted from a preliminary Leg 80 report prepared by Pierre C. deGraciansky, C. Wylie Poag (co-chief scientists), Robert Cunningham, Jr., Paul Loubere, Douglas G. Masson, James M. Mazzullo, Lucien Montadert, Carla Muller, Kenichi Otsuka, Leslie Reynolds, Jacques Sigal, Scott Snyder, Hilary A. Townsend, Stephanos P. Vaos, and Douglas Waples.

Objectives and Site Locations

We drilled Holes 548, 549, 550, and 551 (GOS-IV, GOS-III, GOS-I, and GOS-II, respectively) along a transect across the continent/ocean boundary on the sediment-starved Goban Spur. Our primary objectives were to:

- establish the geologic ages, depositional environments, and subsidence rates during the major phases of development of the continental margin and its boundary with the oceanic crust,
- determine the duration and amount of rifting, and the age and nature of the post-rift unconformity,
- document the age and nature of significant post-rift chronostratigraphic boundaries and prominent seismic unconformities, and to assess their relationships to basin subsidence, global sea-level changes, and tectonism,
- analyze the effects of changing oceanographic conditions, water depths, climates, rates of subsidence, and rates of sediment contribution upon the composition, accumulation, diagenesis, and erosion of continental margin sediments;
- determine the heat-flow rates and thermal regime of this margin and to further assess the nature of crustal thinning near the continent/ocean boundary, and
- compare and correlate the geologic and geophysical record of this continental margin with the known record from other margins, the deep sea, and from the adjacent European landmass. Figure 80-1 shows the locations of the Leg 80 sites. Coring operations are summarized on Table 80-1.

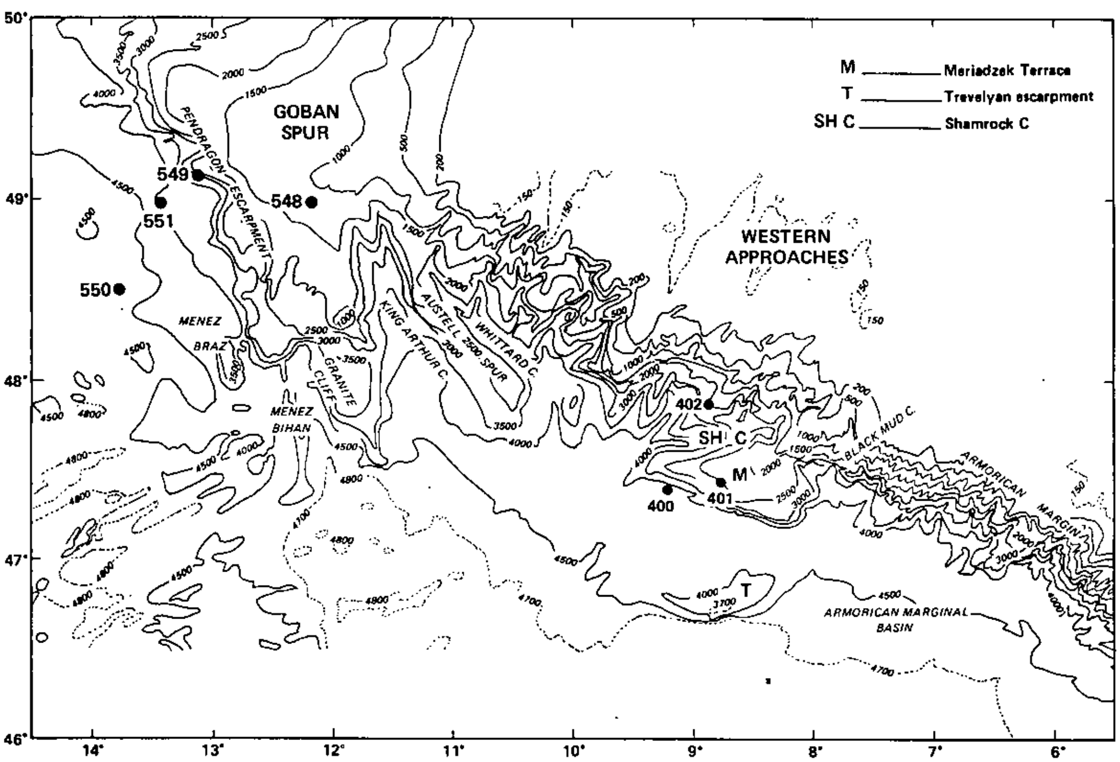


Figure 80-1. Bathymetry, major topographic features, and DSDP-IPOD site locations in the northern Biscay region (after Montadert *et al.*, 1979)[2].

[2]See the Leg 80 Preliminary Report, available from the Deep Sea Drilling Project, for complete reference citation.

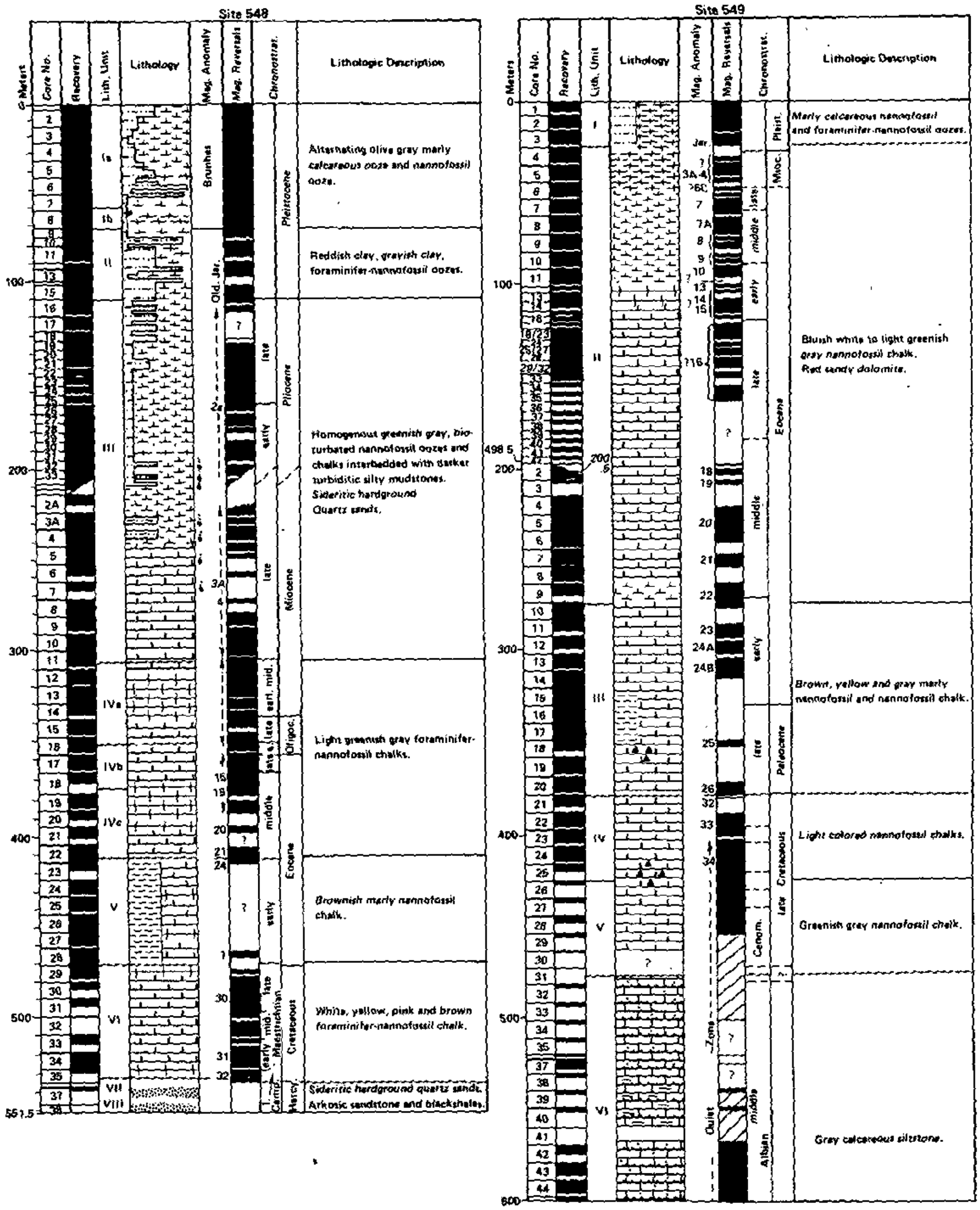
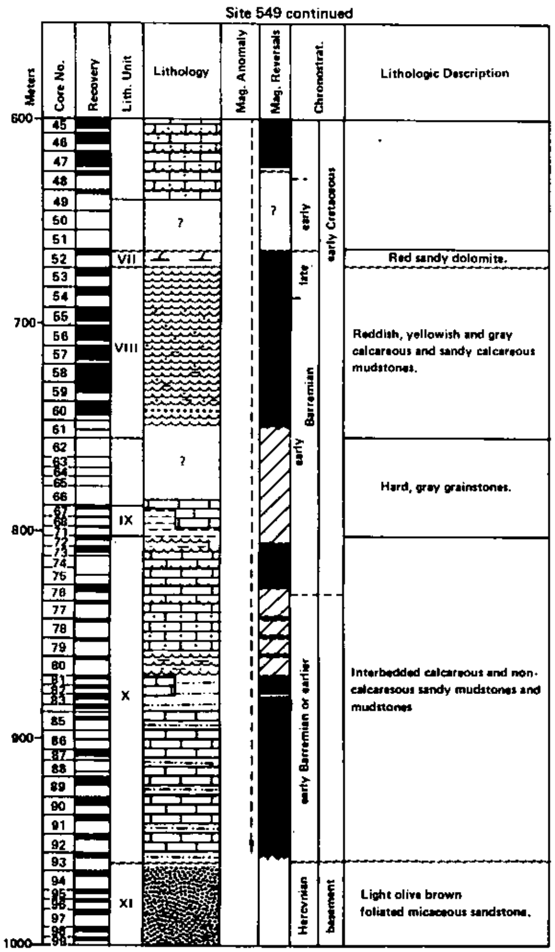
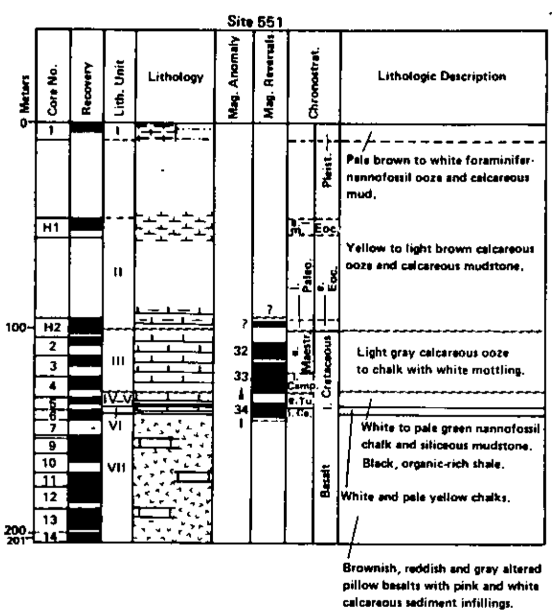


Figure 80-2. Stratigraphic sequences drilled at Leg 80 Sites 548, 549, 550, and 551.


Site 549 continued
Meters
Core No.
Recovery
Lith. Unit
Lithology
Mag. Anomaly
Mag. Reversals
Chronostrat.
Lithologic Description
600
700
800
900
1000
VII
VIII
IX
X
XI
early
late
Barremian
early
early Cretaceous
early Barremian or earlier
Hercynian
basement
Red sandy dolomite.
Reddish, yellowish and gray calcareous and sandy calcareous mudstones.
Hard, gray grainstones.
Interbedded calcareous and non-calcareous sandy mudstones and mudstones
Light olive brown foliated micaceous sandstone.


Site 551
Meters
Core No.
Recovery
Lith. Unit
Lithology
Mag. Anomaly
Mag. Reversals
Chronostrat.
Lithologic Description
0
100
200
201
H1
H2
I
II
III
IV V
VI
VII
32
33
34
Pleist.
Eoc.
Paleo.
e. Eoc.
e. Maestr.
Camp.
e.Tu.
l. Ce.
l. Cretaceous
Basalt
Pale brown to white foraminifer-nannofossil ooze and calcareous mud.
Yellow to light brown calcareous ooze and calcareous mudstone.
Light gray calcareous ooze to chalk with white mottling.
White to pale green nannofossil chalk and siliceous mudstone.
Black, organic-rich shale.
White and pale yellow chalks.
Brownish, reddish and gray altered pillow basalts with pink and white calcareous sediment infillings.

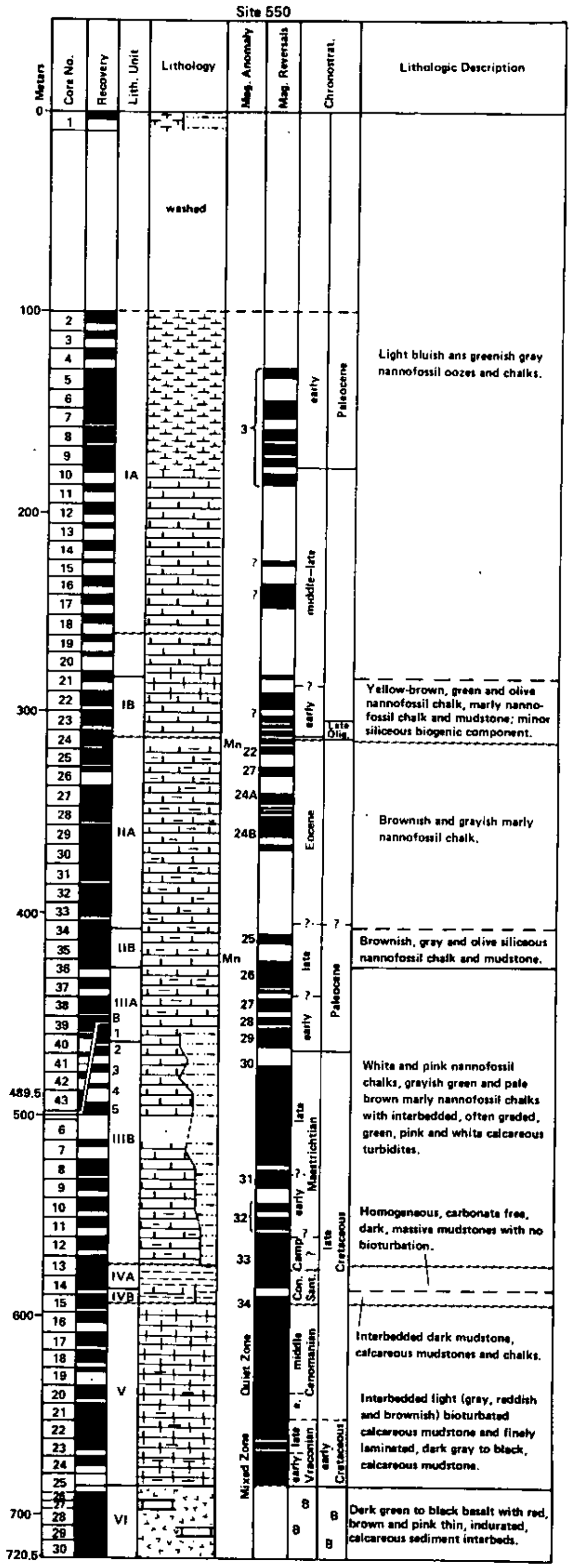

Site 550
Meters
Core No.
Recovery
Lith. Unit
Lithology
Mag. Anomaly
Mag. Reversals
Chronostrat.
Lithologic Description
0
100
200
300
400
489.5
500
600
700
720.5
washed
IA
IB
IIA
IIB
IIIA
IIIB
IVA
IVB
V
VI
Mn
22
27
24A
24B
25
26
28
29
30
31
32
33
34
Quiet Zone
Mixed Zone
early
Paleocene
middle–late
Late Olig.
Eocene
late
early
Paleocene
late
Maestrichtian
Camp.
Con. Sant.
late Cretaceous
middle Cenomanian
early late Vraconian
early Cretaceous
Light bluish ans greenish gray nannofossil oozes and chalks.
Yellow-brown, green and olive nannofossil chalk, marly nannofossil chalk and mudstone; minor siliceous biogenic component.
Brownish and grayish marly nannofossil chalk.
Brownish, gray and olive siliceous nannofossil chalk and mudstone.
White and pink nannofossil chalks, grayish green and pale brown marly nannofossil chalks with interbedded, often graded, green, pink and white calcareous turbidites.
Homogeneous, carbonate free, dark, massive mudstones with no bioturbation.
Interbedded dark mudstone, calcareous mudstones and chalks.
Interbedded light (gray, reddish and brownish) bioturbated calcareous mudstone and finely laminated, dark gray to black, calcareous mudstone.
Dark green to black basalt with red, brown and pink thin, indurated, calcareous sediment interbeds.

Table 80-1. Leg 80 Coring Summary

Hole	Dates (1981)	Latitude	Longitude	Water Depth[1] (m)	Sub-bottom Penetration (m)	No. of Cores	Meters Cored	Meters Recovered	Per Cent Recovery
548	9-11 Jun	48°54.95'N	12°09.84'W	1256	211.0	35	211.0	210.86	99.9
548A	12-14 Jun	48°54.93'N	12°09.87'W	1256	551.5	38	346.0	246.52	71.2
549	15-27 Jun	49°05.28'N	13°05.88'W	2533	1001.5	99	812.5	369.72	45.5
549A	27-30 Jun	49°05.29'N	13°05.89'W	2535.5	196	42	196.0	144.4	73.7
550	30 Jun - 5 Jul	48°30.91'N	13°26.37'W	4432	536.5	48	422.5	262.61	59.3
550A	5 Jul	48°30.96'N	13°26.32'W	4432	95.0	0	0	0	0
550B	6-12 Jul	48°30.96'N	13°26.32'W	4432	720.5	30	264.5	177.91	67.3
551	16-20 Jul	48°54.64'N	13°30.09'W	3909	201	14	125	80.95	64.8

[1]Water depths from sea level.

Site 548 is on the landward point along the Goban Spur transect on the upper slope (1246 m water depth) over the truncated tip of a high basement block. Our chief objectives here were to determine the nature, age, and subsidence history of the basement, to gather information about the depositional environments of post-rift sediments and to sample the strata encompassing a series of seismic unconformities. We were very successful in achieving these goals through recovery of 445 meters of Upper Cretaceous through Holocene sediments and 16.0 meters of basement (or near basement) rocks. Total penetration was 551.5 meters. Figure 80-2 shows the stratigraphic section penetrated at Site 548.

Site 549 is located above the seaward tip of a tilted basement high (2335.5 m water depth) near the Pendragon Escarpment which truncates the seaward slope of the Goban Spur (Fig. 80-3). Whereas we cored chiefly post-rift sediments at Site 548, we planned drilling at Site 549 to penetrate the syn-rift sediments. The chief objectives at the site were similar to those of Site 548, except that they included establishing the age, nature, and depositional environmental of the *syn-rift* rocks.

We achieved these objectives with some difficulty. Core recovery was approximately 50 per cent of the section penetrated (511.8 m of 1001.5 m) and was poor through some critical intervals. The completion of only one downhole logging run produced a poor sonic record which hampered correlations somewhat; good resistivity and gamma-ray records, however, allowed adequate lithologic interpretation of most of the poorly recovered sections. We calculated a geothermal gradient of 24.46°C/km from heat-flow measurements. Figure 80-2 shows the stratigraphic section collected here.

Site 550 is located on the abyssal plain (water depth 4432 m) 10 km southwest of the seaward edge of the Goban Spur, above a high structural block of the oceanic basement. This is the seawardmost site of the Goban Spur transect and drilling here was planned chiefly to determine the age, composition, and subsidence history of the oceanic basement. Continuous coring from 99 to 720.5 meters allowed us to achieve this objective.

Emplacement of basalt flows and pillow lavas during the early stages of sea-floor spreading west of the Goban Spur formed a faulted basement high (300-400 m above adjacent crust) beneath Site 550. Here we recovered 33 meters of remarkably unaltered flow and pillow basalts. Foraminifers and nannofossils from interbedded limestones appear to be no older than late Albian (Figure 80-2).

We drilled Site 551 on the seaward edge of the Goban Spur (3909 m water depth) over the flat top of a raised basement block. Here we expected to sample the Hercynian basement and its overlying sediments as we had done at Site 549. In order to minimize coring time, we moved the site from its originally proposed location closer to the seaward edge of the block where we estimated that no more than 200 meters of sediment was present.

To our surprise, the "basement" was not Hercynian sandstone, but instead at least 59 meters (our total penetration) of flow and pillow basalt overlain by bathyal upper Cenomanian strata. Thus, the flattened top of the block is not a subaerial erosion surface, but the flat surface of lavas emplaced in bathyal depths. Figure 80-2 shows the stratigraphic sequence drilled here.

Summary and Conclusions

A complex of rift-phase listric faults, trending northwest-southeastward across the Goban Spur, breaks the Hercynian basement rocks into a series of tilted blocks and half-grabens which form the framework for Mesozoic-Cenozoic sedimentation. At the end of continental rifting in this area, the half-grabens were essentially filled with Mesozoic syn-rift sediments, and the higher fault blocks were truncated by widespread erosion.

As sea-floor spreading opened the Bay of Biscay and thermal subsidence replaced stretching and faulting as the chief tectonic movement, the sediment supply dwindled and remained relatively sparse on the Goban Spur. The resulting thin sediment veneer over the post-rift unconformity created a condition unusually suitable for open-hole coring. The Goban Spur transect of four relatively shallow holes was planned to trace the development of this passive continental margin and to investigate its relationship to the adjoining oceanic plate.

Basement

The drill encountered continental basement at two sites (Sites 548 and 549; Fig. 80-3). We sampled lustrous black shale, quartzite, and foliated micaceous sandstone in which low grade metamorphism and, in the case of Site 549, near-vertical bedding are indications of Hercynian tectonism.

The 34 meters of flow and pillow basalts penetrated at Site 550 corroborate the previous interpretations of regional geophysics (Montadert, Roberts, 1979)[2]. The paleontological and paleomagnetic age of the sediments resting directly on the youngest pillows is latest Albian (Vraconian) on the basis of paleontological and paleomagnetic data. This date, and documentation that the oldest post-rift sediments on the Goban Spur are early Albian (Site 549), suggests

[2]See the Leg 80 Preliminary Report, available from the Deep Sea Drilling Project, for complete reference citation.

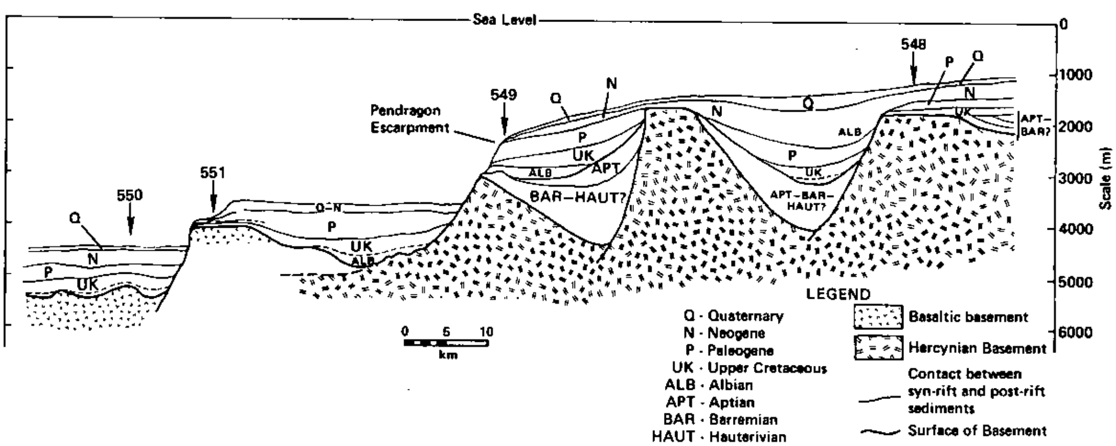


Figure 80-3. Schematic dip section across the Goban Spur along seismic line CM 10 (Sites 548 and 550 projected northward onto the line; Sites 551 and 549 drilled on the line).

sea-floor spreading west of the Goban Spur began in the early Albian. This is in contrast to its Aptian beginning in the Meriadzek region. The oldest sediments at Site 549 are lower Albian and sedimens older than the upper Albian beds at Site 550 are present in a basement depression east of Site 550.

At Site 551 we expected to recover additional Hercynian continental crust, as geophysical evidence seemed to indicate that this fault block marked the continental edge. Instead, we cored a 59-meter sequence of altered pillow basalt resting beneath upper Cenomanian chalk. A re-examination of seismic profiles crossing and adjacent to Site 551 reveals that the escarpment below the site does not persist throughout the region and that the typical syn-rift sedimentary wedge cannot be definitely discerned within strata in the adjacent half-graben.

These features raise the possibility that Hole 551 penetrated oceanic basement, and that the true ocean-continent boundary is northeastward at the foot of the Pendragon Escarpment. Alternatively, Hercynian basement may lie beneath the basaltic layers at Site 551, or it may have been intruded by dikes and sills at several levels, creating a transitional crust similar to that envisioned in other parts of the Atlantic Margin (e.g., Grow *et al.*, 1979[2]).

Syn-Rift Sedimentary Rocks and the Duration of Rifting

The Biscay syn-rift deposits are characteristically wedge-shaped on seismic dip sections (Fig. 80-3). The wedges are thickest in the deepest parts of the half-grabens where they abut against the steep escarpments of the bounding listric faults. They thin progressively up the gentler slopes of the seaward tilted blocks. At Site 549 we cored syn-rift sediments on the tip of a tilted block, and found them to comprise a complex 290-meter transgressive sequence of Barremian-(?)Hauterivian littoral and sublittoral mudstone, limestone, and silty clay. These strata rest on the Hercynian basement beneath Site 549, and can be traced, still lying on the basement, northeastward into the adjacent half-graben. They therefore date the approximate beginning of the main rifting phase in the Goban Spur region.

This discovery has further implications concerning the beginning of the major rift phase of the entire northern Biscay margin. Prior to the development of the northwest-southeast trending listric fault systems across northern Biscay, the main tectonic grain was northeast-southwest. This is demonstrated by the structural trend of the basement ridge upon which the Goban Spur and Cornwall are built. The initiation of the nearly 90° change in tectonic stresses that marks the major rift phase of northern Biscay is dated by the oldest syn-rift sediments in the half-grabens. Our data, and their extrapolation by interpretation of seismic reflection records demonstrate that this took place no later than the Hauterivian.

The Barremian-(?)Hauterivian unit is separated from lower Albian, outer sublittoral, highly calcareous siltstone by a post-rift unconformity. The unconformity represents a stratigraphic gap of about 8 million years and corresponds closely with a major middle Aptian sea level drop (Vail *et al.*, 1977[2]).

Although Aptian strata are missing at Site 550, we infer that a thick syn-rift wedge in the adjacent half-graben (Fig. 80-3) represents Aptian deposits. In this interpretation, the Aptian deposits end syn-rift deposition in the area. We can then estimate the duration of the main phase of rifting as about 12-14 million years (Aptian-Barremian — and (?)Hauterivian).

Oldest Post-rift, Sedimentary Rocks and the Initiation of Sea-Floor Spreading

We dated the initiation of post-rift deposition and sea-floor spreading at two sites: Site 549, on the Hercynian crust, and Site 550 on the oceanic crust (Fig. 80-3). At Site 549, the oldest stratum above the post-rift unconformity is a lower Albian sandy dolosparite. At Site 550, the oldest rocks on top of the basaltic basement high are uppermost Albian mudstone. We can infer, however, from seismic reflection profiles that older strata resting in the adjacent eastward depression existed.

