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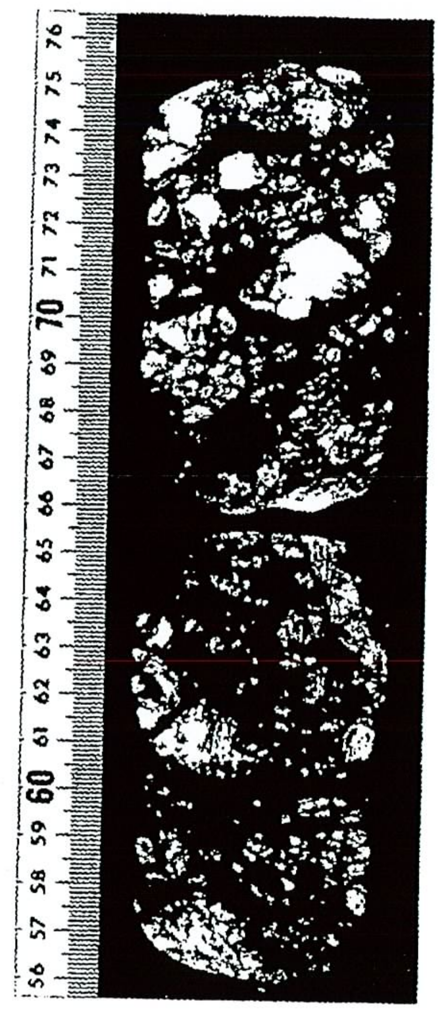

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WOODS HOLE OCEANOGRAPHIC INSTITUTION

Leg 84 co-chief scientists Roland von Huene and Jean Aubouin examine a piece of massive gas hydrate recovered from Site 568; the hydrate sample is unusual in being large enough for visual study in the laboratory. The Leg 84 team succeeded in recovering hydrates from three sites and in detecting, on the basis of chemical analyses, gas hydrate at two additional sites.

Cover: Pieces from a 1-meter long recovered section of massive gas hydrate in Pliocene sediments about 250 meters below the seafloor at Site 570. The site is on the upper slope of the Middle America Trench in about 1700 meters of water off Guatemala. Logs show the massive hydrate interval is 3 or 4 meters thick, with sound velocities of more than 3 km/s and a density of about 1 g/cc.

TABLE OF CONTENTS

VOL. VIII, NO. 2, JUNE 1982

TENTATIVE GLOMAR CHALLENGER SCHEDULE, LEGS 85-91[1]

Leg	Departs	Departure Date	Total Days	Days Opers.	Days Steaming	Terminates at	Arrival Date	Port Days	Re-entry	Objective
85	Los Angeles, Cal.	8 Mar 82	55	31	24	Honolulu, Hawaii	2 May 82	3	No	Equatorial Pacific Paleoenvironment
86	Honolulu, Hawaii	5 May 82	45	25	20	Yokohama, Japan	19 Jun 82	5	No	NW Pacific Paleoenvironment
87A	Yokohama, Japan	24 Jun 82	33	30	3	Yokohama, Japan	29 Jul 82	1	No	Nankai Trough
87B	Yokohama, Japan	29 Jul 82	21	18	3	Hakodate, Japan	18 Aug 82	3	Yes	Japan Trench
88	Hakodate, Japan	21 Aug 82	32	22	10	Yokohama, Japan	22 Sep 82	14	Yes	DARPA — Drydock
89	Yokohama, Japan	6 Oct 82	48	34	14	Rabaul, New Guinea	23 Nov 82	5	Yes	Old Pacific Paleoenvironment
90	Rabaul, New Guinea	28 Nov 82	43	28	15	Wellington, New Zealand	10 Jan 83	0.5	No	SW Pacific Paleoenvironment
	Wellington, New Zealand	10 Jan 83	--	--	11	Papeete, Tahiti	21 Jan 83	5	--	Transit
91	Papeete, Tahiti	26 Jan 83	55	33	22	Balboa, Panama	22 Mar 83	5	Yes	Hydrogeology

[1]Compiled 13 May 1982.

SHIPBOARD SCIENTIFIC PARTIES

Leg 85

L. Mayer	Co-chief scientist	USA - University of Rhode Island
F. Theyer	Co-chief scientist	USA - University of Hawaii
E. Thomas	DSDP representative/ paleontologist (foraminifers)	USA - Scripps Inst. of Oceanography
T. Saito	Paleontologist (foraminifers)	Japan - Yamagata University
J. Barron	Paleontologist (diatoms)	USA - U.S. Geological Survey
A. Pujos	Paleontologist (nannofossils)	France - Universite de Bordeaux
C. Nigrini	Paleontologist (radiolarians)	USA - Scripps Inst. of Oceanography
D. Dunn	Sedimentologist	USA - University of Rhode Island
S. Hills	Sedimentologist	USA - Scripps Inst. of Oceanography
I. Jarvis	Sedimentologist	UK - City of London Polytechnic
N. Pisias	Sedimentologist	USA - Oregon State University
P. Stout	Sedimentologist	USA - Scripps Inst. of Oceanography
T. Handyside	Organic geochemist	UK - The University Newcastle upon Tyne
N. Weinreich	Paleomagnetist	FRG - Ruhr-Universität Bochum
R. Wilkens	Physical properties specialist	USA - Mass. Inst. of Technology

Leg 86

L. Burckle	Co-chief scientist	USA - Lamont-Doherty Geol. Observatory
R. Heath	Co-chief scientist	USA - Oregon State University
A. Wright	DSDP representative/ sedimentologist	USA - Scripps Inst. of Oceanography
N. Lenotre	Sedimentologist	France - Centre Oceanologique de Bretagne
R. Jacobi	Sedimentologist	USA - SUNY at Baffalo
L. Krissek	Sedimentologist	USA - Oregon State University
T. Janecek	Sedimentologist	USA - University of Michigan
S. Monechi	Paleontologist (nannofossils)	USA - Scripps Inst. of Oceanography
I. Koizumi	Paleontologist (diatoms)	Japan - Osaka University
J. Morley	Paleontologist (radiolarians)	USA - Lamont-Doherty Geol. Observatory
A. D'agostino	Paleontologist (foraminifers)	USA - Atlantic Richfield Co.
U. Bleil	Paleomagnetist	FRG - Ruhr University
P. Schultheiss	Physical properties specialist	UK - Inst. of Oceanographic Sciences
K. Horai	Heatflow specialist	USA - Lamont-Doherty Geol. Observatory

Leg 87A

H. Kagami	Co-chief scientist	Japan - Ocean Research Institute
D. Karig	Co-chief scientist	USA - Cornell University
W. Coulbourn	DSDP representative/ sedimentologist	USA - Scripps Inst. of Oceanography

J. Charvet	Sedimentologist	France - Université D'Orleans
N. Lundberg	Sedimentologist	USA - University of Calif., Santa Cruz
A. Smith	Sedimentologist	UK - University of London
C. Stein	Sedimentologist	USA - Sandia Laboratories
A. Taira	Sedimentologist	Japan - Koichi University
M. Lagoe	Paleontologist (foraminifers)	USA - Atlantic Richfield Co.
T. Lang	Paleontologist (nannofossils)	USA - Florida State University
G. Lombari	Paleontologist (radiolarians)	USA - University of Rhode Island
C. Bray	Physical properties specialist	USA - Cornell University
H. Kinoshita	Physical properties specialist	Japan - Chiba University
T. Machihara	Organic geochemist	Japan - Japan National Oil Corporation
P. Mukhopadhyay	Organic geochemist	FRG - Inst. of Oil and Organic Geochemistry

Leg 87B

H. Kagami	Co-chief scientist	Japan - Ocean Research Institute
D. Karig	Co-chief scientist	USA - Cornell University
W. Coulbourn	DSDP representative/ sedimentologist	USA - Scripps Inst. of Oceanography
J.-P. Cadet	Sedimentologist	France - Université D'Orleans
K. Fujioka	Sedimentologist	Japan - Ocean Research Institute
J. Leggett	Sedimentologist	UK - Imperial College of Science and Technology
R. Matsumoto	Sedimentologist	Japan - Geological Institute
C. Stein	Sedimentologist	USA - Sandia Laboratories
M. Lagoe	Paleontologist (foraminifers)	USA - Atlantic Richfield Co.
T. Lang	Paleontologist (nannofossils)	USA - Florida State University
G. Lombari	Paleontologist (radiolarians)	USA - University of Rhode Island
C. Bray	Physical properties specialist	USA - Cornell University
N. Niitsuma	Physical properties specialist	Japan - Shizuoka University

Leg 88

F. Duennebier	Co-chief scientist	USA - Hawaii Institute of Geophysics

Leg 89

R. Moberly	Co-chief scientist	USA - Hawaii Institute of Geophysics
S. Schlanger	Co-chief scientist	USA - Northwestern University

Leg 90

J. Kennett	Co-chief scientist	USA - University of Rhode Island

Leg 91

M. Leinen	Co-chief scientist	USA - University of Rhode Island

GLOMAR CHALLENGER OPERATIONS

CRUISE SUMMARY

Leg 84 - Middle America Trench[1]

Leg 84 began 11 January in Balboa, Panama, and ended 3 March 1982 in Long Beach, California. Operations comprised coring at 11 holes at six sites in the Middle America Trench off Costa Rica and Guatemala.

General Setting and Objectives

The Middle America Trench was first drilled off Oaxaca, Mexico during Leg 66 and later off Guatemala during Leg 67. The results of the two legs across the same trench, however, seem to be contradictory. The scientists of Leg 66 emphasized the evidence for accretion, whereas the Leg 67 scientists emphasized the lack of any such evidence. Inasmuch as the results of Leg 67 were based primarily on the one site that penetrated slope sediment, arguments for a non-accretionary model were not completely convincing. (Attempts to sample basement at three other Leg 67 sites had been halted by the recovery of gas hydrate.) Through subsequent geophysical study, however, the Leg 84 proponents were convinced that basement could be drilled safely at several sites off Guatemala.

On Leg 84 we hoped to complete the objectives not met on Leg 67 and to strengthen the tie between onshore and offshore geology. Thus our major objectives were (1) to establish the age and structure of the continental framework that forms the landward slope of the trench off Guatemala, and (2) to study the origin and occurrence of gas hydrate in the marine environment. This required sampling slope deposits to basement without penetrating through the base

[1]Abridged from a preliminary Leg 84 report prepared by Jean Aubouin, Roland von Huene (co-chief scientists), Robert J. Arnott, Miriam Baltuck, Jacques Bourgois, Mark V. Filewicz, Roger Helm, Keith A. Kvenvolden, Barry Lienert, Thomas J. McDonald, Kristin McDougall, Yujiro Ogawa, Elliott Taylor, and Barbara Winsborough.

Table 84-1. Leg 84 Coring Summary

Hole	Dates (1982)	Latitude, Longitude	Water Depth[1] (m)	Sub-bottom Penetration (m)	No. of Cores	Meters Cored	Meters Recovered	Per Cent Recovery
565	13-19 Jan	09°43.69'N, 86°05.44'W	3099	328.3	34	328.3	287.28	88
566	24-25 Jan	12°48.34'N, 90°41.79'W	3745	55.8	9	55.8	21.46	38
566A	25 Jan	12°47.91'N, 90°41.99'W	3826	7.0	1	7.0	0.12	2
566B	25-26 Jan	12°48.81'N, 90°41.50'W	3661	49.0	0	0.0	0.00	0
566C	26-29 Jan	12°48.84'N, 90°41.53'W	3661	136.6	7	65.8	5.82	9
567	29-30 Jan	12°42.96'N, 90°55.99'W	5500	195.5	2	19.4	0.64	3
567A	30 Jan-7 Feb	12°42.99'N, 90°55.92'W	5500	501.0	29	263.4	103.68	39
568	8-12 Feb	13°04.33'N, 90°48.00'W	2010	417.7	44	417.7	308.40	74
569	12-15 Feb	12°56.31'N, 90°50.35'W	2744	250.7	27	250.7	134.83	54
569A	15-17 Feb	12°56.22'N, 90°50.81'W	2795	364.9	11	100.0	16.32	16
570	17-21 Feb	13°17.12'N, 91°23.57'W	1698	401.9	42	398.9	165.05	42
				Total	206	1907.0	1043.60	55

of a gas hydrate where free gas may have collected (per the guidelines set by the JOIDES and SIO Safety panels). In order to core above the base of any gas hydrate we had to drill on ridges or in eroded canyons where the sediment cover is thinner than the calculated depth of the hydrate layer.