On the basis of the early Albian age for post-rift deposition at 549, these older strata at 550 can be reasonably assumed to also represent lower Albian deposits. Sea-floor spreading, thus appears to have begun west of Goban Spur in the early Albian. This Albian beginning is supported by the presence of the mixed-polarity interval of magnetic anomaly 34 in the upper Albian sediments at Site 550, and by a linear basement anomaly west of Site 550 (also as anomaly 34).

[2]See the Leg 80 Preliminary Report, available from the Deep Sea Drilling Project, for complete reference citation.

Subsidence of the Northern Biscay Margin

Two of the most intriguing aspects of the geological development of passive continental margins are the depth of water over the sea-floor at the start of spreading and the rate of subsequent subsidence. Several authors have addressed this subject in recent years (Sclater and Francheteau, 1970; Berger, 1972; LePichon *et al.*, 1973; Chenet and Francheteau, 1979[2]). Drilling during Leg 48 (Sites 400 and 401) has added to our knowledge about the Meriadzek area. Because post-rift rocks probably did not participate in major faulting episodes, Montadert and Roberts used the difference in elevation of Sites 400 (deep-water carbonates) and 401 (shallow-water carbonates) as an estimate of their original depth difference. Thus they estimated a bathymetric relief of 1500-2000 meters at the end of rifting. Both of these sites, however, were drilled on continental crust. Because we drilled adjacent sites on oceanic and continental crust (Sites 500 and 549, respectively), our transect provides a better measure of the initial depths of the oceanic sea-floor. Data from Site 551 can also be used to provide constraints.

The first post-rift strata (early Albian) at Site 549 accumulated near sea level; they are at present 3188 meters below the sea-floor. The oldest sediments on the oceanic basement at Site 550 are deep water pelagic carbonates, whose present depth is 5117 meters below the sea floor. The elevation difference of 1929 meters is an estimate of the original depth of Site 550 as sea-floor spreading began. This value falls within the upper range of values estimated for early post-rift depths in the Meriadzek region (1500-2000 m). It agrees very well with an estimte of 1860 meters derived from backtracking along the thermal subsidence curve calculated for the North Atlantic (Tucholke and Vogt, 1979)[2]. (The curve had to be vertically shifted to fit the anomalously shallow depth of Site 550).

We can estimate the rate of margin subsidence during early spreading from the fossil assemblages at Site 549 (continental crust). We originally estimated that the depositional surface there subsided from near sea level (early Albian) to around 1000-2000 meters below the sea-floor (Cenomanian) during about the first 12 million years of spreading. This yields a range of average subsidence rates of about 83 to 166 meters per million years. Calculation of the subsidence rate at Site 550 (oceanic crust) using the thermal subsidence curve yields about 67 meters per million years during the first 12 million years of spreading. The discrepancy indicates that the water depths inferred on the basis of bathyal Cenomanian fossils was no more than 800 meters rather than 1000-2000 meters. Both methods show that subsidence slowed appreciably after the initial 25 million years or so (during the Santonian-Coniacian).

Hiatuses

The work of Vail *et al.* (1977)[2] and several others during the last five years has stimulated widespread interest in the subject of seismic stratigraphy and its application to regional geologic studies. Workers have equated regional and even global erosional and nondepositional unconformities with eustatic sea level changes. Seismic control for the Goban Spur transect is a series of superb migrated multichannel seismic reflection profiles upon which we can easily identify seismic sequences and their bounding high-amplitude reflectors. Thus, data from the Leg 80 sites provide us with an opportunity to date unconformities and to analyze the paleontological and sedimentological changes that are associated with them. We were also able to trace the effects of the sedimentological changes from the upper slope to the abyssal plain and to offer explanations for their causes.

We can trace four major chronostratigraphic breaks through Sites 548, 549, and 550. The gaps they represent are of slightly different duration at each site, but their persistence and correlative stratigraphic positions are too similar to be coincidence. The approximate time that the gaps span are middle Paleocene; middle Oligocene; early Miocene; late Miocene. We can recognize two other breaks at Sites 549 and 550: late Santonian-middle Campanian; middle Cenomanian-Coniacian. Two additional major hiatuses, late Albian and late Cenomanian-early Albian, are present at Site 549.

The stratigraphic positions of these unconformities are remarkably close to — and mainly coincident with — the positions of global unconformities discussed by Vail *et al.* (1977). The unconformities have equivalants on many other margins and can be easily correlated with seismic unconformities on our control profiles. It seems unlikely that sea-level fluctuations alone could produce these breaks nearly simultaneously at shelf, slope, and abyssal locations. Other possible mechanisms such as changes in bottom water circulation, were probably linked to major agents such as climatic cycles, regional tectonism, and the adjustment of continental and submarine topographic features that accompanied sea floor spreading.

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[2]See the Leg 80 Preliminary Report, available from the Deep Sea Drilling Project, for complete reference citation.

Uninterrupted Chronostratigraphic Sequences

We encountered three sequences of uninterrupted sedimentation on the Goban Spur transect. At Site 548, 340 meters of lower Miocene to Holocene sediment is interrupted only by one minor unconformity in the middle Miocene. Rich micro- and nannofossil assemblages here provide a detailed biochronology and leave a superb record of changing middle bathyal environments. The nearly 100 per cent recovery of Pleistocene strata yielded especially clear evidence of climatic cycles. The Pliocene/Pleistocene boundary is well documented and is associated with the Olduvai paleomagnetic event.

At Site 549 the excellent biostratigraphic sequence is a 180-meter series of upper Paleocene to upper Oligocene bathyal sediments that are interrupted by only a small gap in the middle Oligocene. This richly fossiliferous record should provide a stratigraphic reference section that is unparalleled in the entire eastern Atlantic. Its suitability as a high resolution stratigraphic sequence is enhanced by our recognition of magnetic polarity reversals within it.

At Site 550, we recovered a continuous record across the Danian/Maestrichtian boundary in an 80-meter sequence of early Maestrichtian to Danian abyssal chalk. Calcite dissolution, however, has left the foraminifers and calcareous nannofossils poorly to only moderately well preserved.

Carbonate Dissolution and the CCD

We detected a close association — especially at the deeper sites — between stratigraphic gaps and drastic changes in carbonate content. At Site 550, the Turonian, Paleocene, and Oligocene disconformities coincide with accumulation below a relatively shallow CCD. Rapidly deposited calcareous sediments below the disconformities are replaced by slowly deposited noncalcareous, and often manganiferous, sediments above the break.

The sequences are reversed at Site 550 in the lower Campanian, and at Site 551 in the upper Turonian. Noncalcareous Noncalcareous strata were produced below and richly calcareous strata were produced above the disconformities. This reflects a lowering of the CCD at the gap. Correlation of these events between sites reveals that the ascensions of the CCD took place suddenly and subsequent descensions of the CCD took place more slowly.

Black Shales

Leg 80 drilling documented two periods in which marine organic carbon was incorporated into black shales. At the deepest site (550), circulation was probably somewhat restricted during the Cenomanián allowing preservation of marine organic matter.

At the next deepest sites (551, 549) marine organic carbon deposited during the early Turonian was preserved during times of an elevated CCD. The elevated CCD also resulted in accumulation of sediments encirhced in biogenic silica. These two periods are apparently the only times when conditions in this part of the eastern North Atlantic permitted preservation of significant amounts of organic remains.

Concluding Remarks

The drilling of the Goban Spur transect was an undeniable success in terms of scientific gains and successful technical and equipment tests. The excellent multichannel seismic control allowed us to accurately assess the structure and general stratigraphy of the sites and to extrapolate the coring data across the Goban Spur and vicinity. Location of the sites on basement highs provided thin, yet reasonably complete depositional records of syn-rift and post-rift sediments. Drilling also revealed significant information about the nature and age of the continental and oceanic basement.

An experienced team of tenacious drilling personnel using the current assortment of drill bits-core barrels provided above average recovery of a wide variety of soft and hard sediments and rock. The new configuration of prototype downhole logging tools and reliable heat-flow probes provided complementary information. The logging data enabled us to interpret sections where core recovery was poor and to better correlate the stratigraphy with the seismic records.

The results of Leg 80 have provided a wealth of new data regarding the nature and geological development of passive margins and will stimulte important new investigative efforts. Included among them will undoubtedly be a re-examination of the position and structure of the continent/ocean boundary and a thorough analysis of the rhythmic deposition of carbon-rich Upper Cretaceous organic sequences. In addition, the Leg 80 results will lead to investigations tracing the influence of carbonate dissolution across the margin and refining the current models of CCD and lysocline history, as well as to refining interpretations of past water-depth and bottom topography.

Leg 81
Rockall Plateau[1]

Leg 81 began on 27 July 1981 Southampton, U.K. and ended on 16 September 1981 in Ponta Delgada, Azores. The scientific team drilled eight holes at four sites (552-555) across the western margin of the Rockall Plateau. Figure 81-1 shows the location of the Leg 81 sites. Table 81-1 summarizes the cruise operations.

Introduction

The objective of the Leg 81 transect was to document the structural evolution of the Rockall margin and to examine the record of changing climate and ocean circulation over the last 55 million years.

[1]From a preliminary Leg 81 report prepared by David G. Roberts, Detmar Schnitker (co-chief scientists), Jan Backman, Jack G. Baldauf, Alain Desprairies, Reiner Homrighausen, Paul Huddlestun, Alfred J. Kaltenback, John B. Keene, Klaus A. O. Krumsiek, Andrew C. Morton, John W. Murray, Jean Westberg-Smith, and Herman B. Zimmerman.

The thin cover of post-rift sediments on the margin allowed us the opportunity to study the history of a margin whose structure differs from that of the Bay of Biscay and offshore Portugal (Montadert, Roberts, *et al.*, 1979). The tilted and rotated fault block classically associated with rifted continental margins — such as occur in the Bay of Biscay — are absent here. Seismic profiles show a thick sequence of oceanward dipping reflectors beneath the margin of Rockall. These dipping reflectors are separated from the adjacent ocean crust by a linear ridge often called the outer high (Fig. 81-2). The widespread occurrence of comparable dipping reflectors on the rifted margins of southeast Greenland, in the Ross Sea, the Vøring Plateau, and perhaps off southwest Africa and eastern North America, indicates their significance. Yet the origin of these seaward dipping reflectors has remained an enigma. Workers have put forth several views including interpreting them as sediments interbedded with syn-rift igneous rocks, or a type of ocean crust formed early in the history of an ocean basin in a manner comparable to the formation of sub-aerial ocean crust in Iceland. A main objective of the cruise was to penetrate the sequence of dipping reflectors to establish its age and origin. We also hoped to document the subsidence history of the margin and to obtain the

Table 81-1. Leg 81 Coring Summary

Hole	Dates (1981)	Latitude	Longitude	Water Depth[2] (m)	Sub-bottom Penetration (m)	No. of Cores	Meters Cored	Meters Recovered	Per Cent Recovery
552	31 Jul - 3 Aug	56°02.56′N	23°13.39′W	2315	314.0	21	219.0	79.19	36.2
552A	4-7 Aug	56°02.56′N	23°13.39′W	2311	183.5	38	183.5	182.97	99.7
553	8 Aug	56°05.32′N	23°20.61′W	2339	59.5	1	9.0	8.33	92.6
553A	10-25 Aug	56°05.32′N	23°20.61′W	2339	682.5	59	531.5	288.97	54.4
553B	26 Aug	56°05.32′N	23°20.61′W	2338	28.5	4	33.5	33.23	100.0
554	27-28 Aug	56°17.41′N	23°31.69′W	2584	76.0	8	76.0	53.76	70.7
554A	28-29 Aug	56°17.41′N	23°31.69′W	2584	209.0	14	133.0	29.52	22.2
555	31 Aug-10 Sep	56°33.70′N	20°46.93′W	1669	964.0	98	926.0	505.25	97.0

[2]Water depths from sea level.

Neogene biostratigraphic and lithostratigraphic record. A good stratigraphic record at these high North Atlantic latitudes which would greatly improve our understanding of the evolution of Northern Hemisphere climate and ocean circulation into the glacial state.

Regional Setting

The Rockall Plateau is a now deeply foundered microcontinent whose sole remaining sub-aerial expression is the tiny island of Rockall. The plateau is located midway between the Reykjanes Ridge and the British Isles. Rockall, Hatton Bank, and the intervening Hatton Rockall Basin form the principal relief above 1000 meters. Below this depth, steep marginal slopes bound the plateau to the west, southwest, and east (Fig. 81-1).

The isolation of the Rockall Plateau microcontinent is a consequence of three major phases of rifting and spreading that fractured the Laurasian supercontinent opening the North Atlantic Ocean, Labrador, and Norwegian seas.

The earliest phase opened the Rockall Trough in post-Aptian-pre Campanian time following Late Jurassic-Early Cretaceous rifting (Roberts *et al.*, 1981). By 76 million years B.P., spreading had ceased in the Rockall Trough and the spreading axis migrated westward opening the Labrador Sea and so spreading the Greenland-Rockall-Europe plate away from North America. This phase created the rectilinear southwest margin of the Rockall Plateau by a combination of east-west transform faulting and rifting about a North-South axis. The adjacent ocean crust becomes younger toward the west along the east-west transform from anomaly 31-32 (76 m.y.) at the foot of Rockall Plateau to anomaly 24 at 25°30′W. Spreading in the Labrador Sea, between anomaly 25 and 24B time (55.2 to 52.3 m.y., Hailwood *et al.*, 1979) may have been partly contemporaneous with the start of rifting between Greenland and the Rockall Plateau. Considerable volcanism associated with the rifting is revealed by the flood basalts of East Greenland and the Faeroes Islands.

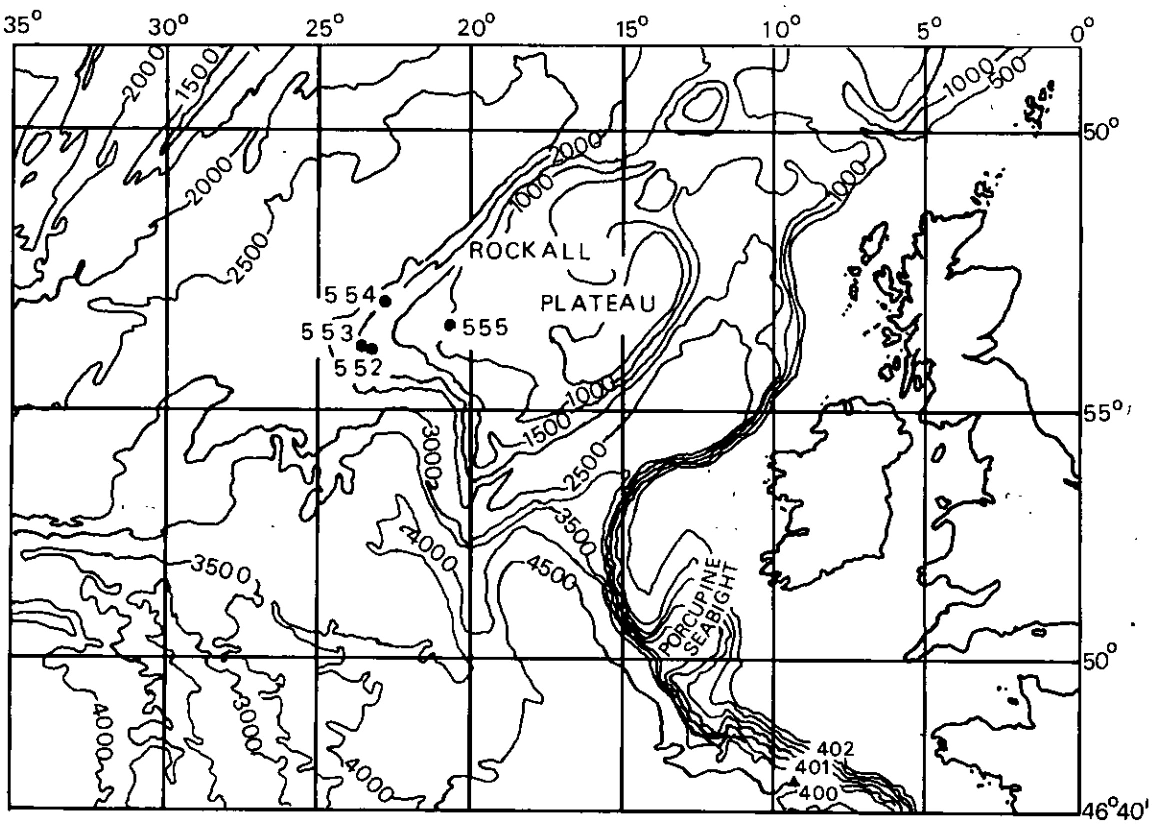


Figure 81-1. Location of Leg 81 sites on the west margin of Rockall Plateau.

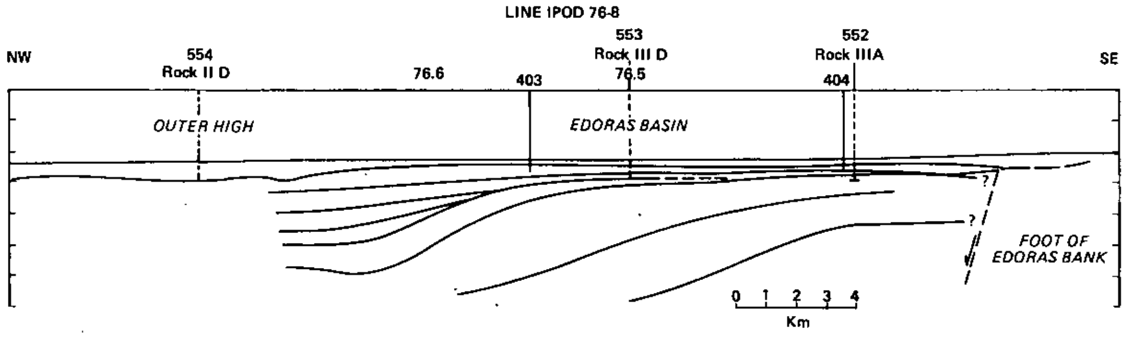


Figure 81-2. NW-SE cross section through Sites 552, 553, and 554.

The transition from rifting to spreading between Greenland and Rockall Plateau was completed by 52.3 million years ago (anomaly 24B). Initially the spreading rate was 1.3 cm yr^{-1} about a NE-SW axis but it decelerated to as little as 0.3 cm yr^{-1} between 38 and 10 million years B.P. This coincided with a reorientation of the spreading axis to a north-south ridge which was cut by zone of closely spaced fractures. About 10 million years ago, spreading accelerated or changed direction to the present NE-SW trend of the Reykjanes Ridge (Vogt and Avery, 1974).

During the interval between 52.3 million years and the present, the completeness and nature of the sedimentary record has been influenced both by the subsidence of the margin and contemporaneous changes in global climate and ocean circulation. These events include the Eocene-Oligocene cooling, best documented from the southern oceans (Kennett *et al.*, 1975), as well as the profound circulation changes resulting from the subsidence of the Iceland-Faeroes Ridge below sea level at some unknown time during the Miocene. Finally, the region was exposed from the late Pliocene (2.4 m.y.) to the progressive cooling of the Northern Hemisphere that heralded the extreme variations in Pleistocene climatic and ocean circulations.

Drilling Results

Sites 552 and 553

Sites 552 and 553 comprise the mid point of the transect situated just oceanward of the base of the Hatton-Edoras Bank. The principal objectives at these sites were to penetrate the thin sediment cover into seaward dipping reflectors and to establish their nature and age. Other objectives were to increase knowledge about the subsidence history of the margin and about the nature, age, and environments of the post-rift sediments. Site 552 was planned to penetrate an older part of the dipping reflectors indicated by an apparent offlap, and Site 553 to penetrate an apparently younger part of the sequence. We also planned drilling at Site 552 to establish whether single-bit penetration into the reflectors was feasible, or whether a re-entry cone would be necessary at Site 553. In the event, we drilled basalt at Site 552 and set a re-entry cone at Site 553 and we completed two successful re-entries before the bit fell off.

All our objectives were achieved at the two sites. At Site 553, the lower part of the basaltic lava flows, probably interbedded with sediments, represents the upper part of the sequence of dipping reflectors and were drilled for 71.0 meters above total depth. (Fig. 81-3 shows the stratigraphic column for this and other sites). The overlying sediments establish the transition from rifting to spreading and document the subsequent subsidence history of the margin. At Site 552A, we cored a 44.0-meter thick Pliocene-Pleistocene section with the hydraulic piston corer. The sediments represent the first virtually complete record of the pre-glalcial and glacial history of the Northern Hemisphere. We penetrated several major unconformities including, at Site 552A, a spectacular 1.75 meter condensed sequence which represents the late Eocene, Oligocene and middle Miocene. Successful heat-flow measurements gave temperature gradients of 53.75°C km^{-1} and 64.51°C km^{-1} at Sites 552 and 553, respectively. The complete suite of logs (caliper, gamma, sonic, density, porosity, resistivity and temperature) run in Site 553 will be invaluable in constructing synthetic seismograms to both aid identification of the reflectors and to model the seismic response to the interbedded basalt and sediment.

At Site 553A, we drilled through 189.0 meters of basalt to total depth at 682 meters. The lower 71.0-meter interval, corresponding to the dipping reflectors identified from seismic profiles and sonic logs, consisted of basalt flows with agglomeratic to scoriaceous tops. Preliminary shipboard analysis of the logs suggests the possible existence of thin sedimentary interbeds. Paleomagnetic measurements on the basalts show cyclical variations in inclination which we interpreted as secular variation. These cycles suggest the lava was deposited at a rate of perhaps as much as 30.5 meters per 1000 years.

At Site 553, the tuffaceous sandy mudstone overlying the basalt may represent a basal transgressive deposit. Up to the NP 11/12 boundary, the variety of lithologies present are distinguished by the relative proportions of tuff, sandstone, and mudstone. In general, the tuff component increases upward but has a distinct maximum at the NP 11/12 boundary. A macrofauna comprising bivalves as well as gastropods, serpulids, and thick-walled oysters occurs commonly. Scouring, cross laminae, and small-scale slumps are also present. Depositional water depths show a general increase up section. The subtle interplay between subsidence and sedimentation, however, is shown by the development of regressive arkosic sandstone, characterized by a high-grade metamorphic mineral assemblage, followed by brackish water lagoonal or estuarine deposits before deeper water deposits increased again. The rapid deposition rate of 90 meters per million years allowed resolution of two hitherto unreported short normal polarity intervals within the long reversed polarity interval 24B to 25. These sediments were deposited prior to the onset of spreading during anomaly 24B time. The onset of anomaly 24B spreading may be closely coincident with the eruption which formed the prominent tuff horizon at the NP11/NP12 boundary. Following this event, the depocenter migrated eastward to Site 552 where we found a thicker upper-lower Eocene section. A change to a heavy mineral assemblage, dominated by augite and olivine, at the NP11/NP12 boundary indicates erosion of an igneous terrain. Increasing subsidence is shown through NP 12, and middle Eocene time by evidence for an increased depth of deposition, westward downlapping of reflectors within the interval, and the increasing dominance of chalk — although tuffaceous and zeolitic components are still significant.

Between the middle Eocene and the early Miocene, the geological record is fragmented; we recovered only 1.75 meters of sediment representing this long interval of time. We found unconformities between the middle and upper Eocene, the upper Eocene and the Oligocene, within the Oligocene, between the Oligocene and middle Miocene, and between the lower and middle Miocene. Non-deposition and/or erosion during time is shown by growth of manganese nodules around nuclei of lithified Eocene sediments. Subsidence throughout the interval is shown by an increase of depositional water depths to 1400 meters by Oligocene time and 2000 meters by middle Miocene time. The souce of terrigenous clastic sediments was evidently cut off by Oligocene time. Thin glauconite-rich chalks were deposited in early and middle Miocene time to be succeeded by thick nannofossil-foraminifer chalks during late Miocene and early Pliocene time. The onset of the glaciation of the Northern Hemisphere is clearly established at 2.4 million years B.P. by the appearance of an alternating sequence of nannofossil-foraminifer ooze and mud. This age assignment is supported by the occurrence of an interval with no siliceous microfossils at the Leg 81 sites which correlates to a similar interval in the Norwegian Sea (Schrader and Fenner, 1977). Cyclical variations in carbonate content in this interval correlate well with the oxygen isotope stages established by Shackleton and Opdyke (1976) for sequences in the Pacific. The sequence cored at Site 553 is the first complete Pliocene-Pleistocene record obtained at a high North Atlantic latitude and will be invaluable for the study of changes in pre-glacial and glacial climates and ocean circulation.

Site 554

Site 554 was located oceanward of Sites 553 and 552 on the crest of the outer high separating the zone of dipping reflectors from the oceanic crust to the west. The outer high lies at the edge of oceanic magnetic anomaly 24B. In the evolution of passive margins, the outer high has been variously considered to mark an uplift associated with the terminal part of the rifting phase, a horst within the rift graben, or perhaps the first formed oceanic crust. Drilling at Site 554 was planned to study the role of uplift (or subsidence) by comparing the depositional environment of the sediments on the high with coeval sedimens at Sites 552 and 553. We also hoped to penetrate into basement to establish the age and origin of the outer high. A further objective was to sample any Pliocene-Pleistocene section that might be present with the hydraulic piston corer. We discovered, however, that the latter section was too thin to justify use of the HPC.

We did achieve both the principal objectives, although persistent torquing and sticking of the drill string in the basaltic breccias eventually forced us to abandon the hole.

The hole bottomed in what are probably pillow basalts. Shipboard magnetic measurements indicate the basalts are predominantly of normal polarity although one reversed interval is present towards the base. Non-fossiliferous volcanogenic conglomerate and sandstone, possibly deposited in a high energy littoral environment, both overlie and fill fractures in the basalt. These beds are overlain by lower Eocene normally magnetized chalks (NP 11) laid down in water depths of 75 to 125 meters. The position of these beds at about 150 meters below the crest of the high suggests that it was probably sub-aerial. The partial overlap of the high by anomaly 24B, the predominant normal polarity of the basalts comprising the basement of the high, and the normal polarity of the overlying NP 11 sedimens is strong circumstantial evidence that the high may represent the first formed ocean crust. The closely comparable depths of the basement drilled on the outer high suggest the adjoining ocean crust may have accreted in depths as shallow as 100 meters and may even have been above sea level.

An unconformity, present between the lower and the upper Eocene, is represented by an 11-cm layer rich in manganese. The layer may represent an incipient hard ground developed after erosion of the middle Eocene sediments. The thin (80 cm) upper Eoene beds comprise glauconite-rich foraminifer marls laid down in depths of 800-1500 meters. These beds are succeeded by a condensed 11.65-meter Oligocene section of glauconite-rich foraminifer marl and chalk in which all the zones of the Oligocene are apparently present. Depths of deposition increased from 800-1500 meters in early Oligocene time to in excess of 1400 meters by the late Oligocene.

The Oligocene is unconformably overlain by lower Miocene glauconite-rich foraminifer chalk deposited in water depths in excess of 1900 meters. An unconformity representing a hiatus of about 3 million years, separates the lower Miocene from the 77.50-meter thick middle Miocene to lower Pliocene interval. Bluish white to gray foraminifer-nannofossil ooze predominates and the sediments were laid down in 2250-2500 meters of water — close to the present depth of the site. Although the average accumulation rate was 0.7 cm per 1000 years, scatter in the biostratigraphic data control points suggests several short hiatuses occurred. An unconformity may be present at the base of the Pleistocene. The principal lithology is alternating beds of white to yellowish brown nannofossil-foraminifer ooze deposited at a rate of 3 cm/1000 years.

Site 555

Site 555 was drilled in 1669 meters of water midway between Hatton Bank and Edoras Bank some 40 km east of the zone of dipping reflectors drilled at Site 553. Our purpose in drilling here was to (a) compare the subsidence history of these banks with that found at the deeper sites, (b) obtain a more complete upper Paleogene and Neogene section, and (c) document the environmental history of the margin.

Somewhat surprisingly, the entire middle Eocene through Oligocene section was absent at Site 555; this represents a 30 million year hiatus. In the underlying lower Eocene and Paleocene section (NP 9 to NP 11) we detected the normal polarity event (24B) and two short normal polarity events in the preceding reverse polarity interval (24A to 25). The lower Eocene sequence consisted predominantly of tuff, feldspathic sandstone and carbonaceous mudstone. Depths of deposition decreased from inner shelf to intertidal and then increased to 200 meters. Tuff increase in abundance downsection. Towards the base, they are replaced by pillow basalts interbedded with autoclastic breccia cemented with analcite. Thin sandstone intercalations are present. Underlying these basalts is a sequence of marine micaceous silty upper Paleocene mudstone (NP 9) resting in turn on massive basalt of reverse polarity. We suppose the NP 9 to 11 part of the upper Paleocene to lower Eocene interval is the lateral equivalent of the thick sequence containing dipping reflector partly penetrated at Site 553. The occurrence of two normal polarity intervals in a sequence of interbedded basalts and sediments offers a unique oppotunity to establish an absolute chronology for the anomaly 24B to 25 interval and to correlate the nannofossil and dinocyst zones to this time scale.

The origin of the prolonged hiatus between the lower Eocene and lower Miocene is an intriguing problem. The seismic profiles show clear evidence of erosion at the unconformity but the timing of the erosional and/or non-depositional events that produced the hiatus remains an enigma. The hiatus could be related to currents acting between the banks developed in response to circulation changes during Eocene and Oligocene time.

The overlying early Miocene chalk contains abundant glauconite. The depositional hiatus between early and middle Miocene followed by differential deposition results in the growth of the large sediment drifts that characterize the Rockall Plateau. A possible cause of the hiatus encompassing most of the Pliocene is erosion associated with an intensification of the Gulf Stream following closure of the Panamanian Isthmus.

Summary and Conclusions

We can describe the structure of the west margin of Rockall Plateau simply in terms of three structural units: an outer high, zone of divergent dipping reflectors, elevated crust. The *outer high* is partly overlapped oceanward by the oldest magnetic anomaly (24B) recorded in the adjacent ocean crust. It is flanked to the east by a zone characterized by divergent dipping reflectors and is underlain by a 12-km thick crust. This zone is, in turn, flanked by a 27-km thick zone of elevated crust comprising the Hatton and Edoras Banks. The distance between these banks and the outer high is about 50 km. The structural pattern of the margin differs in many respects from that found in the northern Bay of Biscay, Galicia Bank, and the Grand Banks (Montadert, Roberts *et al.*, 1979). In these areas rift-phase listric normal faults fractured the epicontinental sediments and underlying crystalline basement into a series of tilted blocks and half grabens that profoundly influenced subsequent Mesozoic and Cenozoic sedimentation. The absence of this distinctive pattern suggests development of the Rockall margin by other processes and in this respect the age and origin of the dipping reflectors known to pre-date the spreading is of special interest. Although first recognized from the Vøring and Rockall plateaus, this type of margin is now known from East Greenland, Southern Australia, the Ross Sea of Antarctica, and from southwest Africa. It may also be present beneath the thick sediments of the eastern margin of North America. The purpose of the Rockall Plateau transect was to investigate the structural evolution of this type of margin taking advantage of the thin post-rift sediment cover to core the dipping reflectors at shallow depth. We planned to establish the age and origin of the dipping reflectors and the outer high, to compare the histories of sites situated on thin and thick continental crust, document the environment history recorded in the post-rift sediments, and to study the evolution of climate and ocean circulation at this high North Atlantic latitude. Despite bad weather and a series of operational problems we achieved nearly all these objectives. One disappointment was the absence of a complete upper Paleogene and Neogene section at Site 555. We obtained heat-flow measurements at all sites and also logged two sites (553 and 555) successfully.

In this brief summary, we cannot do justice to the wealth of data obtained during the cruise which in any case must be refined and elaborated upon by shoreside study. The summary is thus focused on aspects of the results of more general rather than specific interest.

Structural Evolution of the West Rockall Margin

Syn-rift sediments and basalts were cored at Sites 552, 554, and 555. At re-entry Site 553, we drilled basalts deposited under sub-aerial conditions interbedded with tuff and sediment(?) to total depth. Part of this interval is equivalent to the top of the dipping-reflector seqeunce observed on the seismic profiles. The basalts are reversely magnetized; secular variation recorded in these flows indicate that they were extrude very rapidly. One of two previously unreported normal-polarity events in the anomaly 24 to 25 reversed polarity interval suggests a late NP 10 age for the basalt at Site 553. We were unable to penetrate further into the dipping reflectors because of a technical failure (the bit fell off the drill string). Tuffs and interbedded pillow basalts of NP9 and NP10 age drilled at Site 555, however, may represent their lateral equivalent. Identification of an earlier short normal-polarity event at Site 555 in this otherwise reversely magnetized sequence suggests an age at about 55.5 million years B.P. for the basal sediments at this site.

In marked contrast, the pillow basalts cored at Site 554 on the outer high exhibit both normal and reverse polarity. The overlying sediments are of NP11/NP12 age and are normally magnetized, indicating their deposition in the early part of anomaly 24B time. Data from Sites 552 and 553 and the corresponding seismic profiles demonstrate the rift axis was inverted and volcanism was localized to the west and immediately prior to the formation of the first oceanic crust represented by the outer high. From these results and the excellent multichannel seismic data from lines linking the sites, we can propose a preliminary scenario for the evolution of the west Rockall margin that draws to some extent on possible analogues offered by the onshore geology of East Greenland.

Rifting began in the late Paleocene (post-anomaly 25) following deposition of epicontinental Late Cretaceous and early Paleocene beds. The rifting took place in a shallow marine to sub-aerial environment and was accompanied by voluminous eruptions of basic lava and tuffs. We credit subsidence, caused by crustal extension and loading by the thick dense lavas, for the divergent form of the dipping reflectors. The reflectors themselves may result from the acoustic impedance contrast between the lavas and laterally impersistent interbedded sediments. Toward the end of NP 10 time or early in NP 11 time, the locus of volcanism became concentrated at the rift axis. This was followed by inversion of the central part of the rift valley exposing it above sea level resulting in eastward progradation from the high. This faulting which heralded the formation of the first ocean crust ended close to the NP 11/NP 12 boundary. The asthenosphere then broke through the thinned continental crust forming the first oceanic crust creating the sub-aerial outer high early during anomaly 24B time. Subsequent accretion of the adjacent oceanic crust in shallow water or even sub-aerially with contemporaneous deposition of clastic sediments may account for the intrabasement reflectors observed within the adjoining oceanic basement. Since the time of anomaly 24B (58.2 m.y.B.P.) all sites have subsided to their present depths. Sites 552, 553, and 554 appear to have followed a subsidence curve close to that found for mid-ocean ridges. Site 555, however, situated on thicker continental crust, has subsided less. Much of the present structural relief was perhaps created during rifting but the present depth differences between the sites are probably a result of post-rift differential thermal subsidence.

The geological history deduced for the west Rockall margin bears many similarities to that documented for East Greenland since the classic work of Wager and Deer (1938). The East Greenland basalts are flanked oceanward by anomaly 24B and also lie directly along strike from the conjugate set of reflectors found off southeast Greenland. At this stage, it seems reasonable to suggest that the east Greenland basalts are the direct equivalent of the sequences drilled on the Rockall Plateau but owe their present exposure above sea level to Oligocene uplift (Deer, 1976).

Note also that except for an apparent break on the Iceland-Faeroes Ridge the Rockall type of margin, and its conjugate, can be traced northward for 2000 km (from 54°N into the Norwegian Sea). If the geologic history deduced for the Rockall sites can be validly extrapolated over this distance, it seems that we are seeing here an entirely different type of passive-margin evolution of which the distant depression of Ethiopia may be the only extant case. The effects of such volcanism must have been profound and the important Eocene cherts of the North Atlantic Ocean may indirectly reflect the input of volcanic material from this event. Studies of the geochemistry and chronology of the basalts as well as more detailed micropaleontology will test this preliminary working hypothesis.

Pliocene-Pleistocene Cyclic Sedimentation

At Site 552A, we attained almost 100 per cent recovery with the hydraulic piston corer in Eocene through Recent sediments. Preliminary shipboard analysis of the Pliocene-Pleistocene sequence suggests that it represents the most complete record hitherto recovered at a high latitude North Atlantic location.

One striking feature of this interval is the cyclicity of color change and carbonate content; high carbonate values correlate with lighter colors. The cyclical variations in carbonate content correlate remarkably well with the oxygen isotope curve of the Brunhes epoch from the equatorial Pacific Ocean (Shackleton and Opdyke, 1976). The correlation seems to extend back throughout the time interval represented in the core studied by Shackleton and Opdyke (1976). Preliminary examination of carbonate curves for the equivalent interval found at Site 502 (HPC) in the Caribbean Sea shows that the climatic cycles extend back into the early late Miocene. Although similar cycles may be represented at Site 552, the pre-Pleistocene signal is weak and more detailed work is necessary.

From the initiation of cyclic sedimentation at 2.2 to 1.4 million years B.P. the carbonate curve for Site 552A shows a high amplitude glacial signal of short duration separated by long intervening periods characterized by high carbonate deposition. Although some correlation of this signal with the Pacific data is possible, the difference in amplitude may suggest that corresponding glacial intervals in the Northern Hemisphere were short but intense.

For the interval from the beginning of the Brunhes to the present, the North Atlantic carbonate and Pacific isotope curves show a direct correlation indicating linkage of the climatic behavior of the world ocean and North Atlantic Ocean.

The Pliocene-Pleistocene sequence at Site 552A was deposited at a high rate of 2.1 cm per 1000 years. Lack of dissolution effects and the high rate of sedimentation have produced for the first time an expanded, detailed highly resolved record of the history of climatic fluctuations at a high North Atlantic latitude.

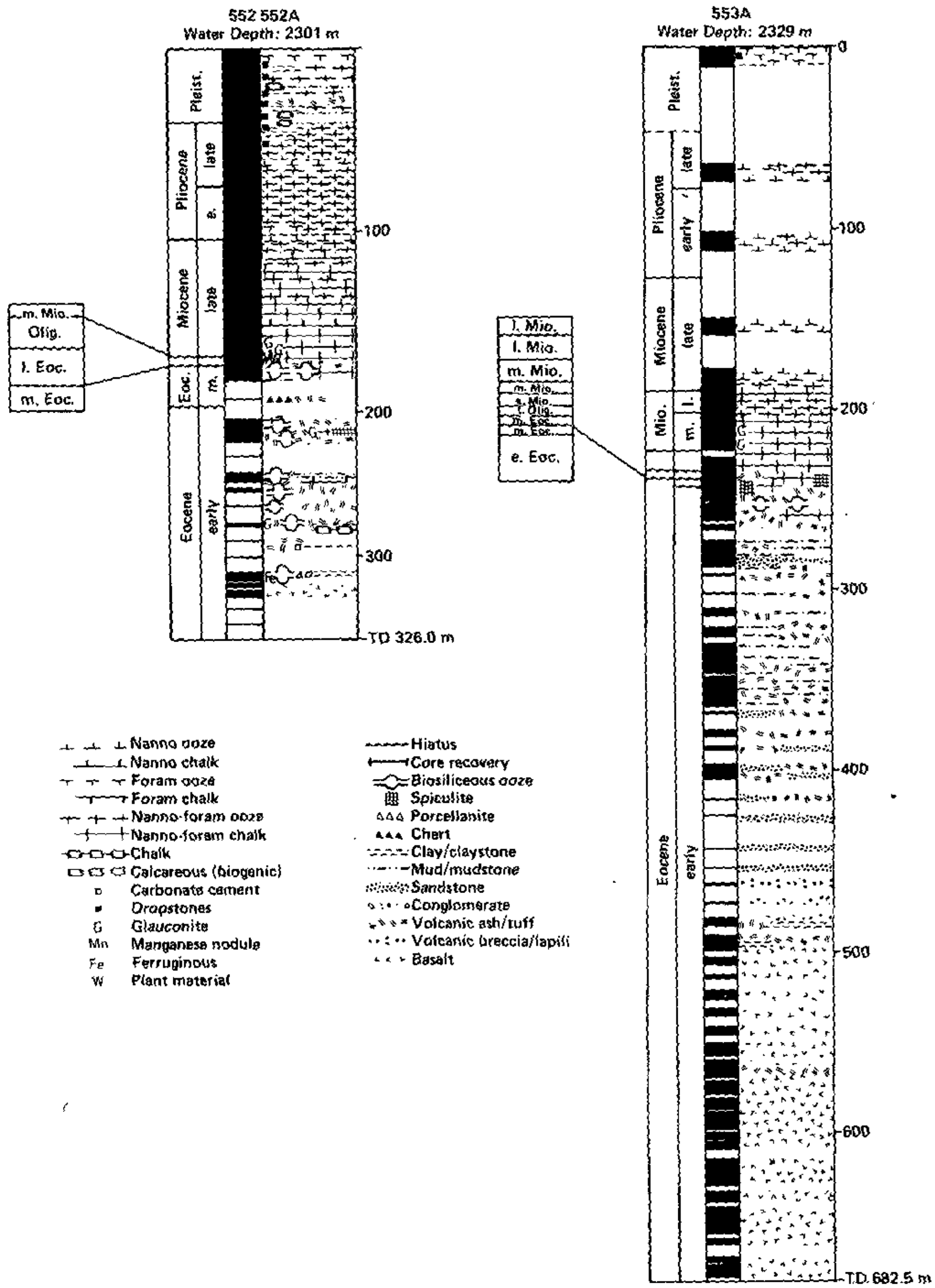
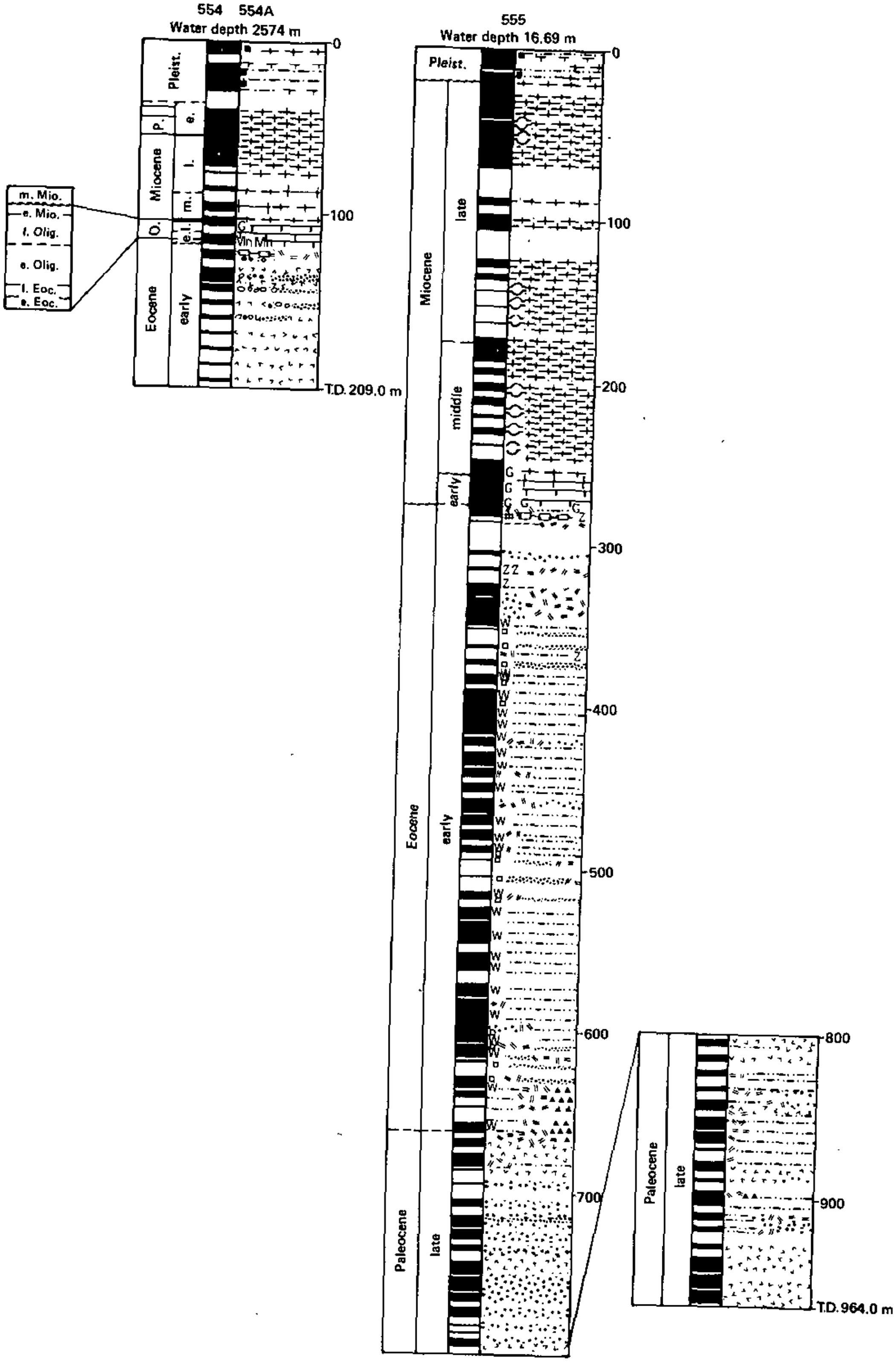


Figure 81-3. Stratigraphy of Leg 81 sites.


554 554A
Water depth 2574 m
Pleist.
P.
e.
Miocene
l.
m.
O.
e.l.
Eocene
early
m. Mio.
e. Mio.
l. Olig.
e. Olig.
l. Eoc.
e. Eoc.
0
100
T.D. 209.0 m
555
Water depth 16.69 m
Pleist.
Miocene
late
middle
early
Eocene
early
Paleocene
late
0
100
200
300
400
500
600
700
800
900
T.D. 964.0 m

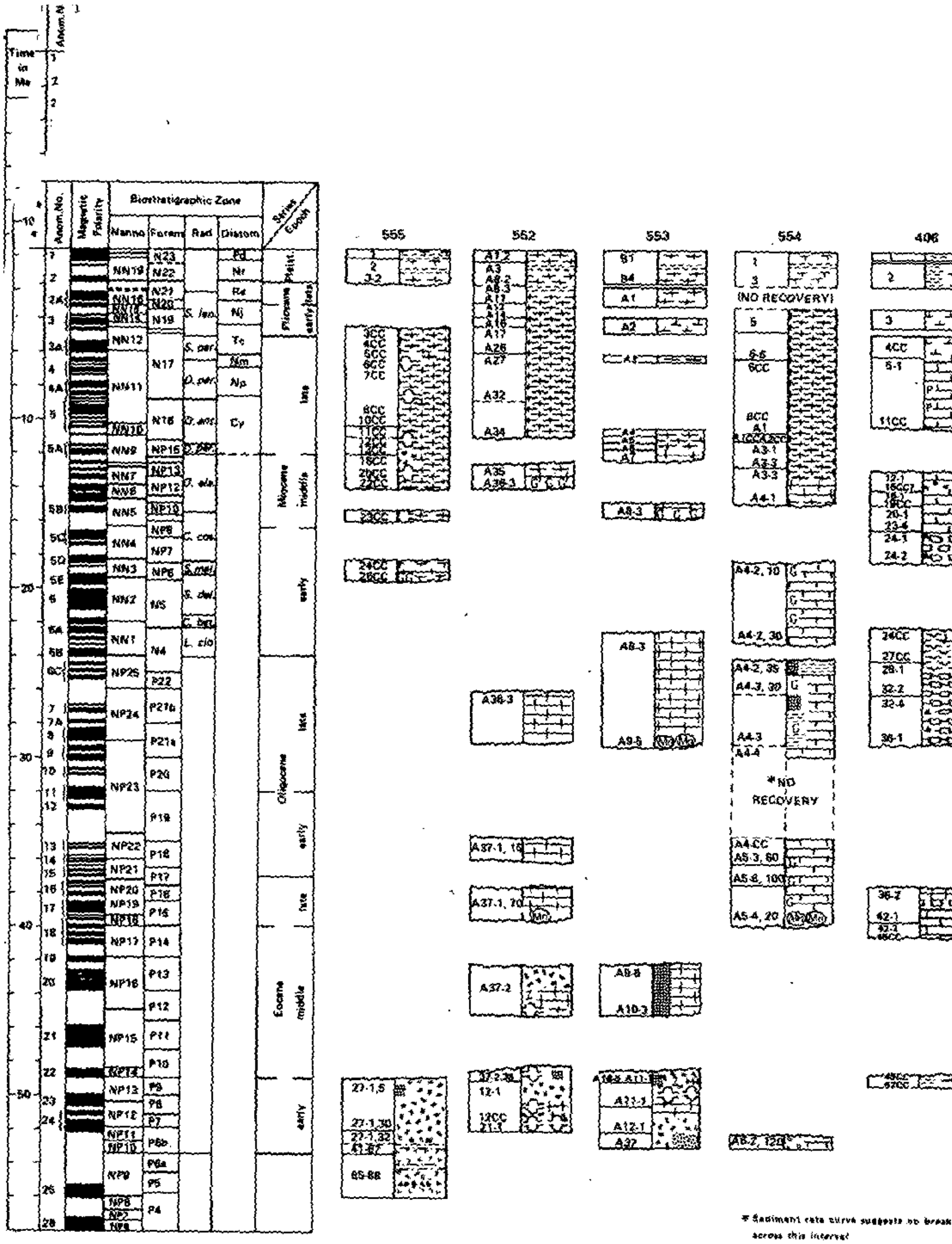


Figure 81-4. Time-stratigraphic summary of Leg 81 sites.

Late Paleogene-Neogene Patterns of Sedimentation

Cenozoic sedimentation rates established from the Leg 81 sites show three distinct phases of sedimentation (Figs. 81-4 and 81-5). The earliest phase represented by the upper Paleocene and lower Eocene at Site 555 and by the lower Eocene at Sites 554, 553, and 552 shows rapid accumulation of primarily terrigenous and volcaniclastic sediments in shallow water. The second phase, from the early Eocene to early Miocene is mainly characterized by non-deposition. Only a fragmentary sediment record comprising lower Miocene, Oligocene, and upper and middle Eocene deposits documents this phase. The final phase represents the late neogene (middle Miocene-Recent) and was predominantly characterized by continuous deposition.

Sedimentation during the late Paleocene-early Eocene is discussed above in the context of the structural evolution of the margin.

During the second phase, all sites show breaks of greater or lesser extent between the lower Eocene and the lower Miocene (Figs. 81-3 and 81-4). The series of mid-Cenozoic climatic events, the constantly changing configurations of the continents and the sills between the ocean basins, as well as sea level changes, may have

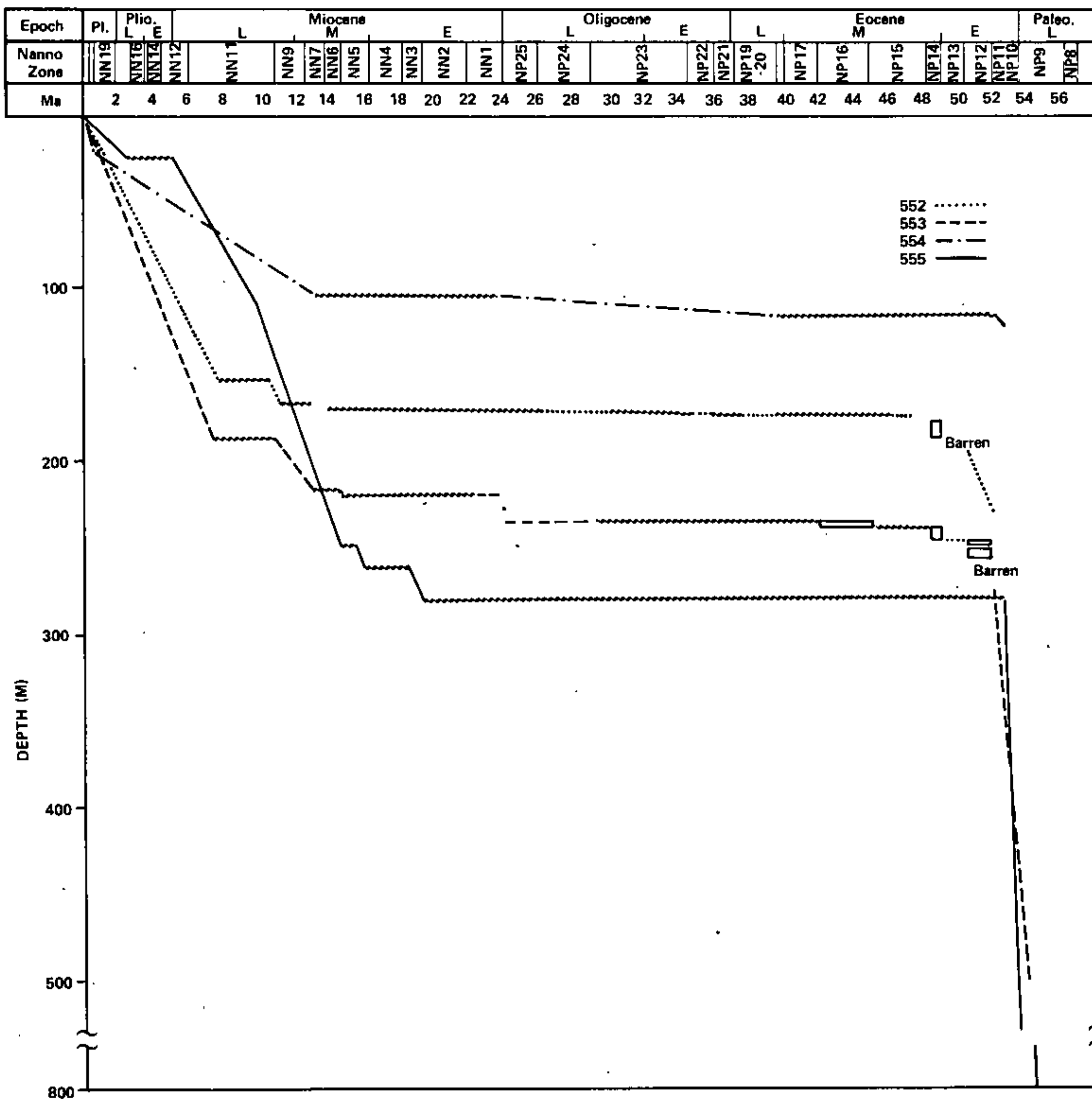


Figure 81-5. Sedimentation rates of Leg 81 sites.

greatly influenced sedimentation patterns in the world oceans. These factors can thus be considered as potential contributors to the periods of erosion and non-deposition spanning the 30-million year interval during Leg 81. Examples of such changes include the initiation of Antarctic glaciations, the opening of the passages between the Pacific and Atlantic oceans as well as the distinct fall and rise in sea level during Oligocene time. We have yet to understand the exact role of cause and effect between these factors but we hope that oxygen isotope studies conducted on the Leg 81 sediments will help resolve this problem.

The onset of the third phase is marked at all sites by breaks in sedimentation between the early and middle Miocene and/or within the middle Miocene (Figs. 81-3 and 81-4). These breaks correspond approximately within the onset of drift deposition and may correlate with the "great sculpturing event" marked by horizon A off eastern North America. In the Rockall area the onset of sediment drift accumulation marks this event. The break may correlate with the subsidence of the Iceland-Faeroes Ridge to a depth which allowed a fuller inflow of water into the Norwegian Sea and in turn which marked the onset of overflow of deep cold bottom water from the Norwegian Sea into the North Atlantic Ocean.