We also drilled a single site on the lower slope off the Nicoya Peninsula off Costa Rica. Here the objectives were the same as those off Guatemala — to study the age and origin of the basement and the development of gas hydrate.

Drilling Results

Table 84-1 summarizes the Leg 84 coring operations and Figure 84-1 illustrates Guatemalan site localities and recovered lithologies.

Site 565 (CR-1C), Lower Slope Off Costa Rica

We drilled Site 565 on the landward slope of the Middle America Trench off the Nicoya Peninsula in 3111 meters of water to 328 meters below the sea floor. The site is about 28 km landward of the trench axis and is on a small raised intercanyon area between two of the small canyons which are common on the slope. These small canyons are generally spaced about 1-3 km apart.

The seismic record here shows irregularly stratified slope deposits over diffracted reflections beneath which few reflections can be seen. These deposits correspond to an extension of the continental framework seaward of the Nicoya Peninsula and our main objective was to sample them to establish their tectonic history. We also hoped to recover and study naturally occurring marine gas hydrate at the site.

The uppermost 30 of the 34 cores recovered at Site 565 contained a dark, olive-gray mud and mudstone with only two recognizable ash layers and two thin beds of sandstone in the 328 meters drilled. We recovered a 10-cm thick, hydrated, muddy, fine-grained sandstone in Core 30 which seemed to mark a major lithologic change.

After recovery of Core 30 the hole conditions began to deteriorate and drilling was soon terminated. Hole failure was accompanied by a back pressure greater than 250 pounds for periods of more than one-half hour. Back pressure developed during times when the circulating pump was off indicating an elevated pore-fluid pressure.

Nannofossils, benthic foraminifers, and diatom assemblages indicate that the stratigraphic sequence is from the Quaternary to (probably) the top of the Miocene. The benthic foraminifer assemblages and sedimentologic analyses also indicated that materials were transported downslope. Below Core 29 the nannoflora contain a significant number of reworked Cretaceous forms and, as the foraminifers were apparently transported from mid-slope, we infer that Cretaceous rocks cropped out in the mid-slope area during latest Mioene or early Pliocene time.

Using three lines of evidence we were also able to document the presence and actual recovery of gas hydrates at Site 565: (1) the 133 to 1 ratio of methane gas to water (by volume) resulting from decomposition of the gas hydrate; (2) a water salinity about 25 times lower than the salinity of the pore fluids in associated sediments; (3) the composition of liberated gas is most easily explained as released from the crystal structure of hydrate. The hydrate does not appear to form massive planar layers and may be dispersed in small concentrations throughout the massive mudstone. It appears to form 1-3 cm masses in fractures or in void fillings in the sandstone.

Site 566 (GUA-5C), Guatemala — Lower Slope

Site 566 is 22 km upslope from the axis of the Middle America Trench and about 3000 meters above it. The site was positioned to sample the acoustic basement at the top of the lower slope of the trench. To reduce the possibility of drilling a sequence containing gas hydrate, we drilled in San Jose Canyon where seismic reflection records show only thin sediment deposits. We drilled three holes spaced 1 km apart along the eastern side of the canyon axis to test the lateral variability of the basement across the strike of the slope. (566B had no recovery and is not considered here.)

Recovery of ultramafic basement fulfilled the primary objectives at this site. The ultrabasic rock had originally been harzburgite as shown by its structure and mineralogy. Its upper surface is now a highly altered serpentinite with carbonate filling the microfractures. The weathered serpentinite grades downward to serpentinite and then to serpentinite with about 20 per cent of the original minerals (forsteritic olivine, pyroxenes, and spinel). The presence of the secondary minerals (talc, serpentine, and magnetite) indicate it was

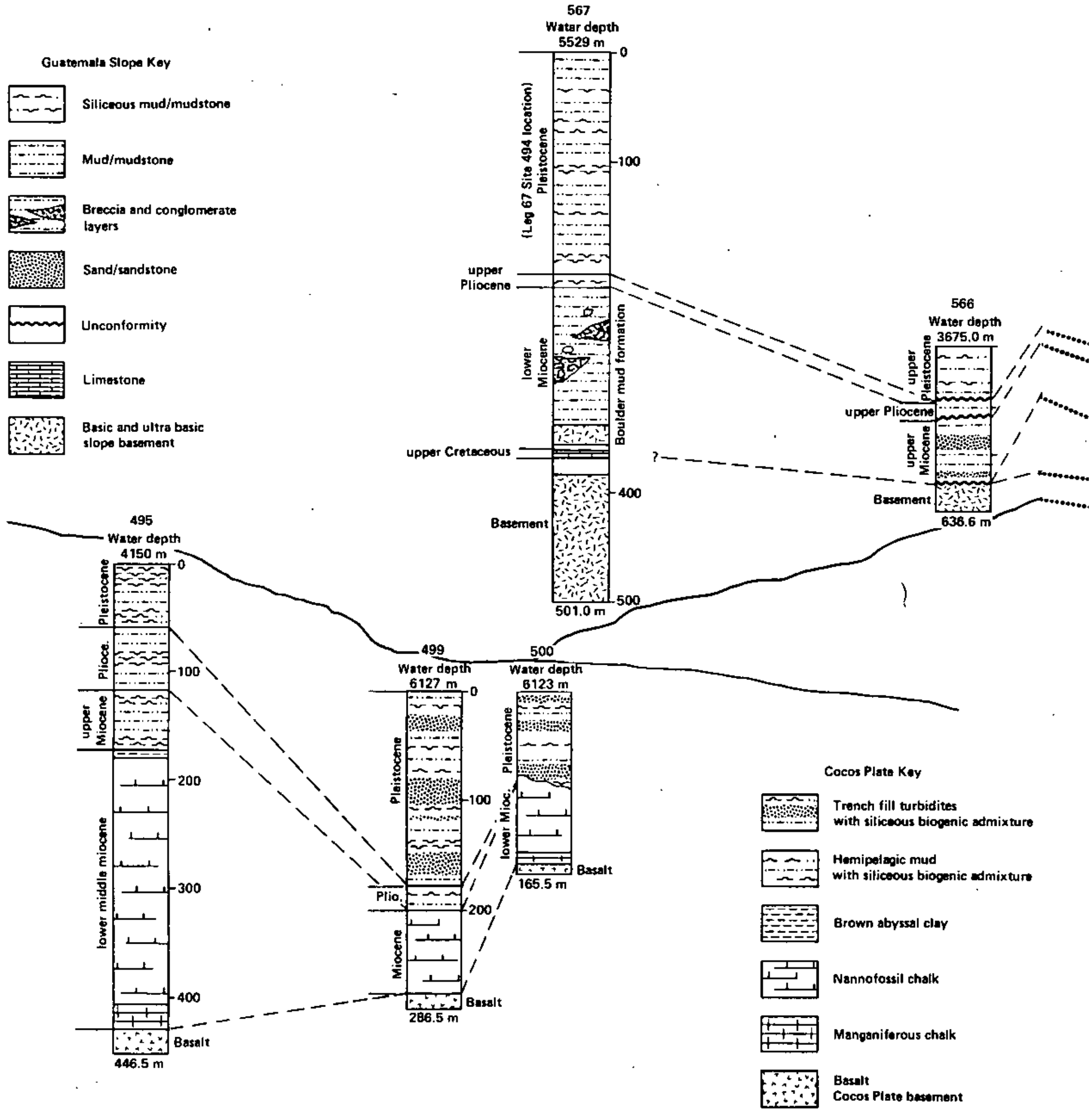
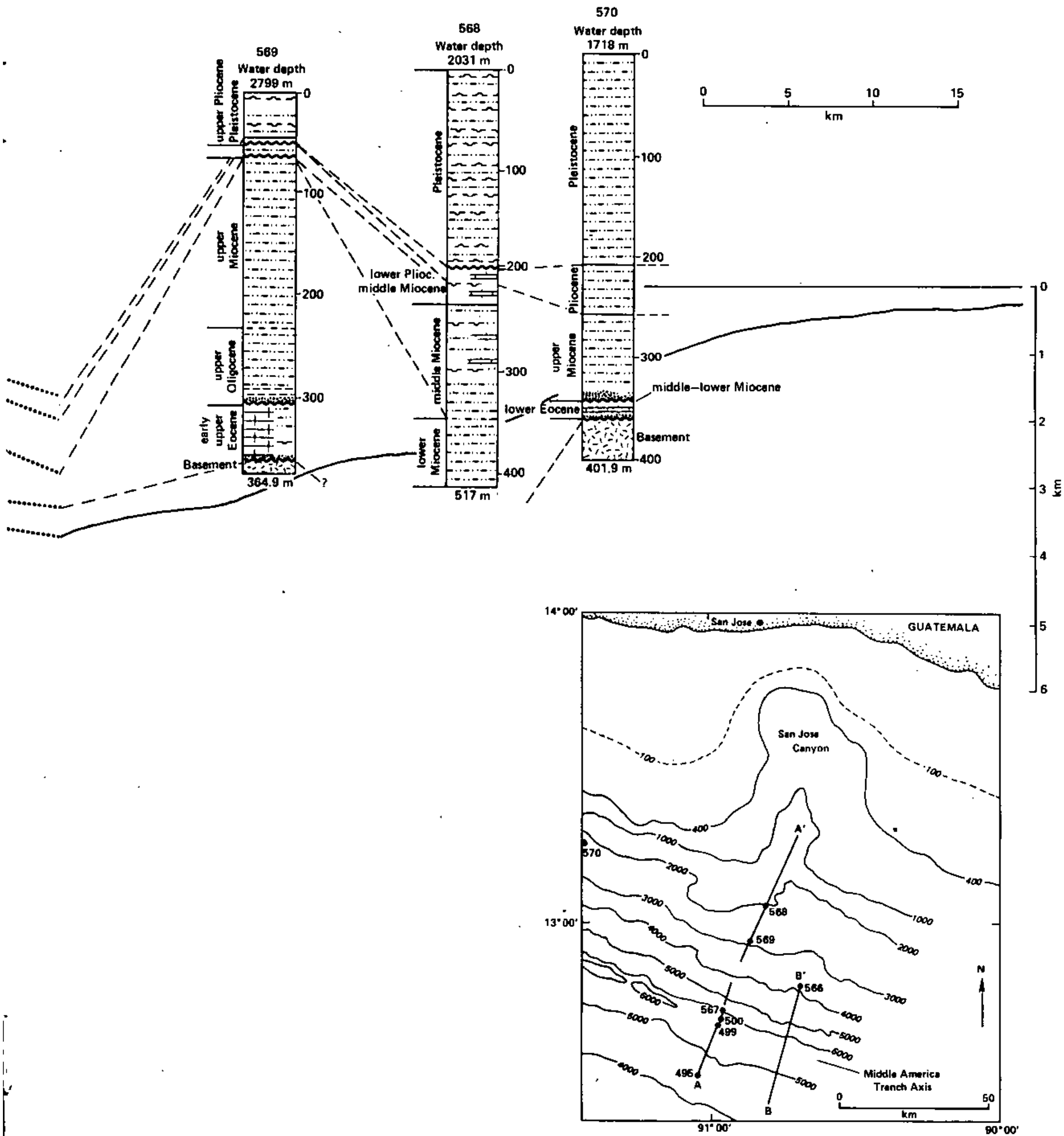


Figure 84-1. Lithostratigraphic columns of sites cored during Leg 84 and 67, and site locations along the Middle America slope. Inset map shows site localities.