The latest part of the final phase from late Miocene to Recent includes two important events. The first is the period of non-deposition during the Pliocene, recorded at Site 555, which may mark intensification of the Gulf Stream and mid-water circulation associated with the closure of the Panamanian Isthmus. The final part of this phase is the growth and retreat of the low altitude continental ice sheets over the Northern Hemisphere since late Pliocene times. Preliminary shipboard bio- and magnetostratigraphic studies show that this phase began in the Northern Hemisphere between 2.4 and 2.2 million years ago.

Preliminary shipboard interpretation of late Miocene to Recent accumulation rates shows that they are low with respect to the productivity potential of pelagic microfossils in the Rockall area. In this interpretation we assume that productivity in the nearby Hatton-Rockall Basin (Site 116) and at the Leg 81 sites is essentially comparable. Sedimentation rates at Site 116 and the average values for Atlantic Ocean are essentially higher than those found at Site 555 for the late Miocene to Recent interval. From this we infer that bottom currents have strongly inhibited deposition at sites drilled during Leg 81 and may account for the substantial differences in the thicknesses of the Neogene sections found at other sites drilled previously on the Rockall Plateau.

Organic Geochemitry

We focused the organic geochemical studies made during Leg 81 on (a) hydrocarbon monitoring for safety and pollution prevention purposes, and (b) study of the nature of the sedimentary organic matter. We found the C1-C4 hydrocarbon gases to be consistently present in very low concentrations and thus posing no safety or pollution problems.

Present to Oligocene

The light hydrocarbon (C1-C4) concentrations are consistent with the generally low organic carbon content (0.01% - 0.05%) of the Recent-Oligocene sediments and indicates deposition in a normal deep-ocean environment.

Pyrolysis analysis of the glacial-interglacial sequence of Site 553B suggests the type of organic matter preserved in glacial versus interglacial sediments is different. The distinction here may be between marine (highly oxidized) and terrestrial (humic) organic matter, which previously have both been classified as type III terrigenous matter by pyrolysis analysis. Evidence of early diagenesis of sedimentary organic matter is also indicated by pyrolysis analysis.

Eocene

The Eocene sediments showed a striking increase in organic carbon content to between 0.1 and 4.1 per cent. Pyrolysis analyses of these sediments indicate they were deposited in nearshore marine and shallow brackish water environments. The sediments contain all three types (sapropelic, humic, and reworked) of organic matter, apparently scattered within the same sample. In general the Eocene organic matter must be considered type III (oxidized), although distinct type I (sapropelic) kerogen is present in some samples.

The organic matter must be considered generally immature (T_{max} 435°C), although a very mature (T_{max} 550°C) hydrocarbon component occurred in most samples. This component usually formed a distinct peak and sometimes masked the sample's true state of maturity. It is probably caused by the maturation of reworked organic matter by proximity to erupting lavas. The absence of ths very mature organic matter in the Eocene sediments at Site 554 suggests that it was derived from a different source and perhaps reflects the raised position of the outer high.

We consider the hydrocarbon potential of this area to be poor. The kerogen is immature and primarily gas-prone on the western margin.

The pyrolysis technique proved unexpectedly valuable in evaluating sedimenary environments in the Eocene, and Pliocene and Pleistocene sediments even with the low concentration of organic matter found in parts of the section.

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PLANNED CHALLENGER DRILLI

Leg 82, Mantle Heterogeneity and The Azores Triple Junction

Ponta Delgada, Azores to Balboa, Panama, 21 S tember to 10 November 1981. Co-chief scienti Henri Bougault and Steve Cande.

During Leg 82 of the *Glomar Challenger* will drill a series of holes on the west flank the Mid-Atlantic Ridge near the Azores to loo for evidence of large-scale heterogeneity in the earth's mantle. Studies of dredged rocks collected along the axis of the Mid-Atlantic Ridge hve shown that there is a fundamental geochemical anomaly associated with the Azores triple junction. The basalts collected along this section of the ridge have unusually high abundances of light-rare earth elements. These anomalous basalts, however, are not found south of the Hayes Fracture Zone at 34°N. The presence of the anomalous basalts near the Azores has been related to large heterogeneities in the mantle that apparently were maintained for long periods of time. (South of the Kane Fracture Zone at 28°N typical basalts are found at the ridge crest in 10-million-year, and in 110-million-year,old crust). The principal objectives of Leg 82 are to explore the distribution of the light-rare earth basalts in the vicinity of the Azores triple junction and to relate it to changes in the character of the triple junction.

Specifically, we are going to examine two problems: (1) the distribution of anomalous basalts along flowlines perpendicular to the spreading ridge at the latitude of the Azores (MAR-1 to MAR-5, Fig. 82-1) and (2) the distribution of abnormal basalts along isochrons parallel to the ridge at the latitude of the Hayes Fracture Zone (MAR-6 to MAR-11). The five northern sites (MAR-1 to MAR-5) are situated on anomalies 6, 13, and 24 and will sample between 20- andd 50-million-year old crust. Our highest priority, however, is to drill the southern sites (MAR-6 to MAR-11) that straddle the Hayes Fracture Zone on anomalies 5, 6, and 13. We hope to be able to determine whether or not the Hayes Fracture Zone has served as a geochemical boundary in the past. If it has, for how long? And how sharp or diffuse has this been?

We do not plan to drill all eleven sites. Instead, we will use the results of on-board chemical analyses at certain key sites to determine which of the remaining sites to drill. Although we cannot directly determine the abundances of the rare-earth elements used to define the character of the basalts (i.e., light-rare earth enriched or depleted)

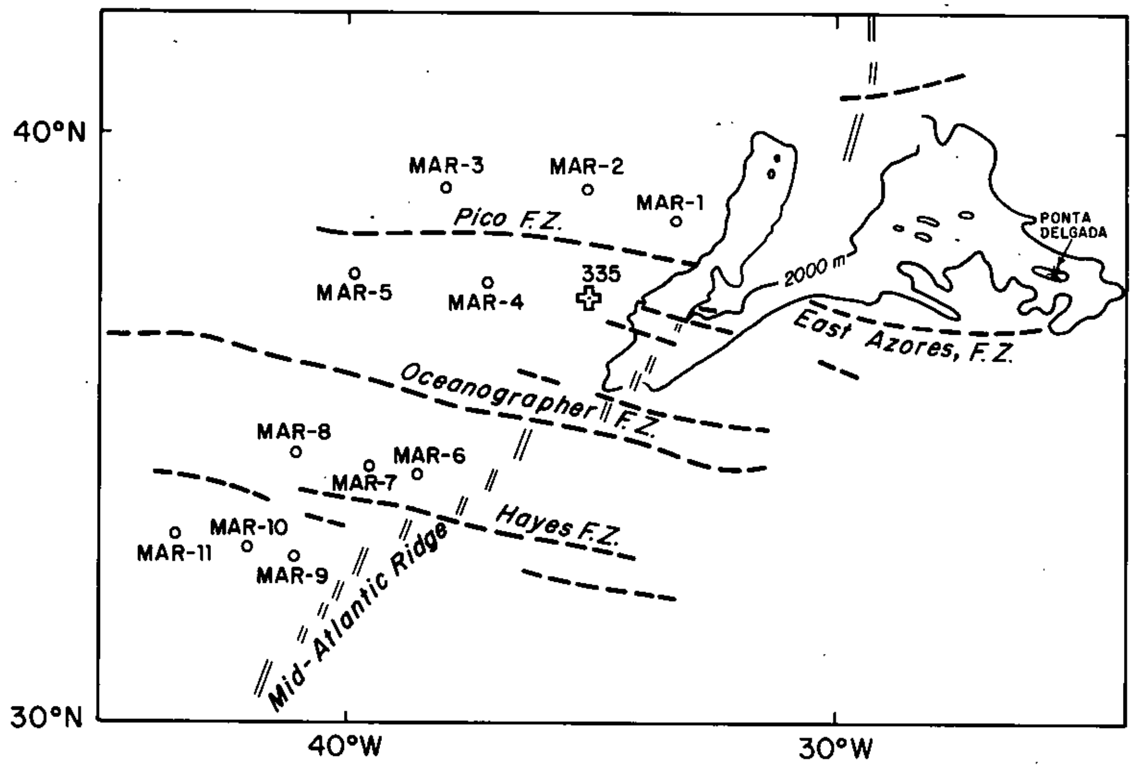

Figure 82-1. Location map of Leg 82 sites.

abundance of critical trace elements by X-ray fluorescence during the cruise which in turn we can track and estimate abundances of the rare-earth elements. We plan to determine the abundances of niobium, zirconium, titanium, vanadium, and yttrium during the cruise.

Our present strategy is to drill first on sites MAR-1 and MAR-2 on anomalies 6 and 13, respectively, north of the Pico Fracture Zone. If the basalts recovered at MAR-2 on anomaly 13 are normal mid-ocean ridge basalts, we would not drill on MAR-3, but proceed directly to MAR-4 on anomaly 13, south of the Pico Fracture Zone. A site is not needed on anomaly 6 south of the Pico Fracture Zone since Site 335 on Leg 37 sampled basement in this location. If we recover "normal" basalt at MAR-4 we would omit drilling on MAR-5 and proceed to the sites near the Hayes Fracture Zone. As of this writing, we are also considering omitting the transect south of the Pico Fracture Zone entirely in order to ensure that sufficient time is available to drill the southern sites straddling the Hayes Fracture Zone.

Of the southern sites, we will first drill MAR-7 on anomaly 6 north of the Hayes Fracture Zone. Depending upon whether or not the basalts here are typical we will drill on either MAR-6 or MAR-8. We will then drill on the same two magnetic anomalies south of the Hayes Fracture Zone as north of it.

Since we are primarily interested in obtaining basalt samples at as many sites as possible, we will drill the holes with only a single bit. We plan to sample the uppermost part of the sediment column (which is up to 700 meters thick on some of the older sites) with the hydraulic piston corer and the lower part with the rotary bit. Although time may not permit us to completely e every site, we will continuously core at least one site along each latitudinal transect. The material recovered by the HPC should provide a particularly detailed Neogene section useful in both paleomagnetic and paleontological studies. (*H. Bougault and S. Cande*)

(Leg 82 is underway at the time of this printing. See also Site Summaries below. Ed.)

Leg 83 — Costa Rica Rift

Balboa, Panama to Balboa, Panama, 20 November 1981 to 4 January 1982. *Challenger* will re-occupy Hole 504B. Co-chief scientists: Roger N. Anderson and Jose Honnorez.

Leg 83 will be entirely devoted to drilling and downhole experiments at Site 504B, located on 6.1 m.y. old crust on the south flank of the Costa Rica Rift segment of the Galapagos spreading ridge system. During Legs 69 and 70, this site was drilled to a depth of 836 meters, through 275 meters of sediment and 561 meters of basalt. A re-entry cone is still in place and the hole was in good condition at the time of abandonment two years ago.

Leg 83 will consist of three segments:

1. The shipboard team will collect water samples, a temperature log, and measure temperature and water flow down the hole for comparison with results obtained during Leg 69 at the beginning of the leg. A relatively high temperature was measured (125°C at 561 m sub-bottom depth) during and the earlier leg and pore-pressure data showed that oceanic bottom waters were being drawn down into a relatively thin (~ 20 m) layer in the upper part of the basalt sequence. The new measurements should give a better measure of *in situ* temperatures (before surface sea water is circulated down the drill string). From them we will learn the rate at which the drawn-down is now operating or whether or not it has ceased. This will provide some constraints on the extent of the convective cell tapped by Hole 504B.

2. Hole 504B will then be deepened over a period of about 30 days. The relative ease of drilling of the basalts during Legs 69 and 70 — probably because the fractures and voids were sealed and cemented by clays and zeolites — augurs well for a very deep penetration: perhaps as much as another kilometer into the oceanic crust. There is thus a reasonable chance that we may encounter rocks near the layer 2/layer 3 transition, or even penetrate the upper part of layer 3.

3. The shipboard party will devote the last part of the cruise to a series of downhole experiments and measurements. These include

- conventional Schlumberger logs (sonic, natural gamma, density neutron porosity, resistivity, temperature and caliper logs).
- borehole televiewer and sonic caliper.

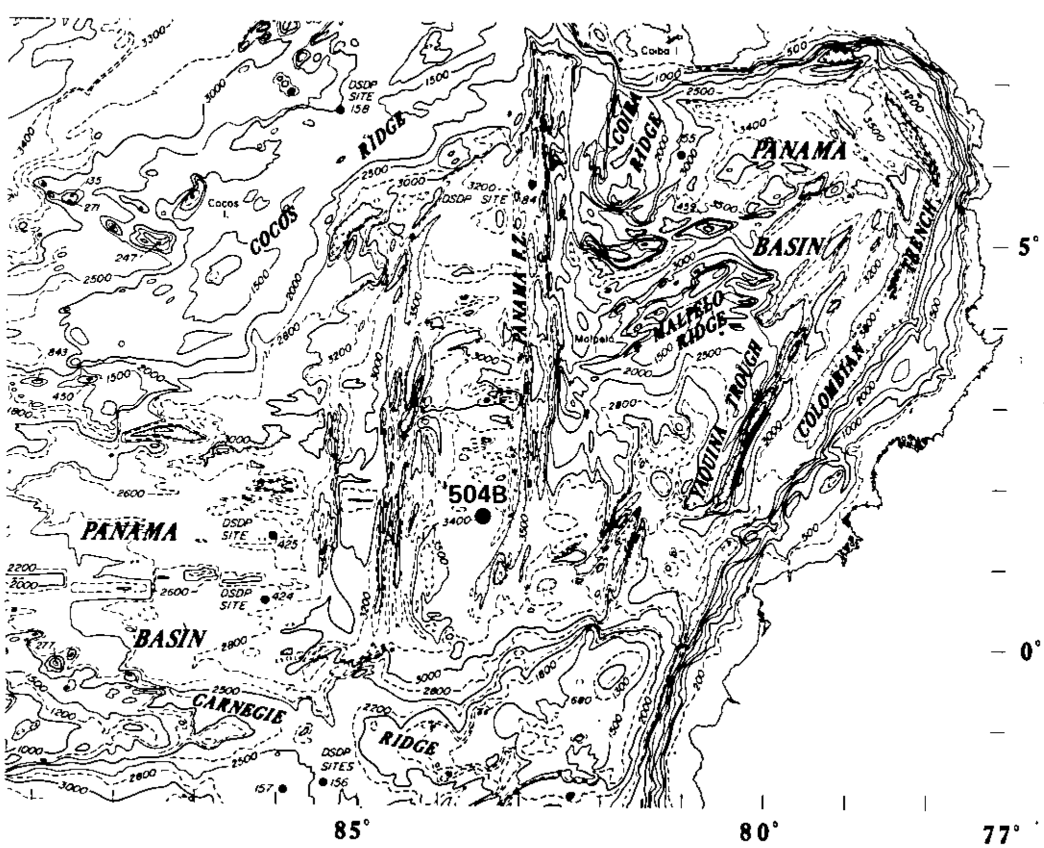

Figure 83-1. Location map of Leg 83.

- sonic borehole televiewer.
- 8-channel multichannel sonic log.
- electrical resistivity experiment.
- *in situ* permeability and pore-pressure measurements and pore-water sampling, using a downhole packer.
- oblique seismic experiment.

The oblique seismic work will be done using the R/V Conrad as the shooting ship.

(*Extracted from the Leg 83 Prospectus*)

SITE SUMMARIES

Leg 82 — Mantle Heterogeneity and the Azores Triple Junction

Co-chief scientists: Henri Bougault and Steven C. Cande.

Site 556 (MAR-2)

Latitude: 38°56.38'N
Longitude: 34°41.1'W
Water Depth: 3680 meters

We cored Hole 556 on anomaly 12 on the west flank of the Mid-Atlantic Ridge on a flow line of the Azores triple junction. After washing down through 461 meters of sediments, the shipboard team cored 177 meters into the basement to bit destruction. The bit penetrated three different basaltic and basalt breccia units down to 96 meters sub-basement. Below this depth down to the bottom of the hole, we recovered gabbros and gabbro breccias interrupted by a thin basaltic layer. Nannofossils found in the basalt breccias are dated at 30 to 34 million years — in agreement with the magnetic-anomaly age. The concentrations in these basalts are: Nb — 1.5 ppm, Zr — 85 ppm, Ti — 8400 ppm, Y — 36 ppm, V — 270 ppm. This unexpected result demonstrates that the Azores mantle plume or blob has been active for a shorter period of time than previously thought, or has been active intermittently. Three temperature measurements made in the sediment while washing-down to the basement document a geothermal gradient of 36°C/km. After the hole was drilled to bit destruction we ran a successful suite of logs. We detected a constant temperature of about 2°C down to the sediment/basement interface, suggesting a sea-water flow into the hole.

Site 557 (MAR-1)

Latitude: 38°49.95'N
Longitude: 32°33.58'W
Water Depth: 2155 meters

The depleted character of the ocean crust found unexpectedly at Site 556 (MAR-2, 34 m.y.) made it important to drill at least one additional hole closer to the ridge on the same flow line passing through the Azores triple junction. Hole 557 (MAR-1) is located on magnetic anomaly 5D (18 m.y. old) in the center of a broad (40 km wide) relief basin. This site is roughly on the same isochron as Site 335 drilled during Leg 37 on a flow line passing through the FAMOUS area. An approaching storm forced us to abandon the hole after we had washed down through 460.5 meters of sediment and cored three meters of basalts at the Site. The recovered basalt samples are fresh and are characterized by high iron and titanium contents and low magnesium contents. The concentrations of magmaphic elements (Nb — 30 ppm, Zr — 220 ppm, Ti — 21,100 ppm, V — 420 ppm) are those of "enriched" basalts normalized to chondrites typical of the basalts associated with the present-day Azores mantle plume. In conjunction with the results from previous work close to the ridge axis, the new findings at Site 556 constrain the initiation of the effects of a mantle plume at the Azores triple junction to lie between 34 and 18 million years.

Site 558 (MAR-4)

Latitude: 37°46.24'N
Longitude: 37°20.61'W
Water Depth: 3766 meters

We drilled Hole 558 (MAR-4) between anomalies 12 and 13 on the west flank of the Mid-Atlantic Ridge about 30 miles south of the Pico Fracture Zone on a flow line passing through the FAMOUS area and the sites drilled on Leg 37. The bit penetrated to a total depth of 561 meters, through 408 meters of sediment and 153 meters of basement. We recovered the entire sedimentary sequence through a combination of piston and rotary coring. The section appears to be complete from the lower Oligocene through the Pleistocene. A major change in the sediment lithology occurs in the lower middle Miocene. The lower part of the section is characterized by a lower accumulation rate and a lower carbonate content. Nannofossils found within basalt breccias at the top of the basement are between 34 and 37 million years old — in agreement with the magnetic anomaly age. The magnetic reversal stratigraphy obtained from the lower part of the sedimentary section is very distinct and will tightly constrain its dating.

The upper 110 meters of basement consist almost entirely of phyric pillow basalts. Below this level down to the bottom the hole, we cored 43 meters of serpentinized gabbro and serpentinite. Five chemical units are distinguished within the pile of aphyric pillow basalts. Depleted (Nb = 3 ppm, Zr = 65 ppm), flat (Nb = 8.5 ppm, Zr = 83 ppm), and enriched (Nb = 15 ppm, Zr = 90 ppm) basalts are all represented by these units. Despite the complexities introduced by these results, such samples will be very valuable for fundamental and comparative geochemistry studies. Isotopic and Ta/La data will be required for interpretations of mantle plumes and geodynamics. A complete set of logs was attempted, but owing to poor hole conditions the logging runs were only partially successful.

Site 559 (MAR-8)

Latitude: 40°07.45′N
Longitude: 38°55.00′W
Water Depth: 3766 meters

We drilled Site 559 between anomalies 12 and 13 on the west flank of the Mid-Atlantic Ridge midway between the Oceanographer and Hayes Fracture Zones. The sediments were washed down to basement which was felt at 236 meters sub-bottom. Coring recovered a sequence of phyric pillow basalts 63 meters thick. The principal macroscopic features of the basalts are marked by variation in alteration and high recovery of fresh glass. These basalts belong to a single petrographic/chemical group. The effects of alteration are clearly shown by chemical data. Systematic variations in the degree of strontium contamination are evident. These variations can be used to choose samples whose inferred strontium contamination is less than 5 ppm for Sr-isotopic studies. The strontium concentration in fresh glass is 157 ppm. The normalized magmaphile element concentrations are enriched relative to chondrites. Concentrations in fresh samples are: Nb — 16 ppm, Zr — 100 ppm, Ti — 9000 ppm, Y — 35 ppm and V — 300 ppm. This last result agrees with the hypothesis of a boundary at the latitude of the Hayes Fracture Zone but we can draw no conclusions owing to the complexities revealed at Sites 558 and 556 on the same isochron.

Site 560 (MAR-7)

Latitude: 34°43.33′N
Longitude: 38°50.56′W
Water Depth: 3455 meters

We drilled Site 560 on anomaly 5D on the west flank of the Mid-Atlantic Ridge midway between the Oceanographer and Hayes Fracture Zones. The sediments were washed down to basement which was reached at a depth of 374.5 meters sub-bottom. Recovery was extremely poor and we found only serpentinized gabbro and serpentine containing chrysotile down to the bottom of the hole at 421.5 meters. We attribute the failure to recover basalt to drilling through a talus slope facing the spreading axis. The repeated occurrence of shallow-level serpentinized gabbros (Holes 334 and 395) seems to be a general characteristic connected with the high frequency of faulting. Owing to lack of basalt recovery, we will drill another hole in the same area.

Site 561 (MAR-6)

Latitude: 34°47.10′N
Longitude: 39°01.70′W
Water Depth: 3470 meters

We drilled Site 561 on anomaly 5E on the west flank of the Mid-Atlantic Ridge midway between the Oceanographer and Hayes Fracture Zones. The site is located 10 miles northwest of Site 560. The sediments were washed to basement which was reached at a depth of 411 meters sub-bottom. The bit failed after it had penetrated only 15 meters into basement. The recovered basement material consists of aphyric pillow basalts. We identified at least three different groups on the basis of geochemistry. Both depleted (Nb = 3 ppm, Zr = 75 ppm) and enriched (Nb = 22 ppm, Zr = 98 ppm) basalts are represented within these groups. Hole 561 is the second hole drilled on this leg in which both enriched and depleted basalts were recovered. From these and previous occurrences in Holes 413 and 504B, we surmise that widely varying abundance ratios such as Nb/Zr at a single location in the oceanic crust is a more common feature than previously thought. The combination of isotopic data and trace element studies will be of the highest interest for understanding the relative importance of mantle sources and melting processes. Inasmuch as so wide a variation in the Nb/Zr ratio was found in the basalt, we decided that more recovery was not necessary here and we could better spend the remaining time drilling on the same isochrons south of the Hayes Fracture Zone.

DEEP SEA DRILLING PROJECT

CHIEF SCIENTIST'S REPORT

At the time of this writing *Glomar Challenger* has just resumed drilling operations after riding out hurricane *Irene* a few hundred miles west of the Azores. Despite very adverse weather conditions encountered during Legs 80 and 81, the ship has operated extremely well and the results gathered from passive margins of the North East Atlantic are spectacular. The enthusiasm within the scientific community is particularly encouraging at the time when JOIDES and DSDP are assembling the elements of a new five-year program for *Glomar Challenger* drilling.

Ship's Operations

Recent Results

The combined results of Legs 79, 80, and 81 has provided a major advance in our understanding of the early evolution of passive margins. These results show clearly what can be accomplished by drilling to limited depths in well selected areas. They also demonstrate how rewarding it is to return to previously drilled areas; the results from the previous cruises combined with geophysical data have clearly stimulated additional research leading to the success of these recent efforts. In addition, the shipboard teams have benefited from the constant progress in technology that has brought *Glomar Challenger's* operations to an unprecedented level of reliability. We have made considerable progress in improving the performance of the ship's positioning system and have also, over the past years, developed drilling techniques which have resulted in both reduced down-time and improved core recovery. The new logging program, begun with Leg 80, has already provided major improvements and will lead to more experimental work in downhole instrumentation.

During the port-call between Legs 79 and 80 at Brest, France, we discussed with Global Marine the first elements of a plan to refurbish the ship for longer-term use. We hope some of these plans may be implemented during the next dry-dock period in Japan this coming summer.

New Shipboard Equipment and Procedures

Coring. DSDP has continued to improve coring techniques at a steady pace. We successfully tested the variable-length hydraulic piston corer during Leg 80; it is now fully operational and reliable. (See also special report, below). We hope to test the heat-flow package — designed by Woods Hole Oceanographic Institutions to fit into the nose cone of the hydraulic piston corer — within the next six months. The extended core-barrel system may be ready for sea trials in January 1982 during Leg 84 in the mid-America Trench region. During the same cruise the shipboard team will again use the pressure core barrel for clathrate experiments. The tool is being fitted with new accessories that should improve both gas sampling and volumetric gas measurements.

Logging. The new logging program, run in collaboration with Schlumberger, started with Leg 80. DSDP and Schlumberger engineers conducted a first evaluation of the results, especially of tool performance, immediately following the cruise. We judged the performance of the resistivity and long-spaced sonic tools as excellent. By recording the full wave train, the long-spaced sonic tool allows for measurement of the compressional, shear, tube, and Stoneley wave arrivals. Consequently, even if the P-wave arrival is poor other waves may record adequate data. The caliper-centralizer tool, however, did not perform well in the oversized holes. The Natural-Gamma data was good but density/porosity results were rather poor — again because of oversized holes. Schlumberger is currently investigating ways to modify and better adapt both systems.

Shipboard X-Ray Fluorescence (XRF): CNEXO has generously lent its XRF container for Leg 82 operations so that shipboard scientists can evaluate the composition of the crust onboard and make immediate decisions regarding site locations. Despite very severe budget constraints both at DSDP and at Centre Oceanologique de Bretagne, we hope to be able to keep the container on board for the Costa Rica Rift expedition (Leg 83).

Word Processor. At last we are now using a word processor on board *Challenger* to produce the shipboard reports (hole summaries). With the increased number of shipboard scientists and the more varied specialties represented on board these reports have become sophisticated documents reaching up to about 1500 pages. The word processor allows the shipboard staff to more quickly type and edit the reports. We also plan to acquire a sister system at DSDP in order to efficiently update this material for direct inclusion in the site chapter sections of the *Initial Reports.*

Shipboard Computer. DSDP has selected and ordered a computer system for use on board *Challenger*, we expect its delivery to DSDP in late November (1981). Production of the software and personnel training has already begun; the system will be installed on *Challenger* in Japan during the summer of 1982.

The shipboard computer will primarily process gas chromatography, physical property, and underway geophysics data. It will also allow us to develop new data acquisition procedures in both the onboard core and paleontology laboratories. It will be capable of processing and storeing all data subject to digitizing as well as to cross plot various results obtained at any given site.

High-Resolution Seismic Reflection Profiling System. The JOI Site Survey Planning Committee has recommended purchase of an upgraded seismic reflection profiling system for *Glomar Challenger*. The system will improve correlation of drilling results with seismic profiles obtained directly over the drill site. The new shipboard computer will digitize the data on board the ship. DSDP will also benefit from recent technical advances made at Scripps with improved processing (signal deconvolution) of single-channel seismic data. A near-bottom hydrophone will be lowered through the drill pipe to a few meters above the sea floor. This will greatly improve resolution during a brief survey to be conducted at each site. We plan to test several seismic sources prior to making our final selection.

Science Reporting: Publications

Geotimes Article. Acting upon a recommendation from the JOIDES Planning Committee, DSDP arranged with Geotimes to resume publication of the short cruise reports immediately following each cruise. The Geotimes articles resumed with Leg 76, which will not duplicate the more extensive scientific papers published in the GSA Bulletin. Rather it consists of either one or two printed pages and includes a graphic presentation of the drilling results (lithologic and biostrattigraphic hole summaries) together with a small site location map. It is meant only to highlight the main results of each cruise in a timely fashion.