569
Water depth
2799 m
568
Water depth
2031 m
570
Water depth
1718 m
upper Pliocene
Pleistocene
upper Miocene
upper Oligocene
early upper Eocene
Basement
364.9 m
Pleistocene
lower Plioc. middle Miocene
middle Miocene
lower Miocene
517 m
lower Eocene
Pleistocene
Pliocene
upper Miocene
middle–lower Miocene
Basement
401.9 m
0
100
200
300
400
0 5 10 15
km
0 1 2 3 4 5 6
km
14°00'
San Jose
GUATEMALA
San Jose Canyon
100
400
1000
2000
3000
4000
5000
6000
570
A'
568
569
B'
566
567
500
499
495
A
B
Middle America Trench Axis
0 50
km
N
13°00'
91°00'
90°00'

subjected to low-temperature alteration (probably below 300°C). Shearing and foliation indicates the rock was stressed, probably during the alteration. Low-temperature alteration also explains the low magnetic susceptibility measured on samples of serpentinite.

The slope and canyon deposits consist of massive mudstone, pebbly mudstone, laminated muds, and graded sandstone. Both current activity and mass movement contributed to their deposition from sources upslope. Reworked benthic foraminifers which lived at about 1500 to 2500 meters are numerous and some Miocene intervals contain reworked Cretaceous nannofossils.

The sediment held insufficient gas for the development of gas hydrate. We detected gas unexpectedly, however, in the serpentinite of Hole 566C. The abrupt exponential decrease in concentrations of the gases with molecular structures larger than isobutane and the prolonged active bubbling of fluid in the core indicate that this gas may have been present as a hydrate.

We did not expect the recovery of ultrabasic rock at Site 566 because the refraction data shows velocities lower than laboratory values for serpentinite and the magnetic anomaly field is featureless. The lack of a geophysical and magnetic signature, however, is consistent with the extensively altered state of the serpentinite.

The position of Site 566 in San Jose Canyon, where slope sediment erosion is common, precluded recovery of the oldest slope deposits overlying the serpentinite. The upper Miocene age of the Hole 566C slope sediment probably reflects only the most recent erosion to basement there.

Site 567 (GUA-1B), Guatemala — Base of Slope

Site 567 is at the base of the landward slope of the Middle America Trench ~ 3 km upslope and 550 meters higher than the trench floor. It is situated on the first of three benches above the trench floor and is about 110 meters from Site 494 drillled on Leg 67. The decision to return to Site 494 was originally prompted by the failure on Leg 67 to complete the drilling to the subduction zone. In addition, we wanted to recover a sequence of old rock in a setting at the front of a convergent margin to test the theory that the slope basement was an extension of the continent. Below a Paleogene and Upper Cretaceous sequence at Site 494, the undrilled section appeared to rest on subducted Neogene trench sediment. The top of the subduction zone was estimated from seismic reflection record GUA-13 (Ladd et al., 1978) at 600-800 meters depth.

At Site 567 the sequence consists of

0-220 m: Quaternary and Pliocene dark green mud (from Site 494);

220-318 m: lower Miocene dark olive-gray mudstone with several breccia layers containing clasts of reworked Miocene, Oligocene, and middle Eocene mudstone, Upper Cretaceous (Campanian) limestone, pumice, and serpentinite;

318-358 m: serpentinite and serpentinitic mud;

358-358.2 m: thin layer of lower Miocene dark olive-gray mudstone;

358.2-365 m: Upper Cretaceous (Campanian) pale yellow micritic limestone;

365-501 m: tectonized ophiolitic rock including altered basalt, gabbro, diabase, serpentinized peridotite (harzburgite), and serpentinite.

We are not certain how the serpentinite body overlying the thin layer of Miocene mudstone was emplaced, but it is most likely a transported block.

The Cretaceous limestone is 20 meters thick at most; it may be a block displaced from upslope as are other small fragments of limestone. We did not recover any underlying Miocene mudstone, however, and so cannot be certain. Alternatively, the limestone could have been deposited on the ophiolitic body in a setting similar to that found on the Nicoya and Santa Elena peninsulas. The various interpretations of recovered and non-recovered contacts notwithstanding, clearly upslope instability during the early Miocene caused debris to move and come to rest into either a canyon or another topographic low. Perhaps deep submarine erosion accompanied such a debris flows.

The very sparse recovery of the ophiolitic rock (less than 20%) and ample evidence of tectonism allows us to interpret it variously. Two or three main zones of serpentinite, interpreted as sheared and mobilized materials, seem to separate different rock types. The recovery of serpentinized peridotite (harzburgite) at this site, Site 566, and at two other localities from surface sampling by an oceanographic vessel (Ladd et al., 1978), indicates that an extensive body of igneous rock is present in the lower slope. Igneous rock is included in the lower Miocene non-metamorphosed slope deposits overlying the igneous rock and thus must have been in place prior to early Miocene.

During the time the drill stem was stuck in the hole, we measured the the pressure at the hole bottom at 550 psi. Because there was no circulation up the hole for more than two hours (the drill cuttings had apparently sealed the drill collars in the hole), we think this reflelcts the formation overpressure. Indeed, we would expect overpressure in this zone of subducted trench sediments in which pore fluids would respond to sudden loading by the over-thrust block through which Hole 567A was being drilled. If the analysis of the seismic record is correct, the hole may have failed just 20 meters from the top of the subducted sediment.

No Neogene accretionary prism exists along the base of the slope — a conclusion also reached by the scientific staff of Leg 67. Collapse structures appear to dominate the first step of the margin above the subduction zone. The lack of deformation in slope deposits and the subduction of trench sediment with low shear strength indicate that the upper and lower plates are highly decoupled across the subduction zone.

Site 568 (GUA-8A), Guatemala — Upper Slope

Site 568 is on the upper part of the Middle America Trench slope, in about 2300 meters of water, 4000 meters above and 48 km landward from the trench axis. It is located about 1 km upslope from a Leg 67 site (496) which was abandoned after drilling encountered gas suggesting possible thermogenic components and perhaps the presence of gas hydrate. Our major objective at Site 568 was to closely monitor the gas throughout the entire section to study the formation of gas hydrate. Seismic record GUA-13 had been reprocessed prior to the cruise to enhance the shallow structure and the base of gas hydrate seismic reflector.

Gas hydrate is present at Site 568; we recognized it both in the composition of the gas released and from the sediments as recovered pieces of gas hydrate. The molecular distribution of hydrocarbon gases and the low chlorinity and salinity indicate that gas hydrates are dispersed in the 418 meters of sediment drilled. The sequence encountered is as follows

0-190 m: biogenic gas above gas resulting from early diagenesis;

190-345 m: gas hydrate dispersed in fine-grained sediment;

345-391 m: gas perhaps in a non-hydrated state;

391-410 m: dispersed and solid gas hydrate;

410-417 m: gas in a non-hydrated state.

The principal porosity and permeability in the sequence comes from fractures within the mudstone formation; the mudstone itself is of very low porosity and permeability. Despite a careful inspection as each core came on deck, we neither *saw* hydrate in the main hydrated section (190-345 m) nor detected an unusual amount of gas in the cores. We recognized the hydrate by a gas composition containing mainly C_1, C_2, C_3, and i-C_4. Larger hydrocarbon molecules were present only rarely because they are excluded from the gas hydrate structure. The visually observed hydrate occurred at 403 meters. It was a white ice-like substance filling fractures in a tuffaceous mudstone (50% glass shards). When the hydrate decomposed between 7 and 30 cc of mainly C_1 were released per milliliter of water. The water was fresh, indicating fresh-water in the gas hydrate structure. The quantity of gas relative to water released upon decomposition, the composition of the released water and of the pore water, and the composition of gas demonstrate that we had indeed recovered gas hydrate.

Downhole logging shows that the gas hydrate occurs in such low concentrations that neither velocity nor density are affected. The lithology is very uniform showing excursions of less than 100 m/s in velocity and 0.2 g/cc in density; rare beds of limestone only 10 cm thick in the core are clearly defined on the logs. Hydrate would show clearly against such a monotonous background. The hydrate certainly does not occur in sheets of solid material, otherwise, we would have detected it in the logs and recovered it in the cores.

The lithology at Site 568 is much like that at Site 496. An upper unit (0-182 m) of massive olive-gray mud — a Quaternary hemipelagic sequence — unconformably drapes a prograding sequence (182-418 m). The prograding sequence is a mottled and bioturbated Miocene mudstone containing reworked Eocene material. Benthic foraminifer assemblages indicate uplift during the late Oligocene, subsidence throughout the Miocene, and both uplift and subsidence during the Pliocene and Pleistocene. This history is more varied than that indicated by the analysis at

Site 496 where the same Miocene subsidence is seen.

Site 569 (GUA-2D), Guatemala — Mid-slope

Site 569 is in the mid-slope area off Guatemala in about 2800 meters of water 32 km upslope and 3200 meters above the Middle America Trench axis. Our objectives in drilling at this site were to sample the basement and sediment immediately overlying it and to study the tectonic history of the mid-slope area.

Seismic record GUA-13 across the site shows a seaward dipping prograding sequence as at Sites 496 and 568. The prograding sequence is underlain by a zone of very faint reflections conforming to the basement topography; beneath this zone a diffracted reflection of relatively high amplitude marks the top of acoustic basement. Drilling shows that an Oligocene-Miocene prograding sequence overlies an Eocene and Oligocene sequence covering the ophiolitic rock basement.

Two holes were drilled at the site: 569 penetrated the upper Oligocene before the bit entered what appeared to be an overpressured zone which caused the hole to fail; 569A penetrated into basement comprising of metamorphosed gabbro and dolerite beneath Eocene mudstones. The sequence is

Hole 569

0-58.9 m: Pleistocene and upper Pliocene green mud;

58.9-250.7 m: Miocene upper Oligocene green mudstone including 58.9-77.9 meters upper Miocene, 77.9-87.4 meters middle Miocene, 87.4-231.4 meters lower Miocene, 231.4-250.7 meters, upper Oligocene light green calcareous mudstone.

Hole 569A

246.0-313.1 m: upper Oligocene light green calcareous mudstone;

313.1-351.4 m: upper Eocene green and black siliceous mudstone, and a few pieces of lower Eocene blue-gray mudstone overlying the crystalline rock;

351.4-360.9 m: gabbro and diabase metamorphosed to greenschist facies.

The age of sediments overlying igneous basement at Site 569 show that the tectonic emplacement of ophiolitic rocks is at least pre-early Eocene. We suspect unrecovered unconformities occur between the upper Pliocene and Miocene, the upper Oligocene and Eocene, and between the Eocene and the igneous basement rock. The presence of upper Oligocene ash layers in Holes 569 and 569A permits the age of the present subduction setting to be moved back into the late Oligocene.

At Hole 569, we attribute the sudden failure of the hole to elevated pore pressure. While the drill string was stuck, the pressure was vented and twice after going to zero it built up again to 250 pounds without pumping. After we freed the drill stem pressures returned to zero indicating that the pressure is not from backflow. This is similar to the conditions at Sites 566 and 567 where we also detected what appeared to be overpressures.

Site 570 (GUA-11),Guatemala — Upper Slope

Site 570 is situated in the upper slope of Middle America Trench off Guatemala, in about 1700 meters of water, 40 km upslope and 4300 meters above the trench axis. The site is about 40 km from the Petrel well reported by Seely (1979). We drilled one hole to 401.9 meters, ending in serpentinized peridotite, and recovered

0-210.7 m: Pleistocene green mud with layers of sandstone, locally thick and pebbly;

210.7-258.8 m: Pliocene green mud with sandstone layers;

258.8-330 m: upper Miocene green mud with a few zones of pebbly sandstone, above about 1 meter of lower Miocene black sandy and pebbly mudstone;

330-374 m: lower Eocene sequence of light green siliceous limestone, grayish greenish sandstone with blackish red pebble horizons at the base;

374-401.9 m: black serpentinized peridotite with horizons of pale blue-green serpentinite.

The Pleistocene sequence is the second thickest and contains the coarsest sediment recovered during Legs 67 and 84 either on the slope or in the trench. This shows that coarse clastic sediment can be trapped on the slope as well as in the trench itself.

The hole was drilled in a region where the base of the zone of gas hydrate was at about 540 meters. Although we detected no bottom-simulating reflector directly beneath the site, we recovered gas hydrates from Core 21 (about 192 m) and occurred in sediment from all cores from 246 meters to the basement. The most spectacular sample came from Core 27 (249.1-258.8 m) and comprised a complete section of massive white hydrate. We had inferred the presence of gas hydrates in the basement peridotite from chemical analysis at Site 566, and a significant proportion of hydrocarbons larger than methane prompted us to abandon the hole for safety reasons. The presence of significant amounts of probable thermogenic gas in peridotite and fractured serpentinite both at Sites 566 and 570 may be more than a local accident and, if it is a general condition, the gas may have migrated from sediment underlying an overthrust ophiolite as on land in Costa Rica.

A good suite of logs confirms the presence of the massive hydrate at 249 meters and indicates a 3- to 4-meter thick body with velocities of more than 3 km/s and densities at about 1 g/cc. The logs show that only sandy layers with a relatively greater porosity have sufficient hydrate to give an increased velocity despite the presence of visible hydrate in the mud recovered. The seismic records do not indicate more than a local distribution of the massive hydrate; no continuous reflection appears in the seismic record at the depth where hydrate is shown by the logs. Below the hydrate the logs indicate zones of high porosity in the serpentinized peridotite zone, which may help explain the occurrence of gas in ultramafic rock.

Summary of Results

- At the four sites where the bit penetrated slope sediment, the basement consists of ophiolitic rock (Fig. 84-1). The upper surface of the basement is covered by lower Eocene (Sites 569 and 570), Oligocene or perhaps Cretaceous (Site 567) and lower Miocene (Site 566) slope sediment. The age of the sediment does not progress from younger at the base of the slope to older at the top as occurs over the accreted complex off Mexico. As a consequence of drilling only on basement highs or through thin slope sediment, we did not recover the complete sequences that initially overlay the basement surface. Thus the early Eocene may be a minimum age of the cover. The sites are situated both across to the margin and laterally km. **The Guatemalan margin is underlain by tectonically disrupted ophiolitic rock. It is a non-accretionary convergent margin; Neogene subduction has not resulted in the development of an accreted complex, instead a tectonized ophiolitic rock now faces the subducting Cocos Plate.**

- The ophiolitic rock was deformed and metamorphosed and the tectonic complex was emplaced prior to the present arc-trench tectonic system. Clastic rocks of the ophiolitic basement are in the unaltered slope sediment, particularly at the base of the slope where debris flows contain large blocks of serpentinized peridotite. Using as a guide the history as developed from onland studies in Costa Rica and Panama and from the offshore Petrel well drilled by Esso, the tectonic history of the Guatemalan margin includes three major periods:

1) Pre-Campanian(?) thrusting of ultramafic rock over the Jurassic-Cretaceous Nicoya complex. Campanian and Maestrichtian sediment then blanketed the complex. Initial tectonism of the Guatemalan ophiolitic rock could have started in the late Cretaceous, and the Cretaceous sediment at the base of the slope could correspond to the Campanian-Maestrichtian sediment cover.

2) A strong Paleocene uplift, documented in the Petrel well, may immediately pre-date the lower Eocene sediment recovered at two sites. This perhaps was a time of major emplacement of the ophiolite-Cretaceous sediment complex.

3) A strong Oligocene-Miocene uplift has left a sharp angular unconformity (observed in seismic records) across the edge of the shelf; the first thick hemipelagic slope deposits of the present tectonic system developed during and after this event.

There is nothing to indicate the present arc-trench system developed until the late Oligocene when the first substantial layers of volcanic ash were deposited in the slope sediments. **The ophiolitic rock of the Guatemalan margin was certainly emplaced before the Eocene and it appears to be an extension of the geology that comprises the continent of Central America.**

- At the base of the slope (Site 567) we came close to penetrating through the upper plate into the subduction zone. Hov- trench sediophiolitic rock at the front of the margin. Drilling ended when the hole collapsed and the drill string became stuck. Collapse of the hole was accompanied by overpressured formation fluids measured directly at the rig floor as was done off Barbados on Leg 78A. We detected overpressure not only in this instance where the sediment is immediately above the subduction zone, but also at Site 570 (top of the slope), Sites 568 and 569 (mid-slope), and at Site 565 (lower slope) off Costa Rica. Seismic records across the mid- and upper slope sites show few compressional faults or folds in the slope sediment where the overpressures were detected. In fact, the most obvious structures on the transect are normal faults at the base of the slope which are best defined in the bathymetric profiles developed by the Seabeam system. Elevated pore pressures are certainly to be expected across the subduction zone and such pore pressures help to explain the degree of decoupling required to subduct soft sediment beneath a mass of ophiolitic rock without accretion. **High pore pressure appears to be very common in the Guatemalan convergent margin and occurs even in slope deposits that show few structures.**

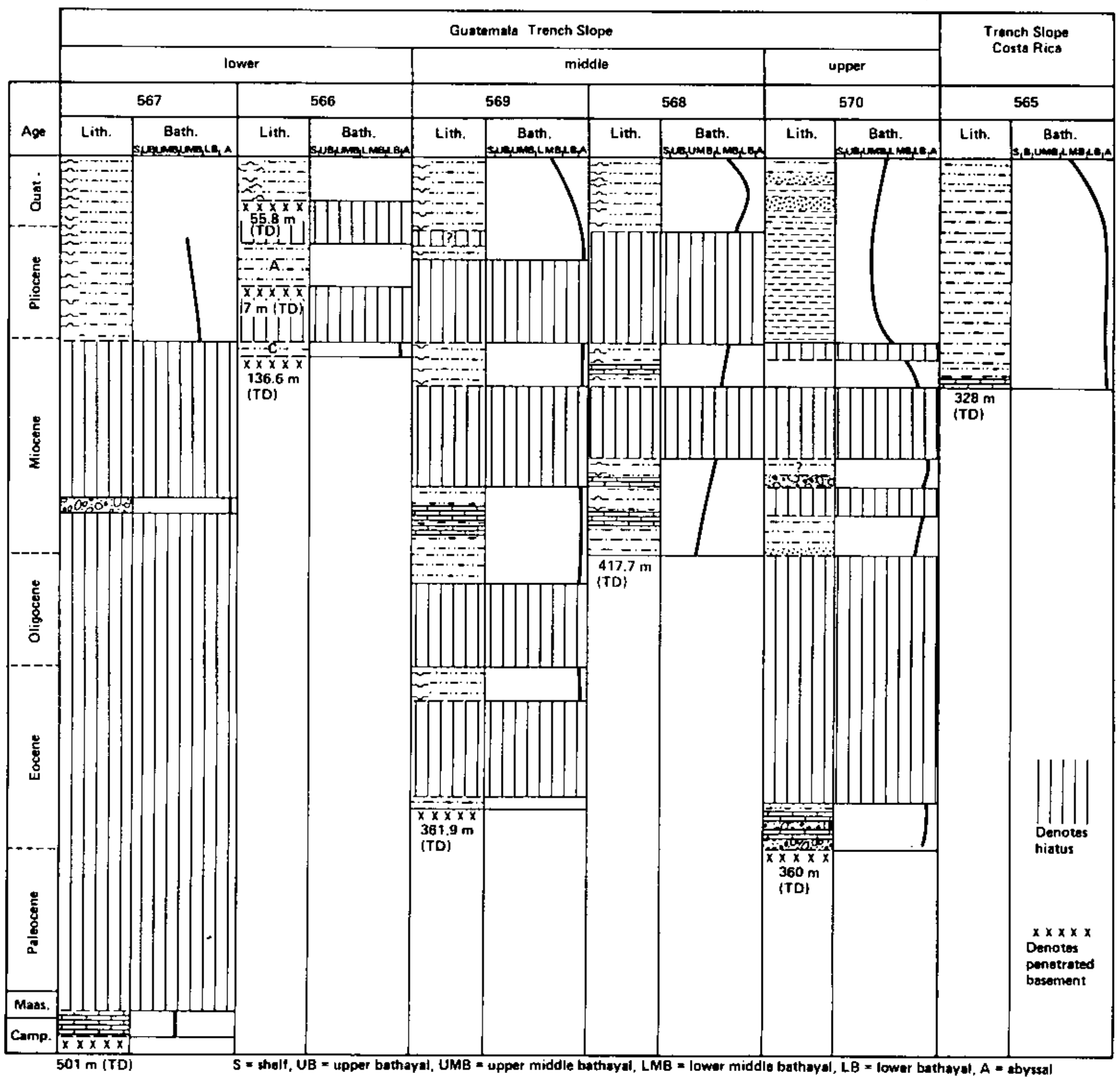


Figure 84-2. Sediment ages and unconformities on the basis of benthic foraminifers and nannofossils. Bathymetric interpretation on the basis of benthic foraminifers.

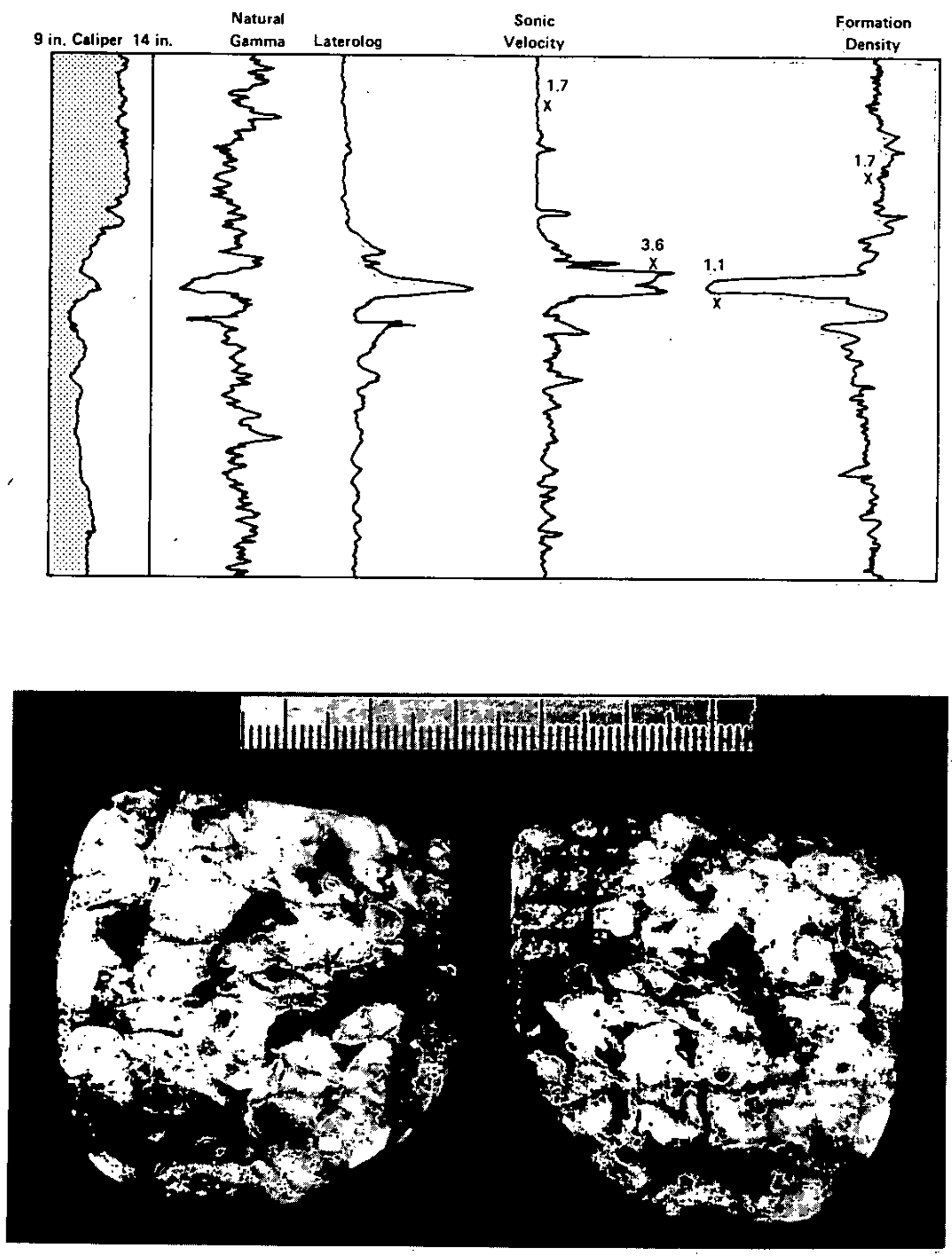


Figure 84-3. Physical properties of gas hydrate obtained during logging at Site 570. Photograph shows a split sample of the massive hydrate sampled at Site 570.