Initial Reports. DSDP has accelerated the pace of production of Initial Report Volumes 60, 61, 62, 63, and 66. Volumes 64 and 65, however, are still running far behind schedule. This results from a combination of voluntary delay dictated by budgetary constraints on FY 1981 funds, and late receipt of manuscripts by authors — a recurrent major cause for production delays. We have begun to implement the new system that imposes an 8-month deadline for submission of the site chapters. They are now submitted in final form during the post-cruise meeting held at DSDP. We recently ran a first full-scale test of the system with the cooperation of Leg 77 shipboard party. The preliminary evaluation of the result is very encouraging.

To date the Initial Reports of the Deep Sea Drilling Project Volumes 1 to 59, 61 and 63 are published. The Government Printing Office is currently printing Volumes 60, 62, and 66.

The Initial Core Description for Leg 27 to 75 are also completed.

Sedimentary Petrology Manual. We have at last received all manuscripts to be included in the Sedimentary Petrology Manual. We cannot firmly schedule its publication, however, because its production must not unduly delay the publication of the *Initial Reports* volumes.

Scientific Staff

We are currently filling the four staff scientist positions vacated by Charles Adelseck, Kenneth Pisciotto, Thomas Shipley, and Peter Borella. The selection process is almost complete and four new scientists will join the Project between November 1981 and January 1982.

Selection of a new Associate Chief Scientist for Science Services is also underway and we expect that DSDP will fill this position in January 1982. DSDP will thus be operating with a full scientific staff soon after the beginning of the year.

Future Plans

The recent past and the immediate future were examined during the annual program review presented for DSDP by M. N. A. Peterson, F. MacTernan and Y. Lancelot to the Director of NSF in late June 1981. NSF has since authorized DSDP to exercise its option with Global Marine for use of the *Glomar Challenger*.

The drilling schedule for FY 1982 appears elsewhere in this Journal and reflects the latest recommendations from the JOIDES Planning Committee. The FY 1983 program is not yet in final form but will include the following targets:

- Oldest Pacific environments
- South Pacific transect from the equator to the southern Tasman Sea to study Cenozoic environments
- Hydrogeology transect across the East Pacific Rise around 15°S to 20°S to study circulation of fluids within the crust and the overlying sediments, and to study the origin of red clays

- Caribbean Sea and Gulf of Mexico
- Western Atlantic margin (off the east coast of the U.S.)
- North Atlantic paleoenvironments
- Paleoclimates off Northwest Africa.

DSDP is now developing longer term plans — those for beyond October 1983, in response to JOIDES initiative to prepare for a five-year *Challenger* drilling program. The broad scientific objectives proposed by the various JOIDES panels and reviewed by the Planning Committee serve as a basis for a first look at operational requirements. In addition to the science gained, such a program will launch a renewed effort to advanced drilling technology. We are currently addressing such problems as "bare-rock" drilling, high-temperature drilling and logging, downhole instrumentation, and limited return circulation. Such a program will require a major overhaul and refurbishing of *Glomar Challenger* and DSDP is examining the engineering aspects of this program in close cooperation with Global Marine.

(*Yves Lancelot, DSDP Chief Scientist*)

ENGINEERING DEVELOPMENTS

Overview

Extended Core Barrel (XCB)

We completed drilling tests of the XCB at the Terra Tek Drilling Research Laboratory in Salt Lake City where blocks of Berea sandstone, basalt, and of cement with clay interbeds and basalt were drilled. The locked-drive system — in which the cutting shoe within the core barrel rotates continuously — proved superior to the clutch driven system in which the cutting shoe is disengaged from rotation when the tool is extended into softer sediment. We learned during the relatively short drilling test that Stratapax (artificial diamond) and carbide cutting elements cut equally well and that the penetration rate through basalt is 16 feet per hour.

The Wireline Re-Entry

DSDP has nearly completed the preliminary design work on a wireline re-entry system. The system will incorporate a modified EDO re-entry tool with an azimuth sensor and fins to decrease its rate of rotation and hold it upright in the re-entry cone. We plan to test the tool in late fall (1981).

Hydraulic Piston Corer/Heat Flow Measurements

DSDP, working closely with Woods Hole Oceanographic Institution, has designed a pressure case to hold a miniature heat flow probe and recorder in the HPC cutting shoe. (Woods Hole is providing the electonics package.) Scheduled for testing on Leg 85, this instrument will allow heat flow measurements to be taken with every piston core. (*DSDP Engineering Staff*)

Variable-Length Hydraulic Piston Corer: A Special Report

Successful Test

The newly developed variable-length hydraulic piston corer (VL/HPC) was successfully deployed at two sites in the northern Bay of Biscay during Leg 80 in June 1981. The shipboard party took 35 cores to a total depth of 211 meters at Site 548 with a 99.99 per cent recovery. These piston cores are magnetically oriented and are the first such ever recovered. On Site 549A, the shipboard team collected 42 piston cores with 73.7 per cent recovery penetrating through 196 meters. At both sites technicians successfully handled the VL/HPC operating it in both the 9.5-meter and 5.0-meter configurations under less than favorable weather conditions. All of the design improvements were successful.

History

The original hydraulic piston corer (HPC) has been operational since December 1978 following its first test during Leg 64. The corer operates as a high-speed hydraulic ram and is injected into the sediments with hydraulic pressure generated by the drill-rig circulating pumps. The HPC is lowered and retrieved through the drill string on a wireline by repetitive operation within the same hole. DSDP designed the HPC to recover undisturbed cores 4.4 meters long and 6.35 cm in diameter. The corer is capable of penetrating formations with sediment shear strengths in excess of 1200 g/cm^2 with the resculting core showing little or no disturbance. Because the piston coring operation does not involve rotation, relative orientation can be noted.

The Project initiated the development program for the variable-length piston coring system to improve the corer's efficiency and handling characteristics, and to extend operating capability while maintaining the same high quality of undisturbed core recovery realized with the original HPC tool.

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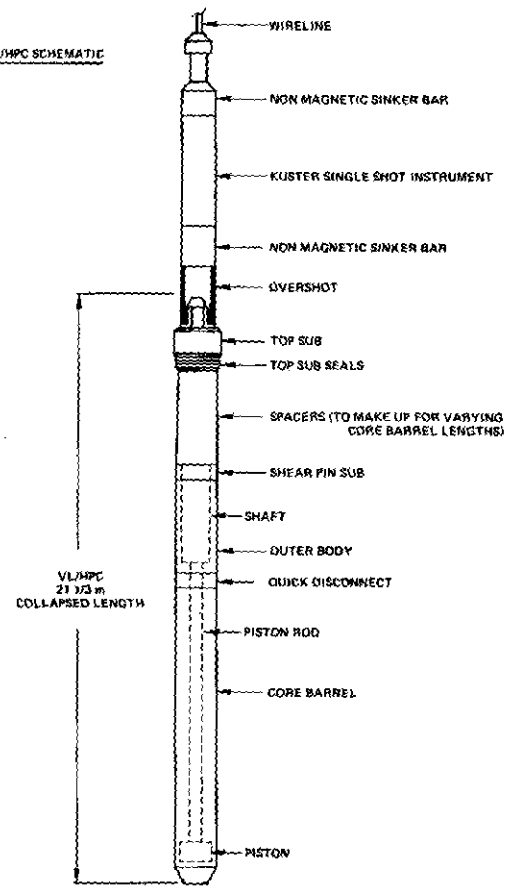
New Features

The VL/HPC incorporates several features not in the original hydraulic piston corer as given below:

- **Adjustable core barrel length.** The length of the core barrel can be varied from 3.5 to 9.5 meters in 1.5-meter increments so that a maximum of undisturbed core can be taken as a function of the material's shear strength. In soft sediments extension to the full 9.5-meter length allows recovery of twice as much core per wireline run and cuts in half the number of breaks (disturbed zones between cored intervals) in the cored section. As the sediment stiffens the stroke can be decreased by dressing the VL/HPC down into a shorter configuration which thus still obtains "full" recovery. Full recovery is desirable to ensure undisturbed cores, inasmuch as water sloshing over a less than full core section during retrieval is a prime source of disturbance.
- **Improved core-catcher capability.** We lengthened the core-catcher sub to allow attachment of both the flapper type and dog type of core catcher simultaneously for retaining very soft and harder sediment, respectively.
- **Quick disconnect capability.** A quick disconnect section above the core barrel allows its quick separatiion from the rest of the 21.3-meter long tool by means of an easy 1/2 turn/pull operation. In addition to decreasing turnaround time, this results in safer handling on the rig floor and allows operations to proceed under less than favorable weather conditions.
- **Absolute core orientation system.** We incorporated a Kuster-single-shot-survey-instrument into the wireline overshot assembly (the overshot is the latch at the end of the wireline by which the VL/HPC is raised and lowered through the drill pipe). This has made it possible to orient every core with respect to magnetic north. The Kuster instrument contains a floating, transparent compass, a timer, a light source, and a small photographic film disc. The instrument is positioned over the VL/HPC in the drill string so that it operates in a section of non-magnetic drill collar. The compass orients itself to magnetic north and a reference hairline in the body of the Kuster instrument is ultimately aligned with a longitudinal reference line on the plastic core liner. The 90-second delay timer is activated when it enters the non-magnetic collar section of the drill pipe; it trips on the light source which [illegible] film disc to the image of the compass and superimposed reference [illegible] Immediately after taking the picture the VL/HPC is shot into the sediment. After retrieval the film disc is quickly and easily developed. The core orientation is determined from the angle between the reference line and the north line. The shipboard technicians longitudinally split the cores along the north line.

Several steps are necessary to ensure alignment between the core liner and the reference hairline in the Kuster instrument. First the core liner is inserted into the core barrel so that its reference mark aligns with a corresponding mark scribed on the outside of the core barrel. Next the core barrel is dressed to the upper VL/HPC section and is adjusted by means of a lockable rotating connection so that it is aligned with a mark scribed on the upper section. When the wireline overshot is latched onto the complete tool to run in the drill pipe it is automatically aligned with the marks on the upper section. We have estimted orientation error to be ±10°.

VL/HPC SCHEMATIC



Special Handling Techniques

In order to increase the stroke of the cores we decided to increase the overall "closed" length of the VL/HPC to 21 1/3 meters. Its extended length varies from 25 meters to 31 meters depending on which length core barrel is used. We anticipated that the tool would be awkward to handle on deck and so developed special handling procedures. When the VL/HPC arrives at the rig floor the drilling crew breaks the drill pipe connection, immediately removes the Kuster instrument and replaces it with a redressed unit. They then pick up the VL/HPC from the drill pipe and lower it into a rig floor storage scabbard. The drilling lock handling clamp around the core barrel section and the tool is "hung off" at that point. Then they break the quick-disconnect section and insert the upper section (with the piston rod) into a redressed core barrel assembly stored in an adjacent scabbard. The tool is telescoped together, shear pins are replaced, and it is lowered into the drill pipe for another run.

Future Developments

The concepts and principles used in designing the hydraulic piston corer are continuing to lead us into the development of improved coring systems. We are currently evolving ideas for an air chamber piston corer (APC) which would utilize hydrostatic pressure to drive a core tube into the formation much the same way as the VL/HPC operates. The APC, however, will generate approximately three times the driving force and thus allow teams to core harder sediments. This additional energy will also allow faster penetration rates which should produce less disturbed cores in rough weather.

We should also see the development of a 10-cm diameter piston corer in the near future which will allow improved sampling for geotechnical and high-resolution stratigraphic purposes. *(Don Cameron, DSDP Development Engineer)*

CORE REPOSITORIES

Samples from DSDP Legs 1-75 are now available to qualified investigators for study resulting in published papers. We encourage potential investigators wishing samples to first obtain a sample request form and statement of the DSDP/NSF sample distribution policy statement from the DSDP curator. Write:

The Curator
Deep Sea Drilling Project, A-031
…itution of Oceanography

PERSONNEL BRIEFS

Thomas Shipley has accepted a research position at Scripps Institution of Oceanography. He will continue as DSDP staff scientist on a part-time basis to complete Volume 76 (Blake-Bahama Basin).

William Coulbourn, DSDP staff scientist, will return to the Project following a year's leave of absence in February 1982.

Keir Becker will join DSDP as a staff scientist 1 November 1981 and will be the DSDP staff representative on Leg 83 (Costa Rica Rift).

John B. Keene will work at DSDP headquarters at Scripps Institution of Oceanography as staff scientist during the first six months of 1982. He will coordinate the Leg 81 (Rockall Bank) work.

* * *

We regret to report that **John L. Usher**, Associate Chief Scientist for Science Services between 1976 and 1981 passed away on 25 July 1981 at his home.

Valdemar (Swede) Larson, for many years Head of Drilling Operations and more recently Head of Development Engineering succumbed to cancer 15 July 1981. The DSDP staff expresses its deepest regrets on the passing of a friend, colleague, and a major contributor to the drilling program.

Errata for Volumes 1 through 44 of the Initial Reports of the Deep Sea Drilling Project are now available. Institutions in the United States and IPOD countries that routinely receive copies of the Initial Reports volumes will automatically receive a complete set of the Errata. Complimentary copies of the Errata are available upon request to all other volume owners. Please specify if you want Errata listings for specific volumes or for the entire set (Volumes 1-44).

Send your request to:

Barbara Pinkston
Science Services
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

IN MEMORY OF VALDEMAR F. (SWEDE) LARSON

1930-1981

In the core lab on board *Glomar Challenger.*

Christmas day 1970 with the first core recovered (as part of scientific operations) using the re-entry system.

Valdemar F. (Swede) Larson succumbed to cancer last July at his home in Pacific Beach, California.

A mainstay of the Deep Sea Drilling Project, Larson served as Head of Operations between 1969 and 1980 and as Head of Development Engineering between 1980 and 1981. He was instrumental in the development of nearly all the coring devices unique to *Glomar Challenger.* Among these are the variable-length hydraulic piston corer, the drill-in-casing, and the downhole bit-release system.

Swede Larson and Mike Pennock (B.P., London) inspect core bits at DSDP headquarters.

Larson (far left) on the *Challenger* rig floor

On the bridge during

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JOINT OCEANOGRAPHIC INSTITUTIONS

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New NSF Plan

On 22 July 1981 representatives of the National Science Foundation, companies contributing to Ocean Margin Drilling Program (OMDP) and nonparticipating companies met in Houston. The purpose of the meeting was to report on OMDP to the nonparticipating companies and to encourage them to join the program. In organizing the meeting it became apparent that industry participation in the OMDP at the funding levels originally proposed might not be achievable.

Taking this into account, and recognizing a widespread desire in the scientific community to find a way to continue *Glomar Challenger*-type operations with foreign involvement into the future, NSF proposed a new plan. The boundary constraints followed in developing this new plan were: (1) that the average total annual contribution from the industry should not exceed $18 million (1981 dollars); (2) that the industry should share the cost of conversion of the ship and the OMDP (i.e., passive margin) drilling equally with the Foundattion; and (3) that capital expenditures should be postponed as much as possible.

Basically, the plan involves asking industry to help finance conversion of the *Explorer* for *Challenger*-type operations to start in FY 84, and includes as much as three years of riseless drilling, then calls for the conversion of the *Explorer* to riser capability, followed by a period of riser and riserless drilling. The National Science Foundation has emphasized that it is not trying to guide the science program, but only to provide a realistic and achievable fiscal framework for both JOIDES and OMDP interests. The oil companies have been asked to respond to the Foundation's proposal by the end of September.

The executive committee of the OMDP Science Advisory Committee (SAC) met in Washington on July 30, to consider the NSF proposal. After considerable discussion in which the SAC explored its implications, the committee welcomed the new plan as an important and positive step forward in planning for scientific ocean drilling. The new plan includes more total drilling time than had been previously planned. This plan also provides an opportunity to draw together the already overlapping interests of the JOIDES and OMDP planning groups into a greatly strengthened scientific program.

OMDP Science and Engineering Plans

While the NSF proposal is under discussion by the various interested parties, development of the OMDP science plan is proceeding as scheduled. As reported earlier, the five regional planning advisory committees (PACs) are assisting in the development of this plan. Using the data base developed by the regional synthesis groups, each PAC held a workshop meeting in the late summer of 1981, during which it identified and discussed outstanding scientific problems in the different geographic areas, and identified the studies including drilling needed to address those problems. Topics for the workshops were:

Mid Atlantic Ridge/East Pacific Rise — August 10-12

West Coast Active margins — August 10-14

East Coast Atlantic margins — August 24-26

Gulf of Mexico — August 28-29

South Atlantic-Antarctic — September 14-16

Although the principal participants in the workshops were the PAC members and members of the appropriate regional synthesis groups, each workshop also included other scientists having an active interest in the regions under discussion. Thus, the reports of the workshops do not represent only the views of a small select group. The reports and recommendations of the workshops provide the basis for the initial science plan for OMDP, to be developed by the Science Advisory Committee at its September meeting. We hope that preliminary copies of the initial science plan will be available in October, 1981.

With regard to engineering, NSF is evaluating proposals for the systems integration contractor for OMDP and the successful contractor should be announced before the end of September, 1981.

In preparation for the NSF Director's annual review of scientific ocean drilling programs, which took place in late June, JOI prepared a briefing book. In addition to providing specific information for the review, the briefing book is planned as a single-source document for all matters pertaining to the Ocean Margin Drilling science program up to June, 1981. It thus provides a useful reference for OMDP participants and others. Copies of the briefing book have been sent to all members of JOIDES Planning Committee for information. Additional copies are available from:

Joint Oceanographic Institutions Inc.
2600 Virginia Avenue, NW
Suite 512
Washington, DC 20037

(*Thomas A. Davies, Chief Scientist, Ocean Margin Drilling Program*, *September, 1981*)

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Update. Dr. Philip Rabinowitz will leave Lamont-Doherty Geological Observatory for Texas A&M, effective November 1, 1981. Dr. John Ladd of Lamont-Doherty has joined Dr. Rabinowitz as Co-Principal Investigator for the IPOD Data Bank.

IPOD SITE-SURVEY DATA BANK

The IPOD Site-Survey Data Bank at Lamont-Doherty Geological Observatory has recently (May-September 1981) received the following data.

- Seismic profiles for line SO-7-13, Lord Howe Rise area, from W. Weigel, the University of Hamburg.
- Preliminary reports for the *Hakuho Maru* cruises KH-77-1 and KH-80-3 across the Japan Trench, Philippine Sea, Shatsky Rise, Guam, Ponape and Ogasawara areas, from S. Nagumo, University of Tokyo.
- Microfilm, microfiche, and computer tape from Lease Sale 56 (Georgia embankment), from the National Geophysical and Solar Terrestrial Data Center in Colorado.
- Sixty processed multichannel seismic profiles, Lines WSA, SA, and AM taken by the *Fred H. Moore* Cruise 1 in the South Atlantic, from the University of Texas Marine Science Institute.
- Multichannel seismic profiles AM-26-A, AM-26-E, and WSA-15 (South Atlantic) and CAR-42-C, from the University of Texas Marine Science Institute.
- Computer tape containing navigation, bathymetry, and magnetic data, and copies of the seismic profiler records of *Knorr* Cruise 80 in the Bermuda area, from Woods Hole Oceanographic Institution.
- Errata for DSDP volumes 1-44, from the Deep Sea Drilling Project.

Best wishes
for a
happy holiday season

JOIDES Office

FOCUS

LETTER FROM THE PLANNING COMMITTEE CHAIRMAN

Events that affect the future of scientific drilling are happening so rapidly that by the time you read this my remarks may be obsolete. In all this confusion, I hope we can continue to steer as directly as possible toward our scientific goals. This means presenting a smashingly good proposal and then doing everything we can to assure its funding.

Office of Scientific Ocean Drilling

Moving the Ocean Drilling Division to the Office of Scientific Ocean Drilling — under the eye of the NSF Director — is a measure of the importance NSF now gives to ocean drilling. New people with new ideas are being appointed to the Division, and I look forward to a healthy working relationship with this reorganized office.

NSF Proposed Plan

During the summer, NSF presented a new proposal to the U.S. oil industry for funding the OMD program and for combining some of the JOIDES and OMDP objectives into one program. The NSF plan envisioned a stretching out of the time schedule by proposing several years of riserless *Explorer* drilling to precede a later period of alternating riser and riserless drilling. Costs are thus spread out over a longer period of time as compared to the present OMD schedule. The oil companies met with NSF in Houston on 6 October 1981 to give their responses to the new NSF proposal, and at that time indicated that they would not contribute more funds to OMDP in FY 1982.

The JOIDES Executive Committee, during its August meeting, asked that the JOIDES Planning Committee begin working with OMDP planners toward a joint scientific program. The JOIDES Executive Committee also made it explicit that the choice of platform(s) for carrying out any such joint plan is not prejudiced. A small subgroup from the JOIDES Planning Committee will attend OMD/SAC meetings and vice-versa. The actual formulation of any combined JOIDES/OMD scientific plan will not begin until January (after COSOD, and after the submission of the formal JOIDES 5-year drilling proposal to NSF). In light of the Industry withdrawal from OMDP, the JOIDES Executive Committee will doubtless take another look at this matter at its December meeting.

Conference on Scientific Ocean Drilling (COSOD)

COSOD preparations appear to be moving very well, and I am looking forward to an excellent meeting. It should result in a more clearly charted course for the whole community of people interested in scientific drilling in and around the oceans. I have asked a few PCOM members and key panel chairmen to attend COSOD, not as a kind of JOIDES flying wedge or commando group, but simply to observe and then to make whatever additions or revisions appear appropriate to our 5-year proposal (which must be presented in final form to the Executive Committee only two weeks later).

Five-Year Proposal

As to the 5-year proposal itself, I continue to write and rewrite the scientific narrative ignoring, as best I can, all the lethal-looking torpedoes whizzing nearby. The Planning and Executive committees approved the proposal outlines presented at their meetings in Hannover in July and August. The narrative follows the COSOD structure in organizing the subject matter, and draws heavily on the JOIDES panel white papers (which we plan to include intact in a long appendix to the proposal). The proposal in its present form envisions somewhat more than one circumnavigation of the globe. Operations would begin in the Atlantic, then move to the Pacific, Indian, and back to the Atlantic (and their marginal seas). Not nearly all the good ideas from the panels can be tested with the drill, even within this 5-year schedule. I believe, in fact, that there are sufficient first-class drilling ideas coming in to flesh out a 10-year proposal. (*E. L. Winterer*)

Major and minor-element analyses for igneous rocks are now available as listings or for computer searches. Both shipboard and shore laboratory data are included for DSDP Legs 13-62 and Leg 65. For information contact:

Donna Hawkins
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

NEWS BRIEFS

NSF establishes Office of Scientific Ocean Drilling

The National Science Foundation has established an **Office of Scientific Ocean Drilling** to focus on new efforts in the ocean sciences. The NSF's Division of Ocean Drilling Programs has been transferred to the new Office and the structure of the Division will be determined soon.

The Office of Scientific Ocean Drilling will be directed by **Dr. Allen M. Shinn**, formerly the Director's Senior Science Associate.

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NSF Authorizes DSDP to Exercise Option With Global Marine

The National Science Foundation recently authorized DSDP to exercise its option with Global Marine, Inc. to contract *Glomar Challenger* for the year beginning 22 October 1982. This period covers the second year of the FY 1982-83 *Challenger* drilling proposal (UCSD-1734).

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Oil Companies End OMDP Financial Support

At a meeting held on October 6 in Dallas, Texas, between officials of the National Science Foundation and the OMDP Contributing Companies Oversight Committee (CCOC), the CCOC indicated that it would not continue its financial support of OMDP beyond this year (FY 1981).

(The Contributing Companies Oversight Committee comprised representatives from each of the ten oil companies participating in OMDP.)

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Reference Collections of DSDP Microfossils

At about the end of this year or early in 1982, sufficient preparations of foraminifers, calcareous nannofossils, and lithological smear slides will be completed (from early DSDP legs) to enable us to announce the accessibility of the collections for examination by interested researchers.

In recent months Japan has offered to make the diatom preparations, and Lamont-Doherty Geological Observatory the radiolarian preparations. New Zealand will probably make the additional foraminiferal preparations required by the decision to increase the number of reference sets from five to eight. (*W. Riedel*)

PUBLICATIONS

The DSDP Curator has supplied this list of recent publications. If you have published a paper using data or samples collected by, or in conjunction with, the Deep Sea Drilling Project, please send five reprints of it to the Curator, Deep Sea Drilling Project, A-031, La Jolla, CA 92093.

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Ling, Hsin Yi, 1981. *Crassicorbisema*, a new silicoflagellate genus, from the southern oceans and Paleocene silicoflagellate zonation. *Trans. Proc. Paleont. Soc. Japan*, N.S. No. 121, p. 1-13.

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Neprochnov, Yu. P., (Chief Editor) 1980. Geological history of the Black Sea according to the results of deep-water drilling. NAUKA, Moscow. Edited collection, 202 pp. (In Russian)

Papaviassiliou, C. Th. and M.E. Cosgrove, 1981. Chemical and mineralogical changes during basalt-seawater interaction: Site 223, Leg 23, DSDP, north-west Indian Ocean. *Mineralogical Magazine*, v. 44, p. 141-146.

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Send your news briefs, fillers, and line drawings to the JOIDES Journal, *JOIDES Office, A-012, Scripps Institution of Oceanography, La Jolla, California 92093.*

Paleontologic data from Initial Reports of Deep Sea Drilling Projects Volumes 1-34 are now available for computer searches. The system includes all fossil groups cited in these volumes. For information contact:

Lillian Musich
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

APPROVED JOIDES PANEL MEETTINGS

	COMMITTEE / PANEL	Mar 1981	Apr 1981	May 1981	June 1981	July 1981	Aug 1981	Sept 1981	Oct 1981	Nov 1981	Dec 1981	Jan 1982	Feb 1982
	Executive Committee (EXCOM)	19-20 SIO					12-14 Hannover				2-3 San Francisco		
	Planning Committee (PCOM)					8-10 Hannover				11-13 Corvallis			23-26 Miami
SUBJECT / AREA	Ocean Crust Panel (OCP)	30-31 U.R.I.										18-20 SIO	
	Ocean Margin (Active) Panel (AMP)		7-9 Menlo Park							9-10 SIO (Sub-com.)		13-15 SIO	
	Ocean Margin (Passive) Panel (PMP)				18-20 Univ. Delaware								
	Ocean Paleoenvironment Panel (OPP)									30 - 1 U.S.C.			
DISCIPLINE	Inorganic Geochemistry Panel (IGP)									23-24 SIO			
	Organic Geochemistry Panel (OGP)												
	Sedimentary Petrology & Physical Properties Panel (SP^4)										3-5 SIO		
	Stratigraphic Correlations Panel (SCP)			6-8 SIO									
OPERATIONS	Downhole Measurements Panel (DMP)		30 - 1 HIG										
	Industrial Liaison Panel (ILP)												
	Information Handling Panel (IHP)												
	Pollution Prevention & Safety Panel (PPSP)	10-11 SIO		21-22 WHOI						5-6 SIO			
	Site Surveying Panel (SSP)			14-15 L-DGO							3-4 SIO		
	Others								COSOD	16-18 Austin	12 San Francisco	(SSPC)	
	Working Group				1-2 AMP *ad hoc* com. (NW Pacific) Menlo Park				8-9 HWG L-DGO				

JOIDES COMMITTEE AND PANEL REPORTS

We have extracted items from either the *draft* minutes of recent JOIDES committee and panel meetings or from brief summaries provided by panel chairmen. We omitted items reported elsewhere in the JOIDES Journal (e.g. NSF, DSDP, OMDP, panel reports and/or certain items of limited interest.)

EXECUTIVE COMMITTEE

William A. Nierenberg, Chairman

The Executive Committee (EXCOM) met 12-14 August 1981 at the Bundesanstalt für Geowissenschaften und Rohstoffe in Hannover, Federal Republic of Germany. The following includes certain items from the *draft* minutes of that meeting. We have not duplicated much of the Planning Committee report to the Executive Committee here. See instead the Planning Committee report, below.

National Science Foundation

Allen Shinn reported for the National Science Foundation.

Reorganization

The National Science Foundation has transferred the functions of the Division of Ocean Drilling to the newly created Office of Scientific Ocean Drilling, which reports directly to the NSF Director. Allen Shinn, formerly the Director's Senior Science Associate, is Director of the Office. Peter Wilkniss has resigned as Director of the Division of Ocean Drilling and NSF is currently searching for an earth scientist to replace him. The Foundation has asked Ian MacGregor to serve as Chief Scientist, but formalization of the appointment awaits resolution of technical problems concerning hiring procedures. Anton Inderbitzen is Acting Chief Scientist.

The Foundation effected the reorganization to help resolve two problems bearing on the future success of scientific ocean drilling: (a) the scientific community had not demonstrated unified support behind a single scientific ocean drilling program, and (b) costs of the ocean margin drilling program, as currently proposed, are too large for the oil companies to bear.

Proposal for Integrated Ocean Drilling Programs

Following upon the NSF reorganization, the Foundation developed a plan for an integrated program which it presented at a meeting held 22 July 1981 in Houston between OMD administrators, industry participants, and various interested oil companies. The NSF proposal for integrating the two scientific ocean drilling programs (JOIDES/DSDP and OMD) calls for:

- retirement of *Glomar Challenger* at the end of fiscal 1983 (the end of the currently NSF-approved drilling program)
- early conversion (beginning in 1983) of *Glomar Explorer* for riserless ocean drilling and use of the vessel in a riserless mode for about 3 years.
- conversion of *Explorer* to contain a full riser and well-control system in 1987(?) and subsequent operation in both riser and riserless modes.
- operation of the JOIDES and OMD programs as an integrated whole in terms of sharing the *Explorer*, but keeping certain aspects of the program segregated. The non-U.S. JOIDES members would be partners in the riserless part of the program. Access to developing drilling technology would be limited to the U.S. oil companies.

The *Glomar Explorer* would be more expensive to operate than *Challenger* but *Explorer*'s capabilities to operate in higher latitudes, a 20-year operational life, and its capability to handle a riser and well-control system makes its conversion desirable at this time. Shinn noted that the opportunity to shift to the larger plartform exists now — but may not exist later. Because *Explorer* is government owned some of this high cost would be offset.

According to Shinn, initial industry reaction among current OMD partners varied. Some companies view it extremely positively; others less so. Possible delay in developing well-control technology, and in drilling the margins are matters of concern. The smaller oil companies are most cost conscious and are very much reassured by the proposed plan. On the other hand, those companies concerned primarily with drilling technology would be disappointed if development of the riser drilling technology were overly delayed.

Discussions have gone well within the Office of Management and Budget and indications are that a reasonable level of support could be expected. The OMD 1982 budget has support in both houses of Congress. The Senate has budgeted $12 million to OMD operations. Shinn notes that the worst case is probably an appropriation of about $7 or $8 million.

Other oil companies (those possibly interested, but not currently participating in OMD) are watching with interest as scientific, developmental technology, and management plans evolve.

The Scientific Advisory Committee of the Ocean Margin Drilling Program viewed the proposal favorably, and although it recognizes difficulties in developing such a program it is confident solutions can be found.

The JOIDES scientific community, which is formally apprised of the plan by means of this report, has not yet formulated a response. Shinn distributed a memo outlining the plan to the non-U.S. members during the present meeting. The U.S. members received copies during the earlier JOI Board of Governors meeting.

Discussion. The Executive Committee discussed the NSF proposal with great interest.

Major points of discussion included:

- Unity of scientific program — The EXCOM encourages the community engaged in scientific ocean drilling to develop a coordinated and unified program. The EXCOM stresses the concept of "one scientific community."
- Science drives the program — The EXCOM unanimously agreed that any program must produce the best possible *scientific* results.
- Cost of *Glomar Challenger* vs. *Glomar Explorer* operations.

Members had several questions concerning relative operating costs of the two vessels. They noted that even in a riserless mode, logistical support of the larger vessel would need to be maintained. NSF's estimated increased costs of 20% over current *Challenger* operating costs is apparently based on different assumptions from those of the DSDP, which estimates costs of about 70% over current *Challenger* costs (88-man crew). (Fig. EXCOM-1 shows comparative cost projections developed by DSDP.) A. Shinn agreed to put the appropriate people from Santa Fe International in touch with DSDP to discuss the bases of projected cost figures. The non-U.S. JOIDES members are particularly concerned about possible increased costs for JOIDES membership.

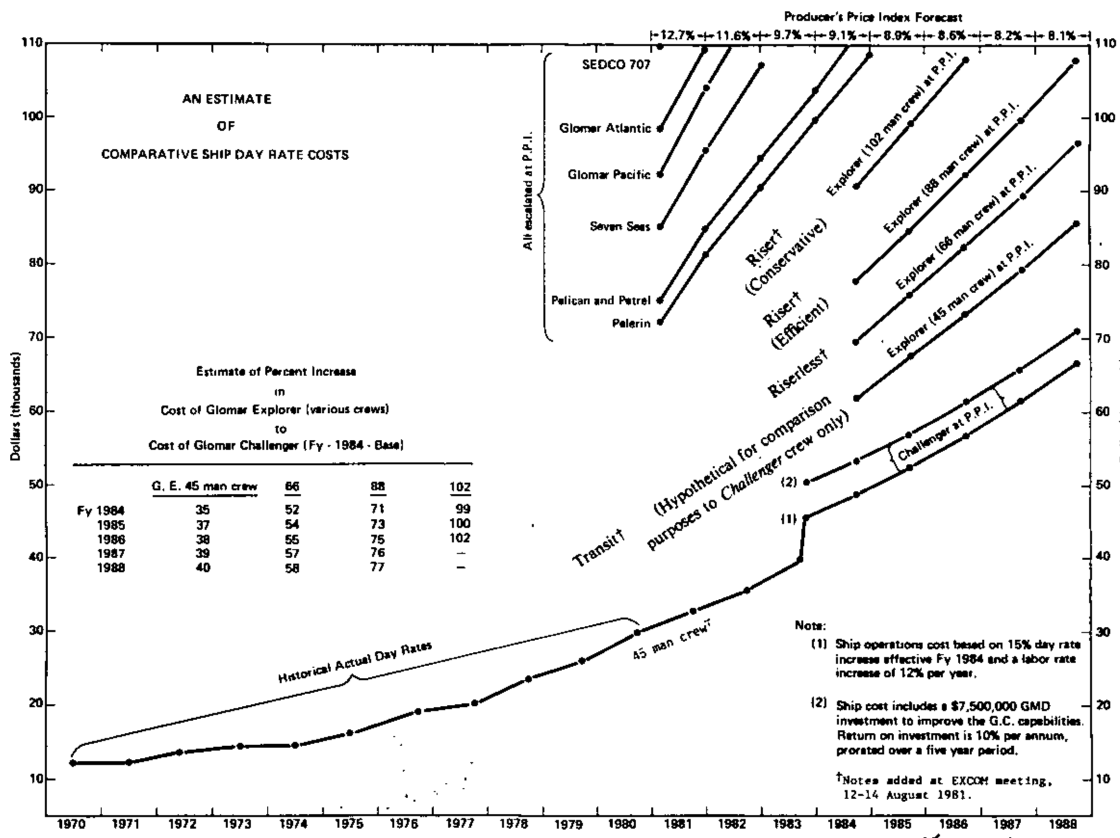

Figure EXCOM-1. Comparative ship-day-rate costs.

F. C. MacTernan 7/24/81

The EXCOM discussed the merits of conversion of *Explorer* versus the problem of using the more expensive ship for operations which could be conducted by *Challenger.* It recognizes that the *Explorer*, as a virtually unused ship, would have an operating life several years longer than *Challenger*, and that the larger platform would both allow operations in higher latitudes and support a riser and well-control system.

- Formidable problems — Some members noted that the integration of logistics, economies, technology, and industrial and national interests without loss of the flexibility to conduct good science would indeed pose formidable problems. Members would not like to see a program which would result in a "permanent compromise of scientific objectives."
- Segregated program/technology transfer

The mechanics of segregated parts of the program would require more definition and explanation. Some non-U.S. members and potential members expressed disappointment that non-U.S. JOIDES partners would be excluded from participation in the technology transfer.

In response to questions, A. Shinn also noted that:

a. NSF cannot dictate what ship would be used, but can only assess the options in apportioning funds. NSF has suggested a plan to combine programs, using *Glomar Explorer*, which it believes to be a good plan for many reasons, but it must be responsive to the wishes of the scientific community.

b. neither details of terms of partnership nor mode of ship-sharing has been addressed.

(The EXCOM also discussed the NSF proposal within the context of other subjects. See also Participation in JOIDES-IPOD and Future Planning, below.)

Summary and Action. W. Nierenberg noted that the Executive Committee "guards its science," and that a significant scientific program is fundamental to JOIDES and would be essential for developing a unified program.

The Executive Committee asked E. Winterer to develop a six-member subcommittee of the Planning Committee to meet with an equal number of SAC representatives to attempt to construct a satisfactory unified scientific plan and report to the Executive Committee at the spring (1982) meeting.

The EXCOM does not constrain the committee by conditions which either state the type of science to be done or which state the platform(s) from which the program would be conducted.

The EXCOM suggests that the "unified-scientific-plan committee" meet in December — after results of the Conference on Scientific Ocean Drilling are known, and after the JOIDES 5-year drilling plan is in final form. This is consistent with NSF's timetable which calls for presentation of a scientific plan to industry on 1 June 1982.

The Executive Committee also encourages the PCOM and SAC subcommittees to attend the OMD Scientific Advisory Committee and JOIDES Planning Committee meetings, respectively.

Planning Committee Report

E. Winterer reported on the Planning Committee meeting, held 8-10 July, at the Bundesanstalt für Geowissenschaften und Rohstoffe. (We include here only the Executive Committee action on Planning Committee items. See also extracts from the Planning Committee minutes, below.)

Seabed Working Group

R. Searle presented background on the Seabed Working group (Nuclear Energy Agency) to the Planning Committee during the PCOM's 8-10 July meeting. The Seabed Working group is interested in exploring the possibilities of forming a co-operative program with JOIDES to drill in certain areas of mutual interest. (Details of the presentation are given in extracts from the Planning Committee minutes, below.)

The Planning Committee was very interested in the Working Group presentation and recognized areas of overlap in scientific interest — particularly those involving physical properties and geochemistry of sediments. The PCOM viewed the discussions as a first step in a mutually educational process and encouraged Searle and the Seabed Working Group to submit drilling and coring proposals to various JOIDES panel chairmen (via the PCOM chairman).

Discussion. W. Nierenberg noted that because co-operation with the Seabed Working Group involes policy issues it should be addressed directly by the Executive Committee. He asked Executive Committee members to be prepared to review and make a policy decision concerning co-operative JOIDES/Seabed Disposal Working Group operations at their next (December 1981) meeting.

Defense Advanced Research Agency (DARPA)

The PCOM expressed continued concern that inadequate site survey may compromise attempts to emplace the DARPA seismic system as well as limit other potential science which might be gained at the site.

Discussion. In response to a question, W. Nierenberg said he understood that all data collected by the DARPA seismic system would be freely available to all JOIDES members. He also agreed to learn what possibilities exist for special use of the system by individual scientific teams.

The Executive Committee agreed that planning to ensure a successful leg should at least equal that of any other JOIDES leg and following general discussion adopted the following resolution.

> **The Executive Committee resolves that in the eventuality that adequate data for proper site characterization, identification, and evaluation are not available, the emplacement of the DARPA marine seismic system be deferred until the next phase of the IPOD program.**

North Pacific Drilling

At its last meeting (March 1981) the Executive Committee instructed the Planning Committee to work toward restoring a northwest Pacific leg during the 1981-83 *Challenger* program.

E. Winterer formed a special *ad hoc* committee to review drilling priorities in the North Pacific. The *ad hoc* group, which met in early July immediately before the PCOM meeting, comprised American and Soviet proponents of northwest Pacific drilling and the chairmen of the Ocean Paleoenvironment and Active Margin panels.

The *ad hoc* group assigned highest priority to (a) drilling the Sounder Ridge where older Mesozoic crust overlain by thin sediments may be trapped in the Bering Sea and to (b) drilling OPP sites NW-3 and -4 in the northwest Pacific. It gave drilling the Shatsky Rise lower priority owing to immaturity of the scientific plan, inadequate survey data, and probable technical difficulties in reaching stated objectives.

During discussion of the *ad hoc* committee's recommendation, the PCOM noted that PCOM priorities for the 1981-83 program had been established on a scientific basis which were fair and reasonable. The Committee was unhappy to be asked to distort the scientific plan for political reasons, but in response to the Executive Committee's directive the Planning Committee resolved that if a leg must be restored on the NW Pacific during the summer of 1982, it should comprise the Ocean Paleoenvironment Panel sites NW-2 through -8. (This leg had been eliminated from the drilling schedule at the February (1981) PCOM meeting to ensure completion of higher priority science.) The PCOM also allowed for the possibility of drilling the Shatsky Rise provided that several issues raised by PCOM members are answered satisfactorily by the proponents.

The Planning Committee felt that the Sounder Ridge-Shirshov program offered potentially very interesting science, but that it could also benefit from greater maturation and might be a high priority area for the 1983-89 proposal.

Discussion. The Executive Committee accepted the restoration of the Ocean Paleoenvironment N.W. Pacific sites (NW-2 through NW-8) as fulfillment of their requirment to add a north Pacific leg. All members agreed that this was a workable solution.

Scheduling Changes

The Planning Committee subtracted 5 days each from Legs 83 and 84 (as given by the 10 June *Challenger* schedule appearing on p. 1 of the June *JOIDES Journal*). This was to bring the time of *on-site* operations of the Pacific legs into better equilibrium. The PCOM suggested that the 10 days could best be used drilling the equatorial Pacific and hydrogeology legs, and on the return transit across the Pacific.

Planning Committee Report

During a general discussion of the 1982-83 drilling plan, P. Kent relayed the United Kingdom's particular interest in problems relevant to the northeastern Atlantic continental margins. **The Executive Committee was sympathetic to the U.K.'s position and recognizing the special-interest problems of the U.K., asked the Planning Committee to adjust the 1983 Northeast Atlantic leg to include drilling relevant to the problems of the continental margin in that area.**

Examples of possible objectives include the nature of the seaward dipping strata adjoining the continental edge, and drift and fan deposits on the lower continental margin.

Consensus. W. Nierenberg thanked E. Winterer and the Planning Committee for their excellent job. **The EXCOM accepted the PCOM report with the suggestions and directives as noted above.** (Items from the PCOM meeting bearing on future planning and additional JOIDES members are noted under a separate headings below.)

Participation in JOIDES IPOD

Member Country Positions

Representatives of the non-U.S. member countries met with A. Shinn and A. Inderbitzen (both NSF) the evening of the first day of the EXCOM meeting. A. Inderbitzen summarized the discussions concerning (a) the non-U.S. member positions for the 1982-83 JOIDES program and (b) post-1983 program as "All non-U.S. participants are optimistic that they can meet the financial requirements for membership covering the 1982-83 extension. Members cannot so easily define positions on post-1983 programs owing to the many problems in integrating the JOIDES and OMD objectives into a single program. Problems include the more complex relationship to the U.S. petroleum industry, greater financing required, and a more diverse membership."

W. Nierenberg also asked each non-U.S. representative to comment on his or his institution's position on the IPOD program.[1]

P. Kent: We need to develop some better form of organization by the end of 1983 to handle the increased participation in an IPOD program or a combined IPOD/OMD program.

H. Durbaum: The Germans are committed to, and have already paid their dues for, the 1982-83 program (but have not yet signed the agreement). The German IPOD group will meet in December, following COSOD, to discuss future participation.

J. Debyser: We are optimistic that we can get funding for the 1982-83 participation. But we would need to overcome many problems in joining a combined program. A 5-year *Challenger* program looks very good to the French. Integration of a JOIDES and OMD program would be more difficult, but we approach all possibilities with an open mind.

N. Nasu: Japan supports the 1982-83 program. The concept of a integrated DSDP/OMD program is a very new and complex concept, and one which would require additiional study.

P. Timofeev: I hope my country will take part in any future program. I will meet with my colleagues during the later part of October to discuss the possibilities.

Other Executive Committee members noted that scientific considerations must drive future planning and selection of drill holes. Participating countries and institutions must all agree to support a scientific program and recognize that not in all cases can the science be done off each country's shore. The OMD-type holes, for example, would require 6 to 9 months drilling on a single station.

Potential Additional Members

The Executive Committee at its March 1981 meeting encouraged countries interested in joining JOIDES to send observers to upcoming Planning and Executive committee meetings. The EXCOM, at its present meeting, reiterated its interest in new members and urged planners to maintain their momentum in working toward expanded membership. The committee invited its potential-member guests to comment on their countries' positions.

Canada. Michael Keen, Geological Survey of Canada, reported on Canadian interest. Assuming that the *Challenger* program would end in FY 82, members of the Canadian scientific communities (comprising the Canadian Geological Survey, Bureau of Energy, Mines and Resources, National Engineering and Research Council, and major oil companies) focused planning and presentations on joining the Ocean Margin Drilling program. The U.S. oil companies, however, declined to invite non-U.S. participation in OMD. The Canadians continue their high interest in the margin drilling and view the possibilities of a joint program (with non-U.S. participation) as very encouraging.

Three matters which concern the Canadians and which would require more definite resolution are those involving cost of the program, rules governing technology transfer, and possibilities

[1] Comments are not direct quotes, but rather paraphrased statements.

of participating in procurement. A. Shinn answered some of Keen's question as follows:[1]

Keen: The cost of the Deep Sea Drilling program is $2-million per year for each non-U.S. member. What would be the expected level of funding for a joint JOIDES-OMD program?

Shinn (NSF): It is impossible to say at this juncture, but perhaps $3 million a year is a reasonable figure, assuming that the oil companies carry half of the total expense.

Keen: What would the rules be governing technology transfer? If Canada joined, the Canadian consortium would involve support from Canadian industry which would be disappointed if excluded from this aspect of the program.

Shinn (NSF): The position of the U.S. oil companies is clear on this point. They would insist on maintaining all rights to technological developments.

Keen: Is the door closed to procurement of systems and special equipment from non-U.S. sources?

Shinn: For the next few months the bulk of the contracts would go to U.S. firms through the systems integration contractor, but the door is not closed to procuremen from a non-U.S. source, especially where equipment with special capabilities is needed. The case for procurement from non-U.S. sources is strongest when a particular piece of equipment with special capability can be procured only through a non-U.S. source.

Keen noted that Canada could not join until 1983, but his country would like to get involved at the working level now (i.e., on JOIDES panels) in order to participate in the planning for post-1983.

The Netherlands. Jan Stel (Executive Secretary, Netherlands Council on Ocean Research) reported that the Dutch government is actively stimulating oceanographic research. Two groups — at the University of Utrecht and at the University of Amsterdam — are leading the effort; the Amsterdam group is particularly enthusiastic. The Dutch government is definitely interested in joining IPOD but faces two problems:

- Owing to budgetary constraints the Netherlands cannot afford to join as a full member. It must find a partner and join as a member of a consortium.
- The government cannot act until the Dutch scientific community demonstrates unified support.

The Dutch are prepared to join JOIDES if these problems can be overcome. Stel asks that in the meanwhile the Dutch be kept abreast of IPOD planning and organizational matters, and that a means be found to include some Dutch contribution in future planning.

Australia. E. Winterer reported on the Australian position as given to PCOM by Peter Cook (Chairman, Consortium for Ocean Geosciences) who had attended the July Planning Committee meeting in Hannover.

The Australian earth science community is unified behind the participation in the JOIDES program. Australian scientists continue their enthusiastic support and are optimistic that their government will support the membership. The Australian Bureau of Marine Resources (BMR) would probably be designated the Australian member agency.

The Australians, however, are most anxious to stay very close to the planning processes and would like to have representatives present at Planning and Executive committee meetings as observers and Australians participating as members of JOIDES panels. Expected participation would initially be on a small scale, but once committed to join (in 1983), Australia would expect greater panel representation.

Norway. E. Winterer visited Jørn Thiede (Univ. of Oslo) immediately following the July Planning Committee meeting to discuss possibilities of membership.

Winterer reported that the Norwegian marine geology-geophysics community, although relatively small, is solidly behind membership. Moreover, a large source for funds exists from revenues from taxation of the offshore petroleum industry. The problem of securing funds specifically for JOIDES membership is a technical/legal one — "it is a matter of finding the right key to unlock the government coffers."

Winterer suggested that Thiede stay in close touch with the JOIDES program, should Norway be in a position to join at some later date. He also noted that should the Norwegians join IPOD, they would probably do so with a strong regional orientation to their scientific proposals.

[1]Paraphrased quotes.

Consensus. The Executive Committee recognizes that a complex set of problems surrounds the status of potential and new members. It discussed additional participation at length and reached a consensus on the following points.

The Executive Committee encourages expanded membership to JOIDES. It encourages panel participation by representatives of those potential members who are seeking full membership, recognizing that such participation on JOIDES panels could be accomplished either by invitation of members from interested countries as individual scientists or by expansion of certain panel membership.

The EXCOM does not wish to address the issue of affiliate (=associate) membership — one involving reduced dues and reduced privileges — at this time as no such proposals have come forth. R. Heath noted his institution would oppose affiliate (=associate) membership.

The EXCOM supports continued observer status at Planning and Executive meetings to likely new members.

Following the general discussion, W. Nierenberg asked the EXCOM (and NSF) to form a 4-man committee to consider questions involving new JOIDES members accommodating ways to equitably involve potential new (full) members in the planning process. The committee, comprising A. Shinn (NSF), H. Durbaum and J. Debyser (plus one U.S. EXCOM member) will develop suitable guidelines and present them at the next (December 1981) meeting.

The Committee also asked its chairman to write NSF, encouraging it to go forward with discussions between the U.S. and representative government agencies of Australia, Canada, and The Netherlands. The EXCOM encourages Norway's participation, but will await a more firm response from that country before issuing specific invitations.

Future Planning

1983-88 Proposal

In response to the Executive Committees directive, the Planning Committee is currently developing the scientific part of a 5-year drilling proposal. Winterer presented two versions of the proposed outline: a "short outline" which closely follows the organizational structure of COSOD, rather than that of the JOIDES Panel organization and a "long outline" which primarily lists the scientific objectives and targets proposed for the program. Winterer has begun to formulate the proposal narrative using materials from the white papers generated by the JOIDES Panels. (He made available a very rough, zero, draft of the proposal at the meeting.) The draft at that stage was primarily a "cut-and-paste" attempt to weave the white papers into a 5-year proposal. Winterer had instructed the panels to prepare white papers without regard to drilling platform; the proposal, however, defines a program specifically using *Challenger.* Targets from the white papers requiring a different type of platform are not addressed in this proposal. The complete text of the white papers, however, could be included in an appendix.

M. Peterson also distributed an outline developed by DSDP for the management part of the proposal. Peterson and Winterer are working in parallel to coordinate closely the proposal's science and management aspects.

Winterer is focussing the scientific narrative following suggestions made by the PCOM at its recent meeting, including sections on

- oceanic hydrothermal systems
- Neogene and Paleogene oceanography
- oceanic sedimentation processes, especially the formation and evolution of sediment drifts, mud waves
- use of holes as conduits for experiments, and
- technological requirements and opportunities

The proposal will include a model drilling schedule suggesting a plausible track to cover the major regions of the world's oceans in an economical way. The PCOM envisions 1-1/2 loops around the world beginning at the end of 1983 in the Atlantic. Planning might include a total of 2 years in the Atlantic, 2 years in the Pacific and 1 year in the Indian oceans and their marginal seas. Scheduling would be planned to allow drilling technology to keep ahead of the planned operations.

The JOIDES panels, especially the Ocean Paleoenvironment Panel, have suggested considerable high latitude work; this requires special considerations owing to the difficulies of weather, scheduling and special insurance problems.

Consensus. The Executive Committee approved the overall outline and direction of the 5-year drilling proposal and asked the Planning Committee and DSDP to move ahead with developing the proposal. The EXCOM also discussed the 5-year proposal in conjunction with COSOD and a proposed joint JOIDES/OMD program.

Conference on Scientific Ocean Drilling (COSOD)

Background. At its last (March 1981) meeting the JOIDES Executive Committee defined the terms of reference for its proposed Conference on Scientific Ocean Drilling, and selected potential candidates for its chairman and steering committee. The steering committee was subsequently emplaced and Roger Larson accepted its chairmanship.

COSOD organization. R. Larson reported on the progress of the conference planning to date.

The COSOD Steering Committee met 21-22 May[1] 1981 at the University of Rhode Island. The committee approved the general terms of reference, but added to, and reorganized the suggested topics into five major categories: (a) origin and evolution of the oceanic crust; (b) orign and evolution of marine sedimentary sequences; (c) tectonic evolution of continental margins and oceanic crust; (d) causes of long-term changes in the atmosphere, oceans, cryosphere, biosphere, and magnetic field; (e) and tools, techniques and associated studies.

The organization reflects an evolution from a regional orientation (original JOIDES panels) to subject panels (IPOD) — both of which the steering committee felt were inappropriate for future planning — to the process-oriented structure.

The Steering Committee also recommended that in order to allow sufficient time for planning and ideas to evolve, the meeting be held in November 1981 (rather than October as the EXCOM originally suggested).

The committee then set about to populate its working groups for each of the major topics and to select steering committee members to serve as liaison to the working groups.

R. Larson distributed an Interim COSOD progress report to EXCOM members, containing the names of the Working Group members and Steering Committee liaison people. The Working Group membership comprises both U.S. and non-U.S. representatives, but Larson noted that the Groups have few industry people. He hopes, however, to compensate for this by strongly encouraging their attendance at the conference.

The working groups will meet before the conference to formulate position papers and suggest ways to test models with the drill. Two groups have already met; others will be meeting shortly.

Timetable. 1 October 1981 is the deadline for receipt of papers for consideration by the conference working group. The working groups are also viewing the original OMD science plan and the JOIDES panel white papers.

The COSOD will be held **16-18 November 1981** at the Townsend Conference Center in Austin, Texas. The COSOD Steering Committee will meet an additional two days to formulate and draft the text of the conference report.

The conference schedule is planned as follows.

16 November 1981. Formal presentation of a summarized reports by each of the COSOD working groups.

17 November, 1981. Meetings of each of the five working groups to discuss their topics further on the basis of discussion generated the first day. Non-members may also amplify and modify their contributions at this time. Each group's chairman and the Steering Committee liaison will then compile a list of scientific priorities.

18 November 1981. The Working Group chairmen will present the revised working group report to the conference for general discussion and development of scientific priorities.

20-21 November 1981. The COSOD Steering Committee will meet to write the formal COSOD report.

COSOD Steering Committee Report. The COSOD report will comprise:

I. Introduction — written by the Steering Committee

II. Working Group Reports (as modified at the conference) — The reports will include a recommendation on the scientific priorities for each subject.

III. Overall scientific priorities as established by the steering committee.

IV. General drilling plan — This would not be as specific as the JOIDES 5-year proposal; it would set forth major scientific

[1]Steering Committee members are Roger Larson, chairman, Jean Aubouin, Helmut Beiersdorf, Robert Coleman, Howard Gould, Christopher Harrison, James Hays, James Baker, John Maxwell, Yuri Neprochnov, and Drummond Matthews.

goals to be realized within perhaps the next 10 years.

The conference report would probably be available by the end of December 1981.

Discussion. W. Nierenberg thanked R. Larson, noting that the EXCOM was very impressed with both the accomplishments of the Steering Committee and with Larson's presentation.