- We detected many local unconformities and hiatuses in sites drilled in slope deposits on the Guatemalan margin. (Fig. 84-2). These unconformities indicate that as one depocenter is rapidly accumulating sediment, another may have lost its feeder channel and temporarily be in an interchannel or erosional area. Hollows and topographic flats on the surface of the ophiolitic mass are sites of ponded basins or early Miocene prograding sediment bodies. The sediment in this sequence locally contains more sand than is found in the sediment ponded in the trench axis. Sand was also recovered in the channel areas demonstrating again that the channels transport sand directly to the trench. **The presence of a large amount of sand and rapid sediment accumulation cannot be applied as the single lithologic criterion by which to distinguish between trench and slope deposits off Guatemala.**

- Slope deposits off Guatemala are now classic sites for gas hydrates; they have been detected at all sites, except 567, and have been recovered at Sites 568 and 570. The best recovery was at Site 570 where we cored a massive 3-meter thick gas hydrate, and preserved samples in special pressure vessels for onshore studies. The evidence for gas hydrate consisted of: (1) visual recognition, (2) volumes of gas released during decomposition that greatly exceed the volume of gas in gas-saturated water, (3) composition of the hydrocarbon gases that exclude molecules larger than isobutane, (4) decrease in chlorinity and salinity owing to fresh-water composition and (5) sonic and density logs showing high velocities with corresponding low densities (Fig. 84-3). These logs contain the first demonstrated log response of cored gas hydrates in oceanic sediment and provide the first measurements of their *in situ* sonic velocity and density.

We found gas hydrates in the following settings: (1) dispersed in very fine-grained sediments, (2) associated with porous, coarse-grained sediments, (3) occupying fractures, and (4) as a massive unit. Geophysical records off Guatemala do not show strata that correspond to the massive gas hydrate or any other gas-hydrated horizon; only the base of gas hydrate reflection is laterally continuous, and we detected it at only one of the occupied sites (Site 568).

Inorganic geochemical studies on Leg 84 confirm the proposed relationship between low values of pore water salinity and chlorinity and the occurrence of gas hydrates. In all cases where we found gas hydrates on Leg 84, values of salinity and chlornity were lower than in sediments where they were absent.

Gases found in the hydrates of Leg 84 may have two different sources: (1) the microbial production of methane accompanied by the early diagenetic production of hydrocarbon gases larger than methane, (2) hydrocarbon gases derived from the thermal breakdown of organic matter during late diagenesis or catagenesis. Most gas hydrates found on Leg 84 were composed of gases from microbial and early diagenetic processes. However, at two sites (Sites 566 and 570) the gases found associated with serpentinite were probably from the thermal breakdown of organic matter. Evidence for this conclusion is the very high concentrations of hydrocarbon gases, particularly of ethane relative to methane, and the appearance of hydrocarbons at least as large as hexane and heptane.

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Seely, D., 1979. The evolution of structural highs bordering major fore-arc basins. *In* Watkins, J. S., Montadert, L., Dickerson, W., (eds.), Geologic and Geophysical Investigations of Continental Margins. Am. Assoc. Petrol. Geol. Mem. 29, p. 245-260.

Major- and Minor-Element Analyses

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 Legs 63-65. For information contact:

Donna Hawkins
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3526

SITE SUMMARIES

Leg 85 - Equatorial Pacific

Co-chief scientists: Larry Mayer and Fritz Theyer

Site 571 (EQ-1B)

Latitude: 3°59.24'N
Longitude: 114°8.53'W
Water depth: 3962 meters

Site 571 (EQ-1B) is in an area of low heat-flow in the eastern equatorial Pacific. The sediment thickness is estimated at slightly over 300 meters. We attempted to take six downhole heat-flow measurements (at sub-bottom depths of 47.5, 66.5, 88.5, 107.5, 161.5, and 199.5 m), and three downhole pore water samples (at 47.5, 107.5, and 161.5 m) with the heat-flow/pore water tool coupled to the hydraulic piston corer. Although we were able to record temperatures and collect water during all but one of the attempts, we encountered technical difficulties during deployment and our initial interpretation of the data suggests that sea water gained access to the sensor and intake port of the probe rendering the experiment unsuccessful.

We recovered a mud-line hydraulic piston core containing 7.11 meters of Quaternary foraminifer-nannofossil ooze and siliceous foraminifer-nannofossil ooze. Generally well preserved planktonic foraminifers and calcareous nannofossils predominate in the biogenous fraction; radiolarians and diatoms occur as well. The sediments accumulated at an average rate of 16 meters per million years. Cyclic variations in the calcium carbonate content, nannofossil abundance and GRAPE-derived density data are tentatively correlated with glacial-interglacial Quaternary cycles. The measured permanent magnetization is stable, normal, and compatible with the latitude of the site.

Site 572 (EQ-1A)

Latitude: 1°26.1'N
Longitude: 113°50.5'W
Water depth: 3900 meters

Site 572 (EQ-1A), located in 3900 meters of water, is just a few miles south and west of DSDP Site 81 on the eastern edge of the equatorial high productivity zone. The site was selected to provide information about paleoceanographic and climatic variations through high resolution stratigraphic studies of the expanded Neogene section. We collected (in five holes) a continuously piston-cored section of the rotary cored section of the bottom 310 meters. The oldest sediment recovered was lower middle Miocene (about 15 ma) at 464.5 meters sub-bottom. The sediment/basalt contact occurs at 479.5 meters, and we recovered 43 cm of fine-grained basalt with a glassy rind.

The sediment section comprises four units recognized on on the basis of the dominant color:

Unit 1: 0-2.35 m: cyclically alternating, Quaternary brown and gray foraminifer siliceous-nannofossil ooze.

Unit 2: 2.35-37.45 m: Quaternary to upper Pliocene varicolored purple, light gray and yellow siliceous nannofossil ooze.

Unit 3: 37.45-458.5 m: varicolored purple, light gray, yellow and green siliceous nannofossil ooze grading to upper Pliocene to middle Miocene siliceous nannofossil chalk. Several diatom-rich layers and 3-4 cm thick laminated chert horizons occur in the lower part of the unit.

Unit 4: 458-464.5 m: lowermost middle Miocene pale yellow to yellow-green siliceous-foraminifer nannofossil chalk. Pyrite and iron-oxide increases in abundance toward the bottom of the unit.

These units correlate with the Clipperton (our Units 1 and 2), San Blas (our Unit 3) and Line Islands (our Unit 4) oceanic formation described on Leg 9. The sedimentation rates are variable and, in some intervals, remarkably high. The average rate between 12-15 million years ago was 64 meters per million years, the average rate between 7-12 million years was 13 meters per million years; between 4.5-7 million years ago it was 50 meters per million years and between 0.5-4.5 million years ago the average rate was 16 meters per million years. Diatom assemblages (indicative of upwelling), enhanced dissolution of carbonate, decreased carbonate content, and increased porosity are associated with the zones of high sedimentation rate.

The hydraulic piston corer continues to provide beautiful cores, in many cases preserving millimeter-scale laminations. The penetration of the HPC, however, was limited by the ability of the tool to withstand pullout — not its ability to stroke-out. We lost two HPC cores when the tool parted at the quick disconnect joint upon pullout (overpull stress greater than 50,000 pounds were experienced). Despite these minor problems, the excellent recovery in a sequence deposited at high rates will [illegible]
material [illegible]

Site 573 (EQ-3)

Latitude: 00°29.91′N
Longitude: 133°18.57′W
Water depth: 4300 meters

Site 573 is in the eastern equatorial Pacific over a section of basement covered by sediments ranging up to 0.68 seconds in thickness. We drilled three holes to sample an expanded upper Eocene to Quaternary sedimentary section for high-resolution stratigraphic and paleoceanographic studies. Hole 573, which we sampled with the hydraulic piston corer, reached about 160 meters sub-bottom; we abandoned Hole 573A, a parallel HPC attempt, at approximately 60 meters sub-bottom. We rotary cored Hole 573B from about 140 meters to 529 meters and recovered a baked sediment/basalt contact and about 1 meter of basalt from the bottom of the hole. While washing down to 140 meters in Hole 573B, we deployed the heat-flow/porewater probe, and retrieved *in situ* pore water from a sub-bottom depth of 53 meters.

The oldest sediment cored was uppermost Eocene limestone (573B, 528 meters). We recognized six lithostratigraphic units in the sedimentary section. These can be correlated with the three oceanic formations established for the sediments at nearby Site 77 (DSDP Leg 9). Most notable among the units are (1) an uppermost Eocene biogenic limestone (528-529, 6 meters), (2) a brown unit that contains metalliferous claystone and foraminifer-nannofossil chalk (528-514 mters), and (3) several altenating units of siliceous calcareous ooze and chalk making up the remaining lower Oligocene to Pleistocene sequence. The brown unit (2) contains lowermost Oligocene sediments at its top, and is virtually barren of fossils in its dark brown center; it correlates with the uppermost Eocene at its base.

Foraminifer, calcareous nannofossil, radiolarian, and diatom assemblages are, with some exceptions, well represented in the cored sediments, allowing us to recognize and correlate most Eocene to Quaternary biozonal and stratigraphic boundaries. We could not unequivocally locate the Eocene/Oligocene boundary, but it either falls within the barren mid-portion of the metalliferous unit, or it coincides with a hiatus. We found additional gaps in the uppermost Oligocene and lower upper Miocene parts of the sections. The overall sediment accumulation rates at Site 573 are relatively constant, varying generally between 12 and 16 meters per million years. A peak rate of 30 meters per million years occurs in between 5.5 and 6 million years old sediments and a low of about 10 meters per million years occurs in between 15 and 21 million year old sediments. Some of the changes in the rates of accumulation correlate with changes in lithology, physical properties, NRM intensity, and interstitial water geochemitry.

Except for the uncertainty concerning the Eocene/Oligocene boundary, the expanded stratigraphic section recovered at Site 573 should greatly enhance studies of Tertiary history in the equatorial Pacific.

Site 574 (EQ-4)

Latitude: 4°12.52′N
Longitude: 133°19.81′W
Water depth: 4548 meters

Site 574 is located over an elongate basement trough covered by flat, acoustically well stratified, sediments 0.57 seconds thick. The site is the second of a three-site latitudinal transect along 133°W across the equatorial high productivity belt. Its position just north of the crest of the belt will provide detailed documentation of migration of the area across the equator and of Tertiary equatorial Pacific paleoceanography. To this end, we cored two parallel HPC holes (574, 0-206.5 meters; 574A, 0-180.2 meters) and two rotary holes (574B, 185-194.5 meters; 574C, 194.5-525.5 meters).

The oldest sediments of the recovered sequence are uppermost Eocene (520 meters sub-bottom) and, except for minor hiatuses, this sequence is continuous through the Quaternary. The deepest cores contained about 60 centimeters of basalt, placing the basement at 520 meters sub-bottom. The sedimentary sequence is divided into a basal metalliferous calcareous unit (502.5-520.0 meters), a calcareous unit at intermediate levels (83.5-502.5 meters), and a cyclic siliceous-calcareous unit at the top of the section (0-83.5 meters).

All major planktonic microfossil groups are usually represented, although planktonic foraminifers are often severely dissolved, limiting their stratigraphic use to specific intervals. Initial data from foraminifers, diatoms, calcareous nannofossils, and radiolarians indicate that a remarkably complete uppermost Eocene to lowermost Oligocene transition was collected in the bottom of Hole 574C within the metalliferous calcareous sedimentary unit overlying the basement. The rates of sediment accumulation generally vary between 10 and 20 meters per million years, being low between 0 and 12 million years ago, high between 12 and 23, and low again between 23 and 34, million years ago. The mass accumulation rates are highest (about 3 gm/cc/1000 yrs) in the lower Oligocene and at about 11.5 to 12.5

million years, and lowest (0.9 gm/cc/1000 yrs) between 3 and 6 million years ago.

Calcium carbonate content and physical properties show strong fluctuations in the record of the last 12 million years but are more uniform in the older part of the section. The NRM intensity is broadly correlative to lithology, being highest in the upper cyclic siliceous-calcareous unit and the basal metalliferous unit, and extremely weak throughout most of the calcareous unit found at intermediate levels. Inorganic geochemical results suggest diffusional control in the upper 150 meters and diagenetic reactions in the lower portion.

The nearly complete and extensive uppermost Eocene to Quaternary section, and especially the Eocene/Oligocene transition found in the section, will make the cores recovered at Site 574 invaluable sources for paleoceanographic research.

Site 575 (EQ-5)

Latitude: 5°51.00′N
Longitude: 133°2.16′W
Water depth: 4536 meters

Site 575, the final site of Leg 85, was drilled through acoustically well stratified sediments at least 0.57 seconds thick overlying a basement of minimal relief. Seismic records show considerable evidence of erosion throughout the region and a 1 kilometer high seamount is present 10 kilometers to the northeast. We only partially accomplished the operational aim of this site — to recover a complete and undisturbed section of Eocene to Quaternary central Pacific sediments — owing to lack of time at the following four HPC holes: 575, 0-98.6 meters sub-bottom, 11 cores; 575A, 93.8-196.3 meters, 33 cores; 575B, 3.25-105.3 meters, 14 cores; and 575C, 0-15.8 meters, 2 cores.

We recovered a nearly complete and undisturbed section from lowest Miocene (22 my) to Pleistocene, which we divided into a topmost unit of clay-rich biogenic ooze (0-30 meters sub-bottom) and a lower unit of siliceous nannofossil ooze (30-196.3 meters sub-bottom). Centimeter-thick sandy to pebbly turbidite layers, containing mostly sand-sized foraminifers, basalt, and/or volcanic glass, are intercalated throughout the section. With few exceptions, all major planktonic microfossil groups are well represented, allowing us to recognize most lower Miocene to Pleistocene biozonal boundaries. The exceptions occur in the very compressed upper 30 meters of the section, where definition of zonal boundaries is often difficult.

The rates of sediment accumulation are variable but moderate (14 to 20 meters/my) in the older (12 to 22 my) part of the cored section, and much slower, about 4 meters per million years and constant in the youngest part (0-10.5 my). There is a hiatus, or an even further compression of the depositional record occupying the interval from 10.5 to 12 million years ago. The NRM intensity shows trends that correlate both with sedimentation rates and lithology. The values are generally high (on the order of 10^{-6} gauss or above) in the upper clay-rich unit (0-30 m) and in the browner sub-units of the lower siliceous nannofossil lithostratigraphic unit. The physical properties continue to be sensitive indicators of lithologic change, particularly in the carbonate content. Pore-water analyses show trends consistent with the findings at previous sites.

The uniquely complete and expanded lower Miocene to upper Miocene section recovered offers an ideal oppotunity to document in detail the site's northward emergence from within the tropical high-productivity belt, as well as to document the reaction of the region to Miocene oceanographic changes. Despite our failure to drill to basement at Site 575 we are extremely pleased with the overall results of Leg 85. We have recovered over 2 kilometers of relatively undisturbed core and now look forward to pursuing the many research opportunities this material will provide.

Sediment Paleomagnetism Data Now Available

The sediment paleomagnetism data base contains shipboard paleomagnetic measurements taken by the discrete-sample spinner magnetometer, the alternating-field demagnetizer and the long-core spinner magnetometer. The file is restricted to paleomagnetic measurements of cores recovered by the hydraulic piston corer. The long-core spinner-magnetometer sediment-paleomagnetism file is complete with measurements from DSDP Legs 68, 70-72 and 75. Discrete-sample spinner magnetometer sediment-paleomagnetism data are available for DSDP Legs 71-73 and 75.

Address request for these data to:

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

PLANNED CHALLENGER DRILLING

Leg 87 — Japan Margin

Leg 87A — Yokohama to Yokohama, Japan, 24 June to 29 July 1982; Leg 87B — Yokohama to Hakodate, Japan, 29 July to 18 August 1982. Co-chief scientists: Hideo Kagami and Daniel Karig.

Background

Drilling on Leg 87 will focus on two inner trench slopes; those of the Nankai (southwest Japan) Arc and the northeast Japan Arc. On the basis of marine geologic and geophysical data and from earlier DSDP results we know that these two arc systems represent quite different responses to plate convergence.

The Nankai Trough (Fig. 87-1) is a slowly subducting trench; estimated convergence rates are between 2 and 4 cm per year. Sediments entering this trench include about 0.75 km of (Shikoku) basinal deposits overlain by trench-wedge deposits which vary in thickness along the arc. In the vicinity of the proposed sites the trench wedge is close to 1 km thick.

Subduction has taken place along this plate boundary, at least intermittently, since at least middle Mesozoic. The present pulse of subduction apparently was initiated after the opening of the Shikoku Basin (early to middle Miocene). When within this interval subduction began, how it has evolved, and the location of the present pole of rotation (EUR/PHIL) are still uncertain.

The forearc of the Nankai system appears on reflection profiles to be typical of accreting arcs. The lower trench slope is ridged with some small linear slope basins and medium-sized but segmented forearc basin is present behind a well

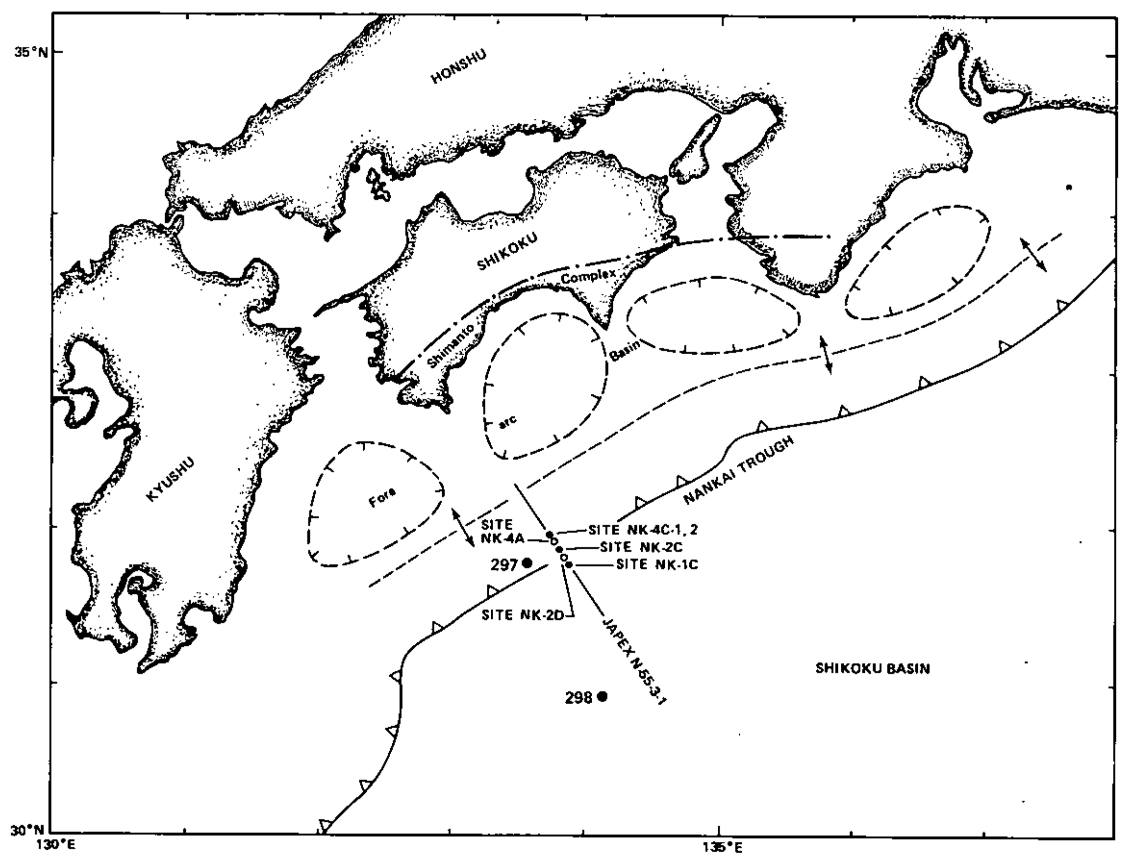

Figure 87-1. Location of proposed Leg 87A sites.

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developed trench slope break. Flanking this basin to the north is the sharply uplifted Shimanto Terrace, a Cretaceous to early Tertiary subduction complex.

During DSDP Leg 31, two sites were drilled near the Nankai margin (Fig. 87-1). Site 297 penetrated most of the sediment fill in the Shikoku basin just south (seaward) of the trench; Site 298 was drilled on the first thrust ridge or terrace up the inner trench slope. Although Site 297 afforded good information on the nature of the sediments now known to be subducted beneath the toe of the accretionary prism, it is Site 298 which has provided the most exciting and tantalizing information relating to subduction processes. The 611-meter deep hole at Site 298 penetrated only Quaternary sediments, but that sequence contained abundant evidence of significant deformation and of anomalous physical properties. Porosities dropped much more rapidly with depth than at sites in nearby undeformed basinal sections. At depths greater than about 200 meters the strata were thus highly overconsolidated. Because investigators saw no evidence of overburden removal, they attributed this anomalous dewatering to some form of tectonic stress.

Investigators have interpreted a distinct cleavage, developed in the finer grained sediments below 300 meters, to be axially planar or fanning cleavage related to an overturned nearly recumbent anticline. They recognied the anticline by inverted strata occurring below 500 meters. Except for the upper 100 meters or so, they considered this sequence to be a trench-wedge turbidite section. These sediments were generally fine-grained clastics, which are even finer grained down section. The upper 100 meters consisted of a less consolidated and poorly sampled sequence of pebbly mudstone, sand, and silt. Although interpreted as slope sediments, probably are part of a slump apron at the inner edge of the trench floor; such aprons have recently been recognized in several other arcs.

Hole conditions at Site 298 were remarkably ible, especially toward its base where sandters are less common. During its withdrawal, h bottom hole assembly almost stuck near the arof the hole, indicating squeezing there.

Iterest in the Nankai Trough surged following

clarity than records from most other a thrust particular, profile 55-3-1 illustrated in imbricate detail, the style of deformation at the bas thick slope. The migrated sections clearly dey by individual faults and allow us to definrust decollement. Trench-wedge strata are selechas sheared off the descending plate as tabular tl in sheets which have become part of the imbrier stack. Each sheet is approximately 1 km thr and 5 km wide. It is thickened internally minor thrusts, and is bounded by major thru surfaces. Subsequent accretion not only ha rotated the earlier emplaced thrust sheet, but, in classic thrust-belt style, has folded the upper thrust sheet into hanging wall anticlines. Further up slope, acoustic coherence within the prism is lost but slope sediments thicken and form several small basins. One shows a marked arcward tilt and is backed by a sharp discontinuity, probably a thrust fault.

The profile also reveals that the structure of Site 298 was misinterpreted. Instead of an overturned anticline, the drilled section is an upright thrust slice. The several overturned beds near the base of the hole may be the result of small-scale drag folds associated with a thrust that apparently penetrated near 500 meters. If this is the case, these slip surfaces can perhaps be successfully penetrated in the Nankai system.

Our overall objectives in drilling the Nankai section during Leg 87 are to study (1) subduction dynamics and mechanics, (2) subduction zone kinematics and evolution, and (3) the sedimentation processes on trench slopes. (Table 87-1 summarizes information about the proposed sites.)