Most discussion centered about potential constraints at the conference and the desire for an open forum. Larson assured the Committee that he had taken steps to advertise the conference widely and to encourage contributions from a broad community. The conference will neither be constrained to discussing ocean drilling programs currently being developed or considered (JOIDES 5-year plan, Ocean Margin drilling, Joint JOIDES/OMD plan) nor by drilling platform. Moreover, the conference will attempt to recommend means to tie studies of the adjacent continental margins. Every attempt is being made to develop new perspectives at the conference.

W. Nierenberg suggested that Larson also consider publication of the results in hard cover, perhaps using a commercial publisher.

Ocean Margin Drilling

Within the context of the discussion on future planning, A. Maxwell reviewed the nature of the Ocean Margin Drilling planning and the structure of the proposed program, contrasting it with the JOIDES planning structures.

The OMD Scientific Advisory Committee (SAC) comprises one member from each JOI institution (=10), one member from each contributing oil company (=10), three members at large and the president of JOI (*ex officio*). The Executive Committee of SAC, comprising six people (A. Maxwell, Chairman, A. Green, N. Edgar, A. Fischer, M. Horn, B. Lewis), meets once a month to "predigest" committee business. Planning Advisory and Technical Advisory committees coordinate planning for the targeted drill areas and provide technical and operational advice. Members of the committees are selected on the basis of their expertise and not as representatives of member institutions.

The five regional Planning Advisory Committees (East Coast, West Coast, Gulf of Mexico, Mid-Atlantic Ridge/East Pacific Rise, Antarctic) have defined ten sites in their model program (Costa Rica Rift, Middle America Trench, Weddel Sea, New Jersey upper Rise, New Jersey middle Rise, Moroccan Margin, mid-Atlantic Ridge, South central Gulf of Mexico, Southern Gulf of Mexico, Barbados Ridge. Drilling at each site would require several months on station; a team of scientists would coordinate the work at each site and would be responsible for all aspects of the scientific program at that site. JOI has issued a number of contracts to groups for the compilation of geophysical and geological data on the target areas and the adjacent onshore regions. All groups are moving ahead to produce comprehensive reports. The reports will contain a series of detailed maps showing depths to prominent reflectors, depth to basement, sediment thicknesses, tectonic activity, and palinspastic reconstructions.

Several workshops involving the synthesis principal investigators, contributors, and industry representatives will be held during August and early September (1981). The investigators will report the results of their studies to the full Scientific Advisory Committee during the third week of September, at which time the Committee will draft its initial scientific program. The planners will resolve questions of what additional geological and geophysical data are needed, what are the highest scientific objectives are, and whether or not changes in site location indicated.

Discussion — Future Planning

The Executive Committee recognizes that it and the JOIDES community are simultaneously engaged in three long-term planning functions: (a) development of a 5-year *Challenger* proposal, (b) sponsorship of a conference to define and recommend ways to attack scientific ocean science problems, and (c) developing a joint scientific program together with members of the OMD Scientific Advisory Committee. It fully supports all three activities as integral parts in developing a unified scientific plan. COSOD takes place in November; the 5-year proposal will be submitted to NSF in December and the Joint JOIDES/OMD committee will meet in December or January. Thus the EXCOM is hopeful that a firm direction for long-term scientific ocean drilling will be established in early 1982.

Other Items Not Covered Above

Panel Membership

The Executive Committee approved all Planning Committee recommendations on panel membership.

EXCOM Membership

Anthony Laughton will replace Peter Twinn as the U.K. alternate representative to the Executive Committee. Peter Twinn retired following the last meeting after many years of service to the committee.

Microfossil Repositories

The Planning Committee had approved a plan to put development and coordination of the microfossil reference centers into the hands of John Saunders and William Riedel. The plan, which emanated from the Stratigraphic Correlations Panel, calls for travel funds for W. Riedel to make three trips (to New Zealand, Basel and the Soviet Union) over a period of 3.5 years (John Saunders would probably acquire travel funds from his own institution.)

Discussion. In conjunction with the discussion, EXCOM members noted that a plan for *long-term curation* of the core samples needs to be developed and suggested that the core repositories should perhaps be tied to archiving institutions. (The microfossil reference collections, however, need to be attached to universities to be most accessible to research scientists.)

Winterer noted that the DSDP core materials were originally to be deposited at the Smisthonian Institute following termination of the DSDP program; that, however, might not be logistically possible or desirable. Both the Information Handling and Stratigraphic Correlations panels are discussing long-term curation of core samples, and the PCOM has asked W. Riedel to make a recommendation.

The Executive Committee endorsed the Planning Committee's recommendation regarding the microfossil reference collections as set forth in the Riedel/Saunders report of 5 May 1981.

The EXCOM considered only the microfossil reference centers in its motion; it views long-term curation of core samples a separate problem.

P. Timofeev relayed that Krasheninninkov will act as the Soviet curator.

Hydraulic Piston Coring

J. Knauss inquired as to whether the inability of the hydraulic piston corer to sample clayey sediments during Leg 79 would adversely impact the *Glomar Challenger* program, inasmuch as so much of the planned drilling relies on obtaining results with this tool.

E. Winterer commented that it may be a problem, but would not have a major effect because most of the planned Pacific coring — for which the HPC is essential — is in biogenous sediments in which the HPC works well.

Use of DSDP-Drilled Holes

The Downhole Measurements Panel had noted that with the development of a wireline capability to re-enter a hole, which would be deployable from a variety of oceanographic vessels, question concerning the "ownership" and the use of DSDP-drilled holes might arise.

In its discussion the Executive Committee noted that this involves two areas: one of coordinating the use of the holes and the other concerning legal 'ownership' and responsibility for the holes. Members added that in addition to the very complex set of problems surrounding jurisdiction in the open sea, ownership implies legal responsibility which could create areas for concern. J. Knauss agreed to prepare a "discussion paper" on the subject for consideration at the December EXCOM meeting.

Future Meetings

The Executive Committee will hold its next meetings

3-4 December 1981
San Francisco, California

Sometime during the week of 22 March 1982, preferably

25-26 March 1982
Alton-Jones Center
University of Rhode Island
J. Knauss — Coordinator

Although preferring to meet 25-26 March, the Executive Committee is willing to meet anytime during the week of 22 March to coordinate its meeting with a meeting between IPOD members and NSF in Washington.

1-2 September 1982
Kyoto, Japan
Noriyuki Nasu — Coordinator

PLANNING COMMITTEE

Edward L. Winterer, Chairman

The Planning Committee met 8-10 July 1981 at the Bundesanstalt für Geowissenschaften und Rohstoffe in Hannover, Germany. We have included here only (abridged) parts of the minutes dealing with future planning and panel reports. Many other items discussed during the meeting including recent *Challenger* and Deep Sea Drilling operatiions, the Conference on Scientific Ocean Drilling, and certain panel reports appear elsewhere in this issue.

Upcoming Challenger Drilling

Leg 82 (North Atlantic Mantle Heterogeneity)

Priorities. The Ocean Crust Panel's principal drilling priorities for Leg 82 are to establish (a) how long the Hayes Fracture Zone has served as a geochemical boundary and (b) to test the lateral extent of light-rare-earth enriched basalt. The scientific team will study the history of production of rock at certain latitudes and establish whether the pattern of change is continuous through time and is reflected in crust of older and older age, or whether the mantle is essentially homogeneous, in which case local temporal changes in the processes of melting and crystallization cause chemical changes in the composition of the crustal materials.

The Ocean Crust Panel selected nine sites shown in Figure PCOM-1. Drilling at Sites A, B, C, D, and E would establish the lateral extent of the "abnormal" basalts; Sites F, G, H, and I would document changes across the Hayes Fracture Zone. Plans call for first drilling sites A-E as necessary to define the limits of the light-rare-earth enriched basalts, then to drill sites F-I to gain information about the chemical discontinuity across the Hayes Fracture Zone.

Members of the PCOM expressed concern that drilling sites F-I last might compromise the possibility of realizing the *highest priority objective* — that of studying changes across the Hayes Fracture Zone. Difficulties in distinguishing normal mid-ocean ridge from other basalts in the A-C series of holes were mentioned. **The PCOM reiterated that it places the highest priority on testing the chemical differences across the Hayes Fracture Zone** and asked E. Winterer to discuss a revised plan with J. Fox and the cruise chief scientists to ensure that this drilling would be accomplished, preferably by drilling these sites first.

The committee also noted that minimum requirements include drilling between 40-100 meters into basement (through at least four flow units). The cruise proponents should also justify any exceptions to the rules governing basement

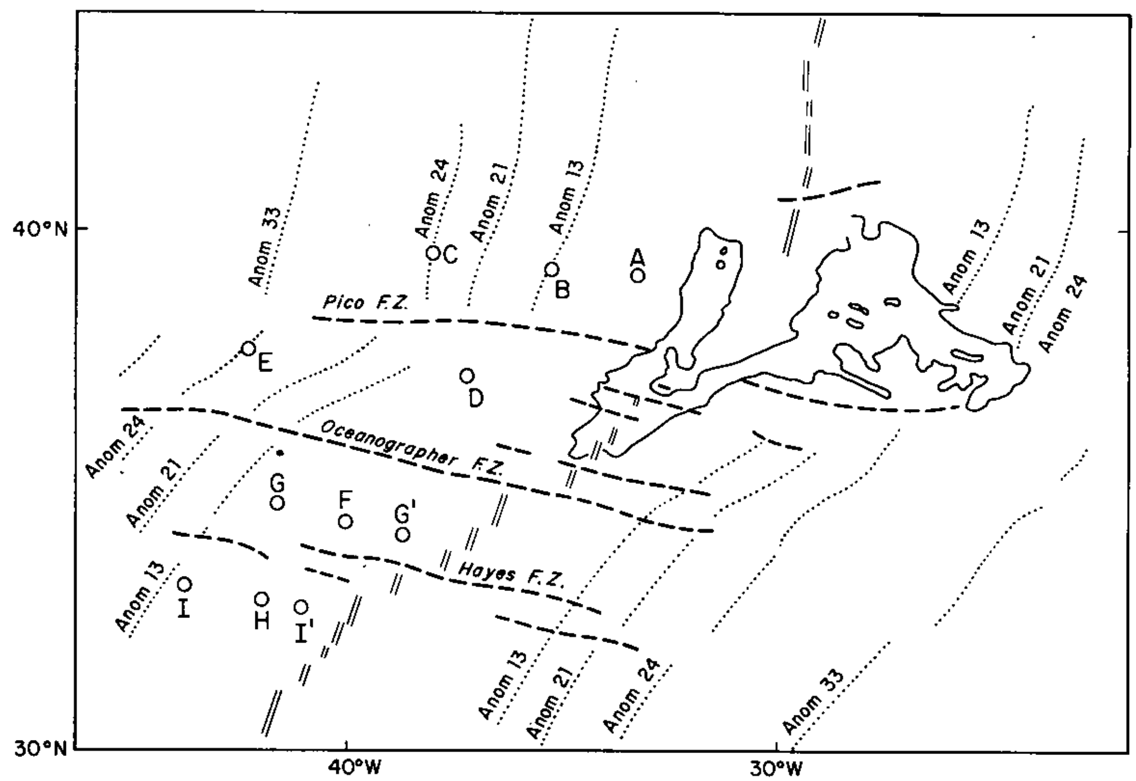

Figure PCOM-1. Possible Leg 82 sites.

penetration and continuous coring through sediment (as noted above).

During dicussion, J. Cann suggested that in view of the considerable interest in studying sites in the North Atlantic as part of the research possible seabed disposal of radioactive wastes, JOIDES should consider a "site of opportunity" on the Sohm Abyssal Plain (at about 56°W, 32°N, due west of OCP Site I). He noted that the Seabed Working Group would be grateful for any additional information about the physical properties, hydrogeology and nature of the sediments of that area. Cann suggested that by investing ± 3 days coring time here, funds for an additional two months of drilling might be found.

The PCOM viewed the idea as promising within the framework of normal drilling operations — particularly to the sedimentary petrologists and inorganic geochemists.

Co-Chief Scientists. The Planning Committee unanimously reaffirmed its recommendation that Henri Bougault and Steve Cande serve as Leg 82 co-chief scientists.

Site Survey. The *Charcot* may be in the region of the Hayes Fracture Zone during August of 1981 to supplement the site survey. The Ocean Crust Panel, however, is prepared to "make do" with the survey data currently available in the event that *Charcot* cannot conduct an additional survey.

Leg 83 (Costa Rica Rift)

Objectives and contingency plan. Leg 83 will revisit old Site 504 to drill deeply into the basement and penetrate a level of major velocity change. The good hole conditions at Site 504 provide an excellent opportunity to reach this objective and to conduct downhole experiments. Plans envision inclusion of two scientific teams, one to study hydrogeology and igneous petrology, and one to conduct the downhole measurements (packer experiments, downhole televiewing).

The Ocean Crust Panel and Hydrogeology Working Groups have recommended a contingency plan in case Hole 504B cannot be reentered, or should penetration be halted early on the cruise. (See Hydrogeology Working Group minutes elsewhere, this issue). The plan calls for drilling a series of "quick re-entry" sites in a 5-km grid around sites 501-504B. Drilling the holes would test the geochemical and thermal differences in the upflowing and downfl[...] parts of a hydrothermal convective cell i[...] area in an attempt to better identify a sour[...] enriched upwelling convective fluid to the [...] of Hole 501.

The Planning Committee addressed the po[...]bilities of contingency drilling for Leg 83 dur[...] a lively discussion. *Conrad* might be availa[...] (with Marc Langseth on board) to take heat-fl[...] measurements before the Leg 83 drilling. Su[...] measurements would greatly enhance the pr[...]posed (contingency) hydrogeology work, but th[...] drilling could go ahead without it. During discussion, PCOM members noted that each "quick re-entry" operation would take 8 to 9 days, and unless drilling at Hole 504 were abandoned completely, only two re-entry sites could be drilled. Also, at a cost of $50 thousand each, four reentry cones expended on a single leg for single-re-entry operations imposed unrealistic costs.

The Planning Committee viewed favorably a contingency plan to pursue science in the area of Hole 504 should drilling be abandoned prematurely at that site, but one not as firmly constrained as in the Hydrogeology Working Group plan. Winterer will ask the Ocean Crust Panel and cruise co-chief scientists for a realistic plan to use remaining time using the scientific staff present on board ship.

Co-chief scientists. The PCOM discussed the problem of appropriate co-chief scientists for Leg 83 at length. Following discussion and the OCP's recommendation that one co-chief scientist be an igneous petrologist and the other be a geophysicist, the PCOM asked that Jose Honnorez and Roger Anderson be invited to serve as co-chief scientists.

Leg 84 (Mid-America Trench)

Priorities. Leg 84 will return to the offshore Guatemala-Oaxaca area to learn more about the dynamics of accretion along a convergent margin. Objectives are virtually unchanged from Leg 67 on which drilling failed to reach deeper levels owing to the presence of gas hydrates (potential safety problem).

Site Survey. Reprocessed seismic profiler data show that a targeted structure penetrates the hydrate surface in at least one place and that targets can be located in valley areas at which drilling would not penetrate completely through the hydrate. No further site survey is required, b[...] the AMP would very [...] SEABE[...]

the area. The SEABEAM data would help locate sites in canyons and show physiographic features influencing site selection.

Co-Chief Scientists. Following discussion, and acting, in part, upon the Active Margin Panel recommendation to include Leg 67 scientists on the Leg 84 team, the PCOM asked that R. von Huene and J. Aubouin be asked to serve as co-chief scientists on Leg 84.

The PCOM also concurred with the AMP's recommendation that K. Kvenvolden be asked to join the shipboard party to oversee sampling and study of the gas hydrates.

Leg 85 (Equatorial Pacific)

Priorities. Leg 85, currently scheduled for March-April 1982, will sample (primarily) Neogene sediments with the hydraulic piston corer to advance understanding of Neogene climatic oscillations and patterns of carbonate dissolution.

The Ocean Paleoenvironment Panel has not met since the last PCOM meeting and so driling priorities remain the same as noted in the February 1981 JOIDES Journal.

Site Survey. JOI has awarded SIO the contract to conduct the site survey for the Equatorial Pacific drilling. E. Winterer reported that *Thomas Washington* will conduct SEABEAM and high-resolution seismic survey in the area in January of 1982. Two water guns will provide the source for a 2-channel digital seismic system. The survey should produce the results needed, but time is short — only 3 weeks — between completion of the survey and onset of Leg 85.

H. Beiersdorf reported that the Germans may conduct a high-resolution survey not far from the area of Leg 85 drilling. The PCOM viewed the possibility of complementary surveys as highly desirable and suggested that Winterer and Beiersdorf agree to work out details of coordinating their surveys.

Co-Chief Scientists. T. Moore; in part per discussions with R. Douglas, presented the PCOM with a list of possible co-chief scientists for Leg 85. The Ocean Paleoenvironent Panel has not met to address the question directly and availability of candidates is not known. The Planning Committee recognized DSDP's need for early designation of co-chief scientists and discussed capabilities required and the potential candidates. It recommended that DSDP review the entire list but made no specific recommendations.

Special Scheduling Consideratiions (Pacific Legs).

During discussion of the proposed Pacific drilling, PCOM members noted that the DSDP drilling schedule (appearing as page 1 in the June 1981 JOIDES Journal) contained ten more on-site drilling days for both Legs 83 and 84 than designated on the February PCOM schedule. Conversely, Leg 85 had lost ten on-site days. Recognizing the logistical problems in developing 51-day cruises with approximately equal on-site drilling time within the constraints imposed by high latitude drilling, the PCOM considered ways to budget more equally the actual science time among the Pacific legs.

Following considerable discussion, and in order to bring the amount of time available for on-site scientific operations into better equilibrium, **the PCOM recommend Legs 83 and 84 be given 40 and 39 on-site operations days, respectively.**

(The recommendation shaves five days from each of the Legs (83 and 84) as given in the DSDP schedule of 10 June 1981.)

In addition, the PCOM generally agreed that logging during Leg 85 might reduce the chance to realize **the primary objectives here.**

Members also discussed merits of drilling into basement at the equatorial Pacific sites and asked Winterer to consult with Fox and Douglas to work out a cooperative plan to core continuously two holes (on Leg 82) and to drill certain holes to basement (on Leg 85).

North Pacific

Background. Acting under instructions from the Executive Committee to work toward restoring a northwest Pacific leg in the 1981-83 *Challenger* schedule, E. Winterer called a special *ad hoc* meeting to review proposed north Pacific programs. The *ad hoc* North-Pacific-Review Group evaluated the drilling and its impact on the approved 1981-83 *Challenger* schedule at its recent meeting on 1-3 July 1981 at Menlo Park.

Ad hoc North-Pacific Review Group. Joe Creager reported for the *ad hoc* Review Joe Creager reported for Review Group, comprising members of the Active Margin and Ocean Paleoenvironment panels, plus Soviet and American proponents of North Pacific drilling. The group considered all currently viable possibilities for drilling in the North Pacific.

1. **The Shatsky Rise** — to investigate the origin, and past environments of the ridge and resolve whether the apparent thickened crust underlying the ridge is a result of volcanic emanations or of actual basement thickening by overthrusting. The Soviets also suggest that the oldest Pacific sediment could be drilled here. The proposal is to drill SH-1[1] on the crust of the rise to sample the upper part of the section, SH-2 and -2A on the lower flank to sample the lower part of the section and basement, and SH-3 adjacent to the rise to sample basement and basin sediments. (Members estimate 30 days to drill SH-1 into igneous crust.)

2. **Shirshov Ridge** — to recover a carbonate and siliceous sequence from a high latitude area for biostratigraphic study and to sample basement at possible subsided remnant arc.

3. **Sounder Ridge** — to resolve many questions about the tectonic history and paleo-oceanography of the North Pacific, including sampling Mesozoic sediments from what might be the highest (Mesozoic) latitude site remaining.

4. **Northwest Pacific Sites NW-3 through NW-8** — to test the climatic history during the Neogene onset of cooling and eventual glaciation (contained in the 1981-83 drilling proposal, but deleted from the schedule at the February 1981 PCOM meeting).

5. **Eastern Aleutian Abyssal Plain** — to resolve questions of America-Pacific plate motion, (e.g., where did the Zodiac fan come from?).

6. **Amlia Corridor** — to relate detailed geophysical data to actual stratigraphy to extract the knowledge of the history of the Aleutian arc-trench system.

The *ad hoc* review committee recommended assigning the following priorities: • Sounder Ridge (very high); • NW-3, -4 (very high); • NW-5 through NW-8 (very high); • E. Aleutian Abyssal Plain (high); • Shatsky Rise (high); • Amlia Corridor (high).

The group, however, emphasized that none of these targets has a priority higher than those given on the 1981-83 drilling schedule developed at the February PCOM meeting.

[1]SH = Shatsky Rise.

Planning Committee Resolution.

The PCOM discussed with interest the potential drilling targets in the NW Pacific noting many aspects of the proposals. Following extensive discussion of this difficult set of problems, that the Planning Committee adopted the following resolution:

The Planning Committee resolves that if a leg must be restored in the drilling plan in the NW Pacific for summer 1982, in response to the directive from the Executive Committee, this leg should be firmly based on the original paleoenvironental objectives for this area (Sites NW-3 through -8). However, the PCOM leaves the way open for reconsideration of the Soviet proposal for drilling a deep hole on the Shatsky Rise, provided that the following specific issues raised by PCOM are answered by the proponents:

1. **that magnetic anomaly determinations suggest basement age to be lower Cretaceous rather than Jurassic**
2. **that a site has already been drilled on top of the Shatsky Rise (305), and other sites have been drilled nearly**
3. **that, without successful technological innovations, such as proving of the extended core barrel, the interlayered cherts and chalks of the Shatsky Rise would give very poor recovery, and that the drilling would thus add little to results already available.**

The Planning Committee points out that these sites (NW-3 through -8) are lower in scientific priority than all other paleoenvironmental sites so far accepted for the 1981-83 drilling plan. The addition of a NW Pacific leg is found to impact unfavorably on the recommended drilling for the rest of the period 1981-83.

DARPA Program

Y. Lancelot reported on an *ad hoc* meeting held at SIO to review the proposed DARPA sites in the North Pacific. Originally set up by DARPA (L. Dorman, coordinator) the meeting, held at SIO, was ultimately attended by only one DARPA/NORDA representative (Al Ballard). Other attendees were R. Douglas (JOIDES), R. von Huene (JOIDES), Y. Lancelot (DSDP) and M. Peterson (DSDP).

The committee noted that of the four sites proposed by DARPA, areas 1a and 3 offered the greatest scientific potential, and area 2 the least scientific potential.

DARPA Area 1 – 42°N, 153°E
DARPA Area 1a – 41°N, 156°E
DARPA Area 2 – 47°N, 161°E
DARPA Area 3 – 48°N, 168.5°E

DARPA has selected areas best situated to receive seismic (natural earthquake) impulses but has also considered operational problems such as water depths, bottom currents, and sediment thicknesses. Bedded cherts in the section at Area 1 and 1a, however, may pose a drilling problem there.

As a result of the meeting, the *ad hoc* committee urged DARPA to conduct additional high-resolution, 3.5 KHz, and magnetic surveys in the area before final site selection is made.

Discussion. The Planning Committee, while maintaining its high interest in the scientific merits of the DARPA seismometer experiment, is concerned that lack of a more complete site survey will compromise attempts to obtain ancillary science as well as the primary objectives of the seismometer experiment itself. Although useful data could be obtained were the instrument coupled to sediments, best results could only result from instruments implanted in basalt. The PCOM is concerned that DARPA be more active now in ensuring selection of the best possible site.

Following discussion, the PCOM asked its chairman to solicit a complete report from DARPA containing a detailed plan of proposed operation. Copies of site survey data should be forwarded to J. Jones (Chairman, Site Survey Panel) and L. Garrison (Chairman, Safety Panel). As is the case for other proposed JOIDES drilling, if data are insufficient for appropriate

Long-Term Planning

Five-Year Plan

Background. E. Winterer submitted an introduction to, and outline for, the 5-year drilling proposal to the PCOM for review and comment. Working from various JOIDES panel and working group white papers, he developed the outline to parallel the topical organization of the Conference on Scientific Ocean Drilling. Although this topical organization does not correspond to the the JOIDES advisory structure, Winterer is able to "flesh out" the outline from material extracted and reorganied from the white papers.

The PCOM accepted the general outline as proposed with the addition of a part dealing with problem definition and required geological and geophysical studies.

Proposal Theme. In response to Winterer's request for direction on how to focus the proposal, members of the PCOM made the following comments and suggestions.

- For post-1983 planning a different JOIDES advisory panel structure – one parallel to the COSOD-type organization – might be preferable.
- In order to alleviate the continuing problem of insufficient time to plan adequate site-surveys, plan to submit a separate proposal to prepare regional site surveys and related geologic data preceding the actual term of drilling. That is, submit a proposal to conduct regional rather than simply site-specific surveys during 1983 in preparation for post-1983 drilling.
- Include discussion about drilling holes for purposes other than sampling, i.e., downhole experiments and emplantation of monitoring devices. With the potential development of wireline re-entry ("fly-in" operations) people from many institutions are considering ways to utilize previously drilled DSDP holes.
- Emphasize study of geologic processes *active* today, for example: (a) *diagenesis of sediments.* Viewing the evolution of a sediment pile as an uniform ongoing process, many stages of the sediment evolution can be sampled within the sediment pile. (b) *hydrothermal processes.* Focus on this major new initiative. Pore fluids in oceanic formations are more "explicit" than within land deposits; that is, the composition of sea water is known, so that there are fewer unknowns in studying hydrothermal processes and pore-water movements in marine than in land deposits.
- Stress integrated studies with time as a common denominator. Link the various "geologic histories" developing within various disciplines (e.g., oxygen isotope changes, magnetic polarity reversals, organic evolution, sea level changes) and look for causal relationships. The program theme is not just oceanography but global histories.

- Emphasize variance around the mean. Geologic history can be viewed in terms of conditions and processes operating more or less uniformly over large spans of time, and processes operating during transitional times. What are the variances during the "uniform" and transitional times?

- Develop 3-dimensional modelling. The structures, rocks and sediments of the ocean basins and their margins have a great deal of *lateral variability* and drilling to date has not begun to adequately explore this dimension. Focus drilling to the scale of lateral variability which now may be studied with the support of detailed bathymetric swath-type mapping.

- Discuss potential of deeper penetration. The PCOM, however, suggested caution here to avoid the disappointment of the early part of the IPOD drilling phase, when the ship was not technically able to reach deep objectives. Find special places (thin sediment, erosional windows, structural highs) to solve questions about the lower crust.

- Link proposed drilling to other important programs and transects. The ocean drilling is not being done in a vacuum, but in cooperation and coordination with other earth scientists.

- Fill in giant regional gaps which have not been drilled and which hold clues to major global tectonic processes and paleoenvironmental changes. For example, the now-closed Indonesian area has in the past been a gateway moderating bottom water flow and faunal distribution.

- Pull together the study of back-arc basins. Gather data to distinguish between the several fundamentally different back-arc basins and their tectonic significance, i.e., the captured-type of basin (Bering Sea?) versus the spreading-type basin. Deformed back-arc basins may form a large part of orogenic belts but their study has somewhat fallen in the crack between the interests of the Active Margin and Ocean Crust panels.

- Tie the ocean drilling to the active tectonic processes going on the continents today. Link volcanism, seismic activity on-shore to the adjacent sea (e.g., Gulf of California). The tectonic deformation of the offshore sedimentary prism provides clues to on-shore mountain building (neo-tectonics).

- Include a model drilling schedule with a "black-line" tract chart.

- Address the development of specific to solve particular scientific problems. DSDP engineers need specific directive regard to planned science to ensure adeq lead times for developing tools.

- In regard to technical problems, consi ways to increase berth space (either on drilling ship or by involvement of a ho ship) to provide staff for special programs.