Objectives — Nankai Trough

Subduction Dynamics and Mechanics

The existence of a seismic profile on which the structural framework associated with a subduction zone is so clearly delineated provides a unique opportunity to investigate the mechanical and physical properties of the deforming sediments as functions of their position in the displacement field. A major goal will be to measure porosity, pore pressure, structural fabric, and other physical characteristics of sediments in a pair of drill sites. One site will be located in front of the deformation front (NK-1C), the other positioned to penetrate the main

Table 87-1. Proposed Leg 87 Sites

Site	Priority	Coordinates	Water Depth (m)	Distance From Land (nm)	Nearest Land[1]	Penetration to Objective (m)	Objectives
NK-1C	1	31°46.0N 133°54.1E	4872	76	Shikoku	1350	Reference site in undeformed trench sediments
NK-2C	1	31°48.5'N 133°51.5'E	4661	71	Shikoku	1500	Structure and dynamics of accretionary prism
NK-2D	1	31°48.3'N 133°52.4'E	4823	73	Shikoku	1200	Same as NK-2C
NK-4A	2	31°52.6'N 133°48.9'E	4090	67	Shikoku	350	Nature of slope sediments and clathrate layer
NK-4C-1	1	31°56.3'N 133°46.1'E	3746	62	Shikoku	450	Nature of accretionary structures and of slope sediments
NK-4C-2	1	31°55.8'N 133°46.4'E	3822	63	Shikoku	450	Same as NK-4C-1
JT-13A	1	40°25'N 143°55'E	4000	89	Honshu	1500/ 1200	Nature of basement and early Cenozoic vertical displacement
JT-13B	1	40°28.5'N 143°49'E	3450	85	Honshu	700	Same as JT-13A; Neogene uplift history
JT-16	2	40°06'N 144°08'E	5200	120	Honshu	900	Structural history of lower trench slope

[1]All sites are under Japan's jurisdiction.

field, and the behavior of pore waters under such circumstances. The holes near the base of the trench are thus, in large part, vehicles for a series of structural, geophysical, and geochemical experiments.

Kinematics and Evolution

Understanding the mechanical response of converging plates in this forearc region requires the delineation of deformation and of its distribution across the forearc. Scattered pieces of information suggest that most of the crustal shortening at a subducting boundary occurs near the trench; this, however, has been challenged and is overly vague. Other arguments revolve around the trajectories of material at the subduction zone: how much material is accreted, subducted to mantle depths, or subducted and accreted to the base of the prism? What factors govern this distribution?

We anticipate that a combination of data from the reflection profiles and other geophysical investigations, in conjunction with determinations of sedimentation rates, rates of uplift, and tectonic setting (e.g., trench, slope, Shikoku Basin) will help us constrain theories of trench kinematics. We also hope to resolve some of the uncertainties surrounding the Neogene geologic history of the Nankai system through dating the accreted material at several points across the prism and analyzing the sedimentation rates in the trench as a function of time.

Sedimentation Processes

Coring the Nankai sites will also provide data on the horizontal distribution of facies across the trench and slope. We may learn something of the relative importance of gravitational and tectonic processes in deformation on the trench slope from drilling slope basin (NK-4C-1). Sampling the trench wedge should clarify the nature of these rather strange fan assemblages and help us test models that have been proposed. To date the generally non-cohesive nature of trench clastics has precluded deep penetration into the trench wedge, but on the basis of results from Leg 31 we can optimistically predict relatively stable hole conditions on Leg 87.

Other objectives identified in the Nankai sector include

- a study of Neogene arc volcanism using tectonostratigraphy,
- paleoceanography of the Kuroshio current,
- organic geochemistry of clathrates (bottom-simulating reflectors occur beneath much of the trench slope),
- heat flow studies, and the nature of the pore waters in a zone of accreting and dewatering sediments.

The Nankai trench is anomalous in having high conductive heat flow values. In part, this probably reflects subduction of young (Miocene) crust of the Shikoku backarc basin. The heat flow contours, however, defines a maximum heat flow in the trench axis which does not fit such a simple picture. Combining temperature gradients in the drill holes with deduced rates of water movement (dewatering) may permit us to calculate convective heat loss and to determine total heat flow.

The quantification of dewatering phenomena has very important implications not only to help us better understand the mechanics of deformation but also to gain information about sediment diagenesis and mass transfer. One of the few ways to obtain empirical information on water flow rates is by analysis of the pore waters. We hope to include a specific effort to this end on Leg 87, in particular at the sites at the base of the Nankai slope.

Objectives — Japan Trench

We will devote drilling during the second part of Leg 87 to a study of the Japan Trench off Honshu. This area has been targeted for concentrated study ever since the theory of plate tectonics was proposed. Investigators have gleaned a wealth of information about heat flow, seismicity, magnetics, gravity, and petrology from the area. Drilling on DSDP Legs 56 and 57 indicated (1) that the landward slope of the trench may comprise an accreted prism which has probably been emplaced since Pliocene time, (2) a mid-Cenozoic period of tectonism was characterized by little net subduction-related accretion or arc volcanism,. The tectonism appears to have produced massive subsidence of the slope area lowering it from above sealevel to its present bathyal depths, and (3) the Cretàceous to early Paleogene period of convergence was accompanied by andesitic arc volcanism associated with a large forearc basin. This suggests the regiion comprises a very extensive accretionary complex.

A subsequent discovery made on the Ocean Research Institute cruise HK 81-3 was the presence of black Cretaceous siltstone (hornfels) outcropping on inner trench slope at 6500 meters which is very near the axis of the trench. These rocks are probably the seaward continuation of the same rocks encountered at Site 439 on Leg 57 and indicate that extensive tectonic erosion was taking place in the forearc toe during the mid-Cenozoic.

Our broad objective in drilling the Japan Trench is to establish the age and tectonostratigraphy of the slope deposits. These stratigraphic data will be combined with geophysical data from seismic profiling, logging, and heat flow measurements in order to test subsidence and uplift models of convergent margin evolution.

We also plan to investigate

- paleomagnetic and physical properties of the slope sediments,
- tephrochronology and explosive volcanic activity of the arc,
- micro-structural features of the cores to unravel the deformation history of the region.

To accomplish these ends, a deep hole is planned at Site JT-13A with Site JT-13B and JT-16B proposed as alternates.

(Abridged from a preliminary draft of the Leg 87 Prospectus prepared by D. Karig and H. Kagami, 28 April 1982.)

Leg 88 - Northwest Pacific Basin

Hakodate, Japan to Yokohama, Japan, 21 August to 22 September, 1982. Co-chief Scientist: Fred Duennebier. (One co-chief scientist to be determined.)

Background

Leg 88 is the second DSDP-IPOD leg specifically planned to conduct downhole measurements. (Leg 78B was the first.) The Defense Advanced Research Projects Agency (DARPA), which is funding the operational aspects of the leg, will emplace a borehole seismometer (marine seismic system) in a hole to be drilled into basement at about 43°51′N, 159°48′E (Fig. 88-1). The marine seismic system will be capable of operation long after the *Challenger* leaves the site. Scientists from the Hawaii Institute of Geophysics plan to emplace a separate borehole seismometer system in another hole close to the DARPA site. (See also Duennebier, F. K., and Blackinton, G., in press.) These two instruments, together with an array of twelve ocean-bottom seismometers (OBSs) from Oregon State University and the Hawaii Institute of Geophysics, will be used to detect earthquakes and explosions during the experiment. The Navy research vessel *De Steiguer* will take part in this experiment deploying the OBSs, shooting explosives, and conducting geophysical surveys.

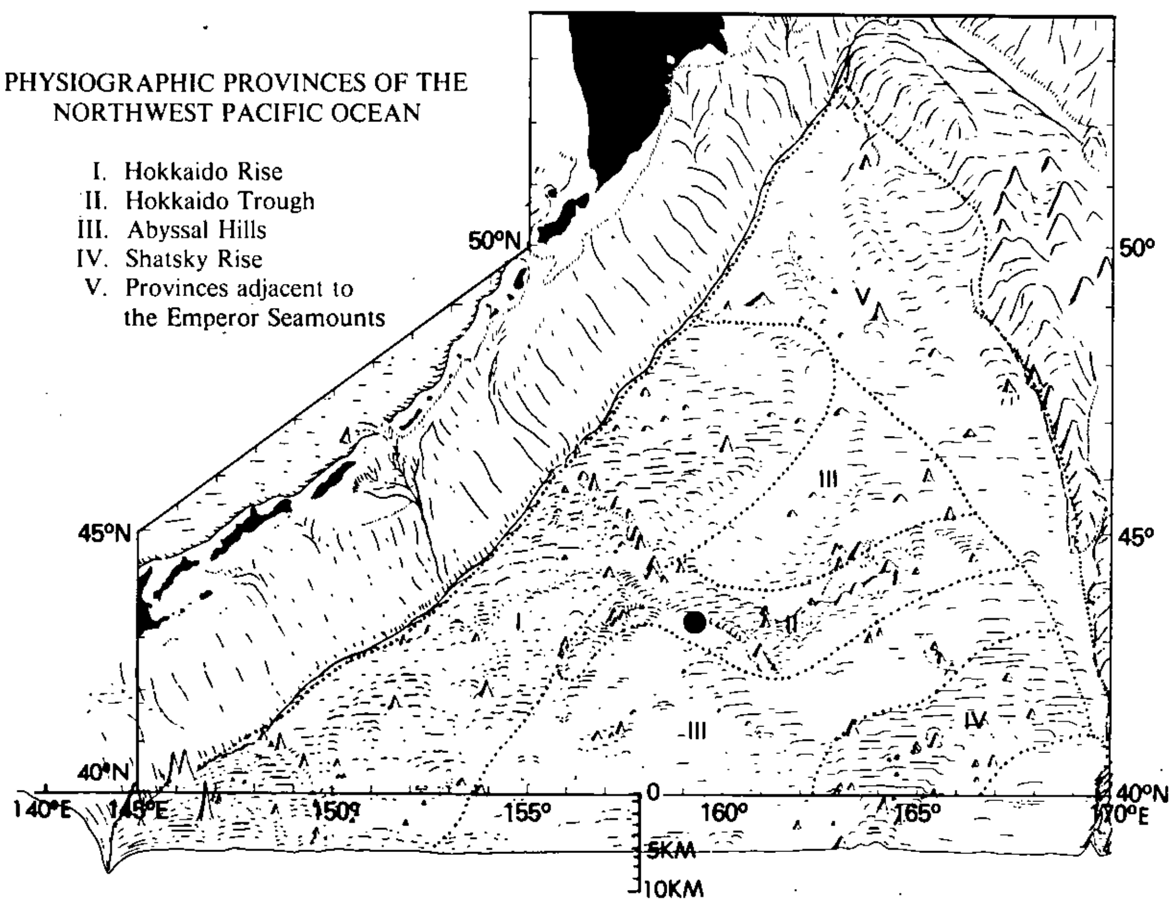


Figure 88-1. Physiographic map of the Northwest Pacific with the Leg 88 drilling site shown. (From Green, J. A., and P. Fleischer, Environmental Report of the Northwest Pacific for the Marine Seismic System (MSS), NORDA Report No. 31, Naval Ocean Research and Development Activity, NSTL Station, MS, 1980.)

Regional Geology

The site lies just south of the Hokkaido Trough in water depths of 5400-5700 meters in an abyssal hills province north of the Shatsky Rise. Magnetic lineations run ENE with a poorly mapped M-1 anomaly just to the south of the site. The anomalies are roughly parallel to the Hokkaido Trough, the origin of which is not yet explained. Magnetic anomalies to the north of the Hokkaido Trough are weak and poorly mapped. The age of the crust, assuming the crust is slightly younger than M-1, is about 110 million years. The basin between the Hokkaido Trough and the Shatsky Rise is characterized by low (200 m) NE-SW trending ridges roughly parallel to the isochrons (Hilde, T. W. C. and others, 1976). DSDP Sites 303 and 304 are south and west of the site in this basin. We expect sediments to be siliceous clay and mud overlying a basal chert, chalk, and nannofossil ooze just above basement — similar to those at Sites 303 and 304. Basement should be normal mid-oceanic ridge basalt generated by the Kula Ridge. The sediment is about 300 meters thick.