On the basis of the discussion E. Winter will prepare a more detailed draft of the drillin proposal for review by the Executive Committee (August 1981). He will arrange to meet individually with Advisory Panel Chairmen as needed to get their panel ideas into the proposal.

Seabed Working Group Presentation

Roger Searle (Institute of Oceanographic Sciences at Godalming, U.K.) presented some background on the Seabed Working Group and introduced a plan for a possible cooperative program between the Working Group and JOIDES use *Glomar Challenger.*

Background

Organization. The Nuclear Energy Agency (NEA) is an agency of the Organization for Economic Cooperation and Development (OECD) of which the U.S., Canada, U.K., the Netherlands, France, Japan, and West Germany are members. Working under the Nuclear Energy Agency, the *Seabed Working Group* (SWG) is responsible for evaluating sites and developing possible systems for nuclear waste disposal on or below the sea floor. The Seabed Working Group has established an *Executive Committee* which coordinates the efforts of several *task groups*, including those for

a. Systems analysis — responsible for determining overall feasibility of a disposal system on the basis of rates of ionic transport, and levels of activity.

b. Sediment and rock analysis — studies the properties of sediments and rocks.

c. Site selection — tries to determine which areas of the ocean floor are *possible* candidates for nuclear waste disposal and oversees much of the survey work done in conjunction with seabed assessment. (R. Searle is chairman of

The Seabed Working Group has no specific budget or direct authority, but serves as a coordinating and planning body. Research is funded by the individual member countries and the Working Group holds a wide spectrum of opinion on research priorities and strategies.

Site Selection. The Site Selection Group uses existing geological data to determine whether or not a site qualifies for possible waste disposal. The type of information needed for site qualification includes:

a. a complete geologic sequence from late Pliocene to Recent to judge the degree of stability, i.e., the absence of faulting, erosion, volcanism, seismicity, and mass movements.

b. chemical property data such as natural diffusion rates, compositions of the water and solid phase, sorption coefficients, and Eh and pH data.

c. physical properties data including those for permeability, shear strength, cohesion, consolidation, density, porosity, pore-water movements and *in situ* pore pressures.

The depth to which data are required is still a matter of discussion within the SWG and depends upon several factors of which sediment type is probably most important. The Working Group, however, would like data to at least 100 meters and would hope to sample between 150 and 200 meters sub-bottom.

Targets. The Working Group has identified from regions for future studies (Central North Pacific, Western North Atlantic, Sohm Abyssal plain and the Eastern North Atlantic. In conjunction with any potential cooperative plan with JOIDES it favors collecting data from two sites on the distal end of the Sohm Abyssal plain (water depth 3000-5000 m). Extensive site survey work has already been done on the area and all proposed sites are in international waters. Sampling here with the hydraulic piston corer and the pressure core barrel to at least 70 meters sub-bottom would provide undisturbed samples for geotechnical or geochemical study. Data should include *in situ* shear-strength, temperature, and pore-water measurements.

In addition to the physical properties work, the program would provide an opportunity for detailed chemical analyses of the cores to resolve the chemical composition and possible origin of the red and green layers seen in sequence throughout the area. Scientific objectives include study of degree and type of lateral variations in the sediments, dynamics of sedimentation, detailed geochemistry, and detailed testing of physical properties.

Planning Committee Discussion

Dr. Searle's presentation evoked a lively discussion which focused on areas of overlap in scientific interest — in particular those overlapping the interests of the Sedimentary Petrology and Physical Properties, Inorganic Geochemistry, and Organic Geochemistry panels. The Passive Margin and Ocean Paleoenvironment panels would also have some interest in the targeted sites.

The Planning Committee noted it would consider any program primarily on the basis of its scientific merit and would avoid simply "selling legs" to special interest groups without regard to the science. The PCOM recognized certain logistical and philosophical problems in engaging in such a joint program. Those relating to special shipboard staffing and equipment, and special core handling could probably be resolved without too much difficulty.

The PCOM is also aware that disposal of nuclear wastes is an extremely sensitive subject and would want to proceed with caution to avoid any misunderstanding about the nature of the study. The JOIDES policy is that all cores and data collected during a cruise and all supporting site-survey data are fully available to the scientific community at large.

The PCOM encourages the Seabed Working Group to send drilling/coring proposals to the PCOM Chairman, who will send them to the various JOIDES panels (given above) and looks forward to continued discussions.

Additional (National) Interest in JOIDES Participation

Background

During its last (March 1981) meeting, the Executive Committee encouraged countries interested in joining JOIDES to send observers to the next Planning and Executive Committee meetings. Peter J. Cook (Chairman, Consortium for Ocean Geosciences of Australian Universities) and Jan Stel (Executive Secretary, Netherlands Council on Ocean Research) were present as observers at the PCOM meeting. (M. Keen, Canada, was unable to attend but planned to observe at the August Executive Committee meeting.)

Drs. Stel and Cook agreed to acquaint the Planning Committee with their respective country's interests in JOIDES.

The Netherlands

J. Stel reported that the Dutch government is actively stimulating oceanographic research and wants to take advantage of membership in cooperative international programs.

Members of the Dutch scientific community, industry and government met with representatives of JOI (W. Hay), JOIDES (E. Winterer), and NSF (P. Wilkniss) on 3 April 1981 to obtain information about the IPOD program and to discuss possibilities of membership.

The meetings demonstrated a serious interest by the Dutch governmental agencies in JOIDES participation and Stel hopes that the Dutch scientists will now demonstrate their unified support. For budgetary reasons, the Netherlands cannot join IPOD as a full member, however, and is investigating possibilities of forming a consortium.

Australia

P. Cook reported that an enthusiastic unified support for joining JOIDES exists amont scientists in his country. (Cook distributed copies of The future of scientific ocean drilling in the Australasian region, The Consortium for Ocean Geosciences Publication No. 1, eds., P. J. Cook, K. A. W. Crook and L. A. Frakes, April 1981.) Australian scientists had, in fact, been active in the Deep Sea Drilling effort prior to 1975, when initiation of IPOD reduced the number of shipboard berths available to people from non-member countries.

The Australian scientists are interested in a broad range of scientific objectives — those addressing global problems and not merely those of a more regional interest.

The Consortium for Ocean Geosciences of Australian Universities is, at the moment, the point of contact and the driving agency for Australian involvement in IPOD. It is working closely with industry and government agencies. Industry has now designated a representative to liaise with COGS. Further discussion between COGS, industry represenntatives and the Director of the Bureau of Mineral Resources (BMR), are likely to be held in the near future. The BMR would probably be the Australian member agency if Australia goes ahead with membership. A Senate committee has recently endorsed Australian membership; it will still be some time (mid-1982), however, before any commitment is made, though it should be evident before then whether or not there is a good chance of Australia becoming a member.

With regard to membership, provided adequate funding can be obtained, Australia prefers the option of full membership. At this early stage, however, the possibility of a consortium approach is certainly one which the Australians would like to keep as an additional option.

Other Interested Nations

W. Hay noted that Norway has shown a definite interest in joining IPOD. The Scandinavian countries might consider forming a consortium. Switzerland is also interested in membership, but cannot afford full membership. E. Winterer will visit Jorn Thiede in Oslo immediately following the PCOM meeting to discuss Norwegian membership.

Discussion. The Planning Committee agreed that a way to encourage Australian participation is by further liaison through continued observation at Planning Committee meetings and by inclusion of individual Australian scientists on JOIDES panels.

In response to a question from P. Cook, members of the PCOM noted that JOIDES could probably absorb two new members without creating large changes in the amount of shipboard participation/science by member countries. Addition of more than two members, however, would likely require renegotiation of existing agreements.

* * *

Panel Chairmen: Please keep the JOIDES Office apprised of changes in working group membership.

Panel Reports to the Planning Committee

(See also Panel reports appearing under separate headings below. Ed.)

Ocean Crust Panel

J. Corliss reported for the Ocean Crust Panel. The OCP last met 30-31 March and 1 April 1981 at the University of Rhode Island. Items pertaining to Legs 82 and 83 drilling and future planning are reported under separate headings.

Items of panel business included:

a. The Ocean Crust Panel identified alternative sites in the Eastern Atlantic should weather make drilling the North Atlantic sites (Leg 82) impossible.

b. The OCP views the PAC-A-BERS proposal as a potentially rewarding scientific program, but one still at a formative stage, and one which would probably require two legs to resolve the questions proposed. It views the proposal as an excellent program to be developed for the post-1983 drilling.

c. P. Robinson told the Ocean Crust Panel about a program to drill several holes on the Troodos ophiolite. The Troodos drilling will be undertaken by an international group including Canada, U.S., Denmark, U.K., Germany, France, and Cyprus. The level of funding has been agreed upon (at least the initial funding basis) and drilling should start in the spring of 1982. Seven shallow holes will sample the ore deposits and test hydrothermal circulation systems. The OCP is enthusiastic about the prospects of drilling around known sulfide deposits to develop a 3-dimensional model of sulfide formation.

d. The Ocean Crust Panel stresses that for the hydrogeology leg in the Pacific to be successful, heat flow, SEABEAM, deep tow, and pore water chemistry data must be coordinated beforehand.[1]

[1] JOI has contracted with SIO, L-DGO, and URI (joint program) to collect these data as part of the site survey program.

Active Margin Panel

J. Creager reported for the Active Margin Panel, which last met 7-9 April 1981 at USGS in Menlo Park. Items pertaining to the North Pacific drilling are discussed above in North Pacific Drilling.

Items of panel business include:

a. The AMP is very interested in drilling off Peru and gives it high priority for drilling after 1983. Apparently, political problems would not prevent drilling here, but the area would need to be surveyed.

b. The Panel was enthusiastic about the success of the Barbados drilling on Leg 78A during which the bit penetrated to the zone of decollement between the converging plates. Leg 78A scientists believe that the failure to reach basement was more a technical than a geological problem (the bit release failed to disengage the casing). The AMP gives drilling in the Barbados region high priority and asks that it be considered a "target of opportunity," during the current program.

c. The order of priorities for the Nankai Trough and Japan Trench *should* have appeared in the AMP minutes and JOIDES Journal (June 1981, p. 65) as:

1. NK-2B
2. NK-1B
3. JT-13A and -13B
4. NK-4A
5. NK-3A

This now comes out as a 51-day program.

d. The AMP reviewed the PAC-A-BERS (Pacific, Aleutian, Bering Sea) proposal during its April meeting, and an *ad hoc* group reviewed it again during an early July meeting. The AMP viewed the PAC-A-BERS science as quite exciting and recognizing that the proposal cuts across the interests of the established panels, asks JOIDES not to let it "fall in a crack." The AMP considers the proposal an excellent target for drilling during 1983-88.

Passive Margin Panel

W. Bryant reported for the Passive Margin Panel, which last met 18-20 June at the University of Delaware. Items pertaining to Leg 81 drilling priorities and long-term planning are incorporated in discussion of those topics, above.

Items of panel business included:

a. The Passive Margin Panel (PMP) urges the Planning Committee to reinstate a *Gulf of Mexico leg* into the 1982-83 schedule.

b. Dave Prior (LSU) gave a presentation to the PMP on slumps along the margin. The Panel resolved to establish a *Slumps Working Group* to document suitable drill sites. Members would possibly include B. McGregor (USGS), D. Prior (LSU), R. Bennett (NOAA), and W. Bryant.

E. Winterer asked the group to communicate with the Sedimentary and Petrology and Physical Properties Panel, which is also interested in problems of mass movement.

c. The PMP has also suggested the names of several (at least 12) people to form a *Submarine Fan Working Group.*

d. In view of poor recovery with the hydraulic piston corer during Leg 79 and the great importance of the work on fans, the PMP asked DSDP to upgrade the *HPC to better sample sandy sediments.* This capability will be needed in the Middle America Trench (Leg 84).

e. B. Tucholke presented results of a recent ENA-3 site survey. The PMP strongly supports drilling *ENA-3* because of its multidisciplinary aspects and potential to add knowledge about the development of the ocean on a global scale. It assigns drilling at ENA-3 "highest priority."

Discussion. The Planning Committee felt uncertain as to the order of Passive Margin Panel drilling priorities, but noted its probable objectives as (1) Gulf of Mexico (highest priority), (2) New Jersey Transect (very high priority), and (3) ENA-3 (high priority). W. Bryant will solicit a more clearly differentiated sequence of priorities from the panel for the next Planning Committee meeting.

Downhole Measurements Panel

W. Bryant reported for the Downhole Measurements Panel which last met 30 April-1 May 1981 at the Hawaii Institute of Geophysics.

Panel business included:

a. M. Salisbury (DSDP) presented an update on logging data acquired through Leg 78A.

b. Salisbury reported that the downhole experiments and the DARPA/NORDA experiments on Leg 78B were very successful. The shipboard team collected a complete suite of logs and although the quality of the data through enlarged sections of the hole was somewhat poor the data overall were excellent. The Soviet downhole nagnetometer and USGS televiewer were also run successfully.

c. F. Duennebier demonstrated the HIG ocean bottom seismometer (OBS).

d. The panel spent one day of the meeting preparing a white paper for future planning.

Stratigraphic Correlations Panel

J. Creager reported for the Stratigraphic Correlations Panel which last met 6-8 May 1981 at Scripps Institution of Oceanography.

Panel business included:

a. The SCP produced a white paper recommending drill sites for the post-1983 program.

b. Pavel Cepek has completely encoded published data on Cretaceous nannofossils, radiolarians, and diatoms. Foraminifer and diatom data are partially encoded. The DSDP paleontologic data base (Tertiary) is complete through Leg 44.

c. The SCP is deeply concerned about the quality of the paleontologic data in the *Initial Reports,* especially the lack of data on preservation, abundance, and range for species described. Although these data are critical to understanding the distribution of species throughout wide areas as well as the interpretation of CCD levels, the SCP determined that 40 per cent of the paleontologic papers published in recent Initial Reports contained no abundance data, an additional 35 per cent had undefined abundance data; only 25 per cent of the contributions had adequately defined abundance data.

Planning Committee Recommendation. Following discussion, the PCOM unanimously passed a motion **asking DSDP to ensure that each paleontologic report appearing in the Initial Reports of the Deep Sea Drilling Project includes range charts giving preservation and abundance data for each faunal assemblage and abundance data for each recorded species as outline below. Manuscripts which do not contain these data are subject to rejection.**

Preservation: good (G), moderate (M), poor (P).

An example of defining abundance is,

R = less than 3% of samples
F = 3% - 15%
C = 15% - 30%
A = over 30%

Other schemes could be used so long as the relative abundance designators are *defined.*

d. Per a report to the SCP by W. Riedel and J. Saunders, six **Microfossil Reference Centers** have been designated: Basel, SIO, New Zealand, Japan, L-DGO, and the Institute of Paleontology of the Academy of Sciences in the USSR. The addition of L-DGO to the list is made with the understanding that a reference center there would not pre-empt another one on the U.S. east coast at an established curatorial institution.

The Stratigraphic Correlations Panel recommended that travel funds be made available to Riedel and Saunders to coordinate operations between the repositories and to help get them operational. Travel funds would be required for three trips for W. Riedel (to New Zealand, Basel, and the Soviet Union) over a period of 3-1/2 years.

The Planning Committee viewed favorably the plan to put the coordination and development of microfossil reference centers in the hands of Riedel and Saunders and approved the course of action set forth in the Riedel/Saunders report of 5 May 1981 provided that the reference centers are endorsed by the respective nations and assuming the availability of travel funds through JOI, Inc.

Site Survey Panel

J. Jones reported for the Site Survey Panel, which met 12-13 March (European members) and 14-15 May 1981 (full meeting at L-DGO). Items of panel business included:

a. JOI has recently awarded site survey contracts for three areas: Equatorial Pacific (SIO), Western Pacific (HIG and SIO), and Pacific Hydrogeology (URI, SIO and L-DGO)

During the May meeting R. Sheridan objected to the re-allocation of funds originally designated for survey of ENA-8 to finance the surveys listed above, saying such action would discourage site-survey groups from future participation. Funds were diverted owing to the reduction of ENA-8 to a contingency site targeted for drilling much later in the program.

b. Site surveys may be available from member countries as follows:

France. *Jean Charcot* can possibly conduct a SEABEAM survey across the Hayes Fracture Zone in August of 1981.

Charcot has conducted a survey (SEABEAM, magnetics, 3.5 KHz seismic) off Mexico and Guatemala and has also made two traverses from the East Pacific Rise to Tahiti which are available to supplement the Pacific hydrogeology data.

Japan. The Japanese (JAPEX) have conducted many multichannel surveys in the Japan Trench and Nankai Trough. The survey data show several areal features such as offsets of the trench structure, a subsiding seamount and accretionary imbricate structures at the toe of the landward wall of the Nankai Trough. (The Active Margin Panel has given the Japan Trench high priority for drilling during the 1981-83 program.)

Germany. The Germans have surveyed the OPP Site 8 (North Atlantic paleoenvironment transect) and have undertaken surveys in the equatorial Pacific (EQ-7-8), Southwest Pacific (SW-7).

United Kingdom. The U.K. will be operating their GLORIA system from a chartered vessel in the summer and fall of 1981 in the area of the north Atlantic paleoenvironment transect (OPP sites 1, 5, 6 — sites near the Azores have already been covered extensively with GLORIA single and multichannel lines). Two of the most northerly OCP (mantle heterogeneity) sites could possibly be surveyed at this time.

c. The status of site surveys for proposed dilling is:

Leg 82 (North Atlantic mantle heterogeneity) — possibility of surveys by *Charcot* and I.O.S.

(GLORIA survey). S. Cande is reviewing existing data and OCP feels drilling can go ahead without additional surveys, if necessary.

Leg 83 (Costa Rica Rift) — no additional survey is needed.

Leg 84 (Middle America) — no additional survey is required. The panel recommended additional reprocessing of UTMSI multichannel data and noted that SEABEAM data would be very helpful.

Leg 85 (Equatorial Pacific) — will be surveyed by *Thomas Washington* (SIO) in January 1982. E. Winterer will maintain close contact with R.

Douglas to ensure all OPP survey requirements are met.

Leg 86[1] **(DARPA seismic experiment)** — The Site Survey Panel needs specific requirements for site survey in conjunction with proposed attempt to emplant a downhole seismometer.

Leg 87[1] **(North Pacific)** — The Executive Committee has recently re-inserted a north Pacific leg in the program, but the location of specific sites has not been resolved. The Site Suvey Panel places highest priority on ensuring the north Pacific sites are adequately surveyed.

Leg 88[1] **(Japan Trench)** — no additional survey required.

(Old Pacific)[2] — The survey will be conducted by the Hawaii/Scripps group per contract recently awarded by JOI.

(Southwest Pacific) — Single- and multichannel records are available from F.R.G. and HIG. L-DGO has 3.5 KHz records available from this region. No further survey is needed.

(Hydrogeology) — JOI has contracted with URI, SIO, L-DGO to conduct the hydrogeology surveys.

(East Coast Passive Margin, ENA-3) — no additional survey data are needed.

(North Atlantic Paleoenvironments) — The F.R.G. and U.K. plan survey of at least three of the proposed sites. E. Winterer will ask the site proponents to draw up specifications for the site survey; the panel recommends funding be found for surveying OPP Sites 4, 5 and 6.

Neither the **New Jersey transect** nor **northwest Africa** require additional site survey.

The Site Survey Panel supports funding for detailed high-resolution surveys in the *Gulf of Mexico* scheduled for drilling toward the end of the FY 1981-83 program.

d. Personnel at the IPOD data bank are moving ahead with compiling the 1975-78 site surveys for publication. The first volume will contain site surveys over the central Atlantic.

The Planning Committee discussed a suitable form and the mechanics of its publication. One possibility is publication in hard cover in the same format as the Initial Report series and produced (camera-ready-copy) by Deep Sea Drilling. Some members of the Planning Committee supported publication in the "blue book" format; others suggested a similar, but slightly different format, confining the blue book style to actual cruise reports. Any additional production efforts by DSDP would, of course, take time away from production of the Initial Reports.

The PCOM reached no specific conclusion, but asked Y. Lancelot to review the alternatives and recommend a manner of its production/-publication at the next PCOM meeting.

Discussion. The Site Survey Panel is actively working to promote better communications between itself and other panels and site proponents.

The lead time for planning a site survey is two years; drilling targets must be defined well in advance of actual drilling. D. Hayes also urged a broader view toward surveys — one addressing a more regional plan to allow better site selection and regional correlation after the drilling rather than one made simply to satisfy a Safety Panel review.

D. Hayes and E. Winterer will encourage proponents to think realistically about what surveys are truly needed and work closely with the site survey panel to ensure the appropriate surveys are run.

The SSP also recommends meeting more frequently to tighten liaison and hopes to schedule its next meeting for December 1981.

Pollution Prevention and Safety Panel

Although not in attendance at the last Safety Panel meeting held at Woods Hole on 21-22 May 1981, E. Winterer summarized the results of that meeting for the Planning Committee.

The Safety Panel reviewed the sites for the New Jersey transects. Most sites were approved as proposed. The Panel recommended site NJ-2 be moved upslope to shot point 1030 (USGS Line 34) where the upper part of the section outcrops on a canyon. (The proposed site was deemed unsatisfactory because hydrocarbons could have migrated from a potentially productive reef up known faults to the site.) Drilling the New Jersey transect has been postponed until late 1983.

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[1]See revised schedule elsewhere in this issue for revised Leg numbers.

[2]The schedule beyond Leg 88 is more poorly defined. Leg numbers have not been assigned and appear variously on various documents.

J. Fox briefed the Panel on proposed Leg 82 (mantle heterogeneity) drilling at sites. Encountering hydrocarbons at these oceanic sites is unlikely and the panel will review them by mail.

Hydrogeology Working Group

The Hydrogeology Working Group met at the Baltimore AGU meeting in April 1981. E. Winterer relayed items from that meeting contained in a memorandum from R. Anderson to E. Winterer.

The Hydrogeology Working Group made several recommendations regarding downhole logging experiments and logging tools including (a) support for a Becker large-scale resistivity experiment (b) acquisition of a high-temperature logging tool, (c) 7-conductor logging cable, van encoder for certain legs, and (d) design and inplementation of wireline heave compensator, and (e) use of the drillstring heave compensator when the packer is used. The Working Group asks DSDP to report on what logging equipment and tools will be available on which future legs (esp. Legs 83, 85, 86, 88, 89 and 91[1]).

Suggested contingency plans for Leg 83 (Costa Rica Rift) drilling are discussed under Upcoming *Challenger* Drilling, above.

Other Panel Related Business

In response to queries from various panel and working group chairmen and in view of the ongoing *Challenger program*, E. Winterer noted that he would encourage additional panel meetings as necessary to ensure adequate liaison and planning. Panel chairmen are reminded to request meetings in writing 3.5 months in advance of the proposed date. The letter of request must include proposed dates and location, a tentative agenda, and names of attending members and proposed guests. Requests for working group meeting not involving Soviet scientists can be made 1.5 months in advance.

[1]Leg numbers per DSDP schedule of 14 May 1981.

Future Meetings

The Planning Committee will next meet,

11-13 November 1981
Salishan Meeting Center
Salishan Lodge
Gleneden Beach, Oregon —
(near Oregon State University at Corvallis)
(John B. Corliss — Coordinator)

23-26 February 1982
Miami, Florida
(Wolfgang Schlager — Coordinator)

7-9 July 1982
International Institute for
Mineral Resources Development
Fujinomiya, Japan
(Kazuo Kobayashi — Coordinator)

POLLUTION PREVENTION AND SAFETY PANEL

Louis E. Garrison, Chairman

The Pollution Prevention and Safety Panel (PPSP) last met 21 and 22 May at Woods Hole Oceanographic Institution to review the New Jersey transect sites.

Safety Review, New Jersey Transect

The New Jersey transect sites lie on the Atlantic slope and rise off the State of New Jersey. They were to have been drilled during Leg 82 but, owing to schedule changes, drilling was postponed to a later time. The Safety Panel reviewed these sites as planned inasmuch as review preparations were already completed and it deemed the extra time as useful, should the U.S. Geological Survey require a drilling permit. Mr. Richard Krahl, Conservation Manager for the Eastern Atlantic Region, attended the Safety Review as an observer to facilitate communication with the U.S.G.S.

The JOIDES Safety Panel recommendations for the New Jersey sites are as follows:

NJ-1: Approved as proposed.

NJ-2: The proposed site is unsatisfactory because hydrocarbons have possibly migrated up-dip along demonstrable faults from the potentially productive Cretaceous "reef" into the Tertiary beds to be penetrated. The Panel therefore recommends that the site be moved to a new location at S.P. 1030 on U.S.G.S. Line 34 near which the upper part of the section crops out in a canyon. The Panel further recommends that penetration be no deeper than to the mid-Eocene reflector at 2.38 sec. which appears to be near the base of the outcrop.

The Panel indicated that the depth restriction might be reconsidered if proponents could show that the lower part of the Tertiary section cropped out nearby, or could demonstrate a structurally low position in the non-outcropping section.

NJ-3: The site is approved provided the down-dip NJ-4 site is drilled first and no evidence of migrating hydrocarbons is found in the NJ-4 Eocene-Paleocene section. (One panel member disapproved drilling NJ-3 under any conditions.)

NJ-4: Approved as proposed.

NJ-5: Approved as proposed for a total penetration of 400 meters. The Panel urges the shipboard party to collect a complete suite of logs to add to the meager knowledge of gas hydrate occurrences and to increase the safety in future hydrate drilling.

NJ-6: Approved as proposed. A slight possibility exists that the bottom-simulating reflector at NJ-5 extends up-dip as far as NJ-6, but is masked by interfering reflections. The Panel therefore recommends that as an extra precaution at NJ-6 at last two cores be taken in the pressure core barrel in the upper 300 meters and checked for evidence of hydrated gas. If such should be found, drilling should be terminated. If the pressure core barrel is inoperative, the conventional cores in this section should be examined with extreme care for any evidence of clathrates or greater than normal volumes of gas.

NJ-7: Approved for hydraulic piston coring (HPC) to refusal.

Safety Review, Leg 82

The proposed Leg 82 sites are as shown in Table PPSP-1.

The JOIDES Safety Panel reviewed the sites proposed for Leg 82 following the May meeting and found no undue safety risk at any of the listed locations. Because the region is underlain by young oceanic crust with only a thin cover of pelagic sediment, the panel did not deem it necessary to convene to examine the data. The usual safety review package was assembled and sent to each Panel member, with subsequent opinions being collected by mail and telephone.

Table PPSP-1. Proposed Leg 82 Sites

Site	Anomaly Number	Lat. (°N)	Long. (°W)	Depth (m)	Sediment Thickness (m)
MAR-1	6	38.5	33	2200	500
MAR-2	13	39	35	4000	700
MAR-3	24	39	38	4725	600
MAR-4	13	37.5	37	3900	400
MAR-5	24	37.5	40	4300	600
MAR-6	5	34.3	38.5	2900	400
MAR-7	6	34.5	39.9	3400	500
MAR-8	13	34.9	41.2	3800	600
MAR-9	5	33.4	40.8	3000	200
MAR-10	6	33.7	42.2	3900	400
MAR-11	13	33.9	43.9	4200	400

The Leg 82 proponents have also requested safety approval to make their final locations "up to 50 km away from locations proposed" owing to the scarcity of site-specific data. Under these circumstances of mid-ocean drilling, the panel saw no increased risk in allowing the final location to be selected at sea. It recommends, however, that all locations, as well as site conditions, be communicated to the appropriate people at DSDP as soon as they are known.

The Pollution Prevention and Safety Panel will next meet 5-6 November 1981 at Scripps Institution of Oceanography to review the Leg 84 sites (mid-America Trench) and the DARPA northwest Pacific data.

* * *

Panel Chairmen: Remember to send copies of your panel minutes to the JOIDES Office. Also please submit a summarized or extracted version of the minutes for inclusion in the JOIDES Journal.

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