Operations

As now planned, the Leg 86 team will continuously core a pilot hole through the sediments and 20 meters into basement. The Neogene section should be complete here and coring will also satisfy the ocean paleoenvironment objectives of Site NW-6. On Leg 88, we will return to the site, set a re-entry cone, drill and case the hole to basement (without coring) and then core an additional 50 meters into the basement. We will attach the DARPA borehole-instrument package to a modified bottom-hole assembly and lower it to the bottom of the hole. We then hope to record refraction data in real time from a 500-km long refraction line and orthogonal 70-km refraction lines shot by the *De Steiguer*, after which we will attach a long-term recording package to the tool and leave it on the sea floor.

Before leaving the site, the *Challenger* will drill another hole to basement and deploy the H. I. G. seismometer (which also records temperature and tilt). If time is available and the *De Steiguer* is still in the vicinity, we will conduct a shooting experiment around the *Challenger* before attaching and lowering the long-term recording package to the sea floor. Another ship will return to the site in late October and recover both the H. I. G. and DARPA seismometers. (*Fred Duennebier, 19 April 1982.*)

References

Duennebier, F. K., and G. Blackinton, The sub-bottom seismometer, In *Geophysical Exploration at Sea*, R. Geyer, ed., CRC, in press.

Hilde, T. W. C., N. Isezaki, and J. M. Wageman, Mesozoic Seafloor Spreading in the North Pacific, Geophysical Monograph 19, American Geophysical Union, p. 205-220, 1976.

Leg 89 - East Mariana Basin

Yokohama, Japan to Rabaul, New Britain, 6 October 1982 to 23 November 1982. Co-chief scientists: Ralph Moberly and Seymour Schlanger.

Background and Primary Objectives

The recovery of a Jurassic section deposited in the Mesozoic superocean has long been a goal of DSDP-IPOD. Attempts to recover such a section on Leg 61 by drilling at Site 462 in the Nauru Basin (Fig. 89-1) were frustrated by the unexpected presence of a thick complex of mid-Cretaceous sill flows. The complex was not completely penetrated during Leg 61 because of a lack of time. Site surveys indicate that at Site MZP-6 (Fig. 89-1, -2) a sedimentary section apparently 1000 meters thick overlies crust, and the magnetic lineation evidence indicates the section to be 150-160 million years old. Successful penetration into basement will yield a record back to middle Jurassic time.

Major oceanographic changes have resulted from the continuing global tectonic evolution of an earth from comprising a single supercontinent and a single superocean to one comprising fragmented continents and several oceans. These oceanographic changes included the transition from a warm to a cold ocean, the occurrence of periods of pronounced oxygen deficiency in deep or mid-water oceanic environments (oceanic anoxic events) with related changes in ocean chemistry, and the evolution of major marine plankton groups which probably altered the pathways of major elements such as calcium, silicon, carbon, and phosphorus. The creation, consumption, and possibly temporary isolation of marginal seas and ocean basins appear to have led to chemical fractionation and sudden environmental changes. In particular, the first half of that history — prior to 100 million years ago — is still poorly known.

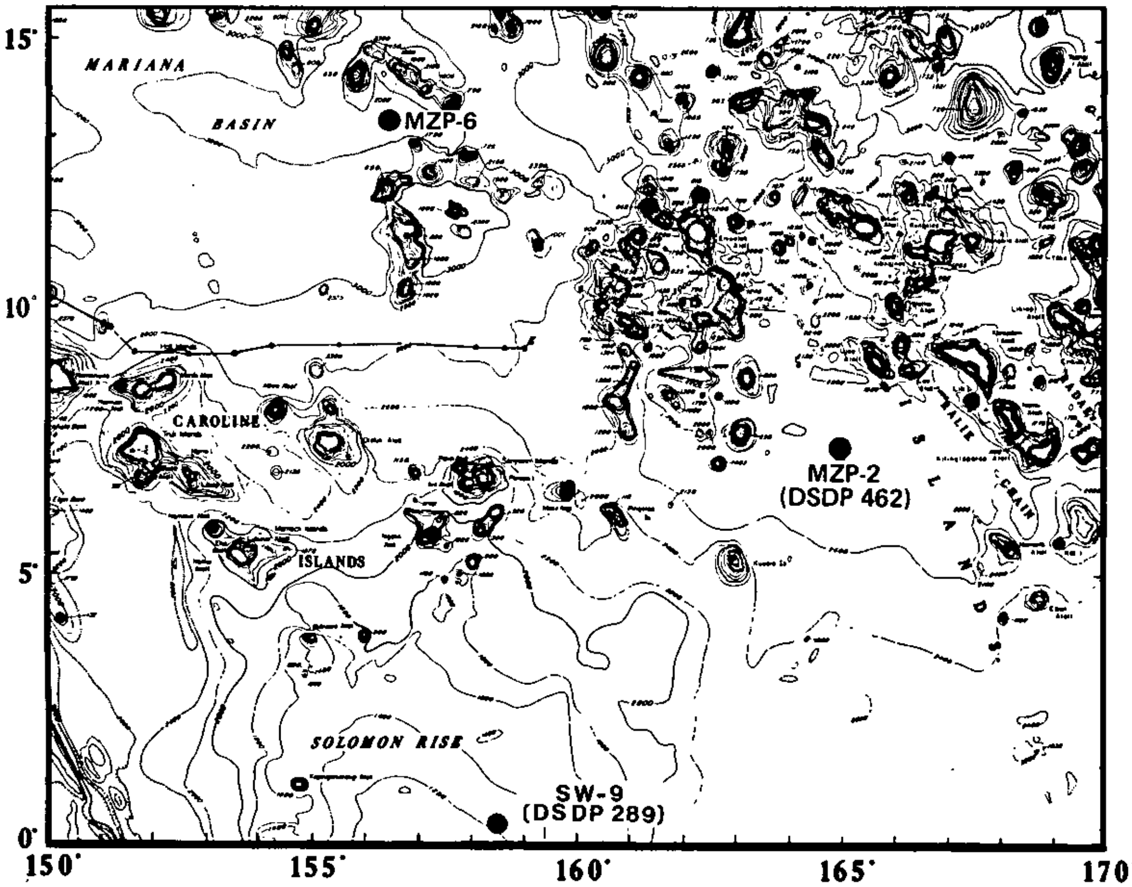


Figure 89-1. Locations of MZP-6 and MZP-2 (DSDP 462).

The modern western Pacific Ocean represents a remnant of the early Mesozoic superocean, whereas the Atlantic and Indian Oceans have developed relatively recently. The oldest sediments reached by ocean drilling are upper Callovian, cored at Site 534 in the Blake-Bahama Basin during Leg 76. Results from this site indicate that early Callovian environments were those of a restricted basin. Later Callovian and Oxfordian time saw the first opening of a world-wide ocean pathway linking the Tethys and Pacific Oceans. In the Pacific, the oldest sediment drilled on the ocean floor is of latest Jurassic or earliest Cretaceous age. We lack knowledge of earlier Jurassic Pacific sediments that could substantiate this opening or record its effects.

Our record of middle Jurassic pelagic sediment comes primarily from sections outcropping in the Tertiary fold belts, where they correspond to Tethyan continental margins in various stages of evolution. A major controversy centers on whether these sections are truly representative of the early Mesozoic world ocean and it is remarkable that sediments which contain that record have never been sampled from any deep oceanic basin. A consequence of this enormous gap in our knowledge is that all biostratigraphic data from the early Mesozoic remain biased towards fossil assemblages from near shore and marginal areas of ocean basins in the early stages of their evolution.

We have ample evidence from magnetic data that portions of the oceanic crust in the western Pacific are at least as old as middle Jurassic but have no complete record of the sediment sequence overlying known oceanic crust in this area. Geophysical data from DSDP and other sources also suggest that these portions of the seafloor were actually generated in moderate to low latitudes of the southern hemisphere away from any large continental land mass. We expect that this Mesozoic sediment record can be recovered at Site MZP-6 in the deep East Mariana Basin.

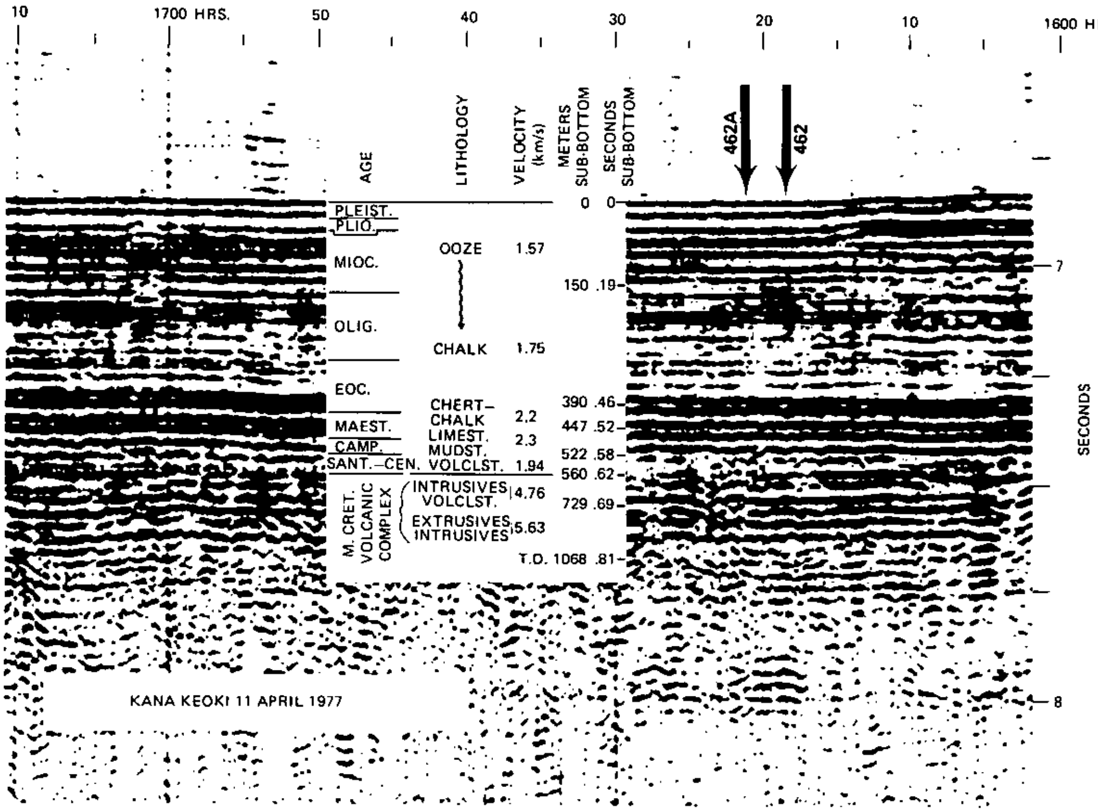


Figure 89-3. Section penetrated at DSDP Site 462. Re-entry is planned here in order to penetrate the mid-Cretaceous volcanic complex, if time permitting.

Table 89-1. Proposed Leg 89 Sites

Site	Priority	Coordinates	Water Depth (m)	Distance From Land (n.mi)	Nearest Land	Maximum Penetration (m)	Objectives
MZP-6	1	13°60.5'N 156°48.8'E	3075	330	Eniwetok, Marshall Is.	1200	1. Cretaceous and Jurassic sediments 2. Jurassic basement
MZP-2 (DSDP 462)	2	7°14.25'N 165°01.83'E	5180	120	Ujae Atoll, Marshall Is.	Deepen Site 462 (T.D. 1068 m) to ~ 1300 m	1. Penetrate sill-flow complex 2. Cretaceous and Jurassic sediments 3. Jurassic basement
SW-9 (DSDP 289)	2	00°29.92'S 158°20.69'E	2206	180	Solomon Is.	250	1. Neogene paleoceanographic records at low latitude western Pacific.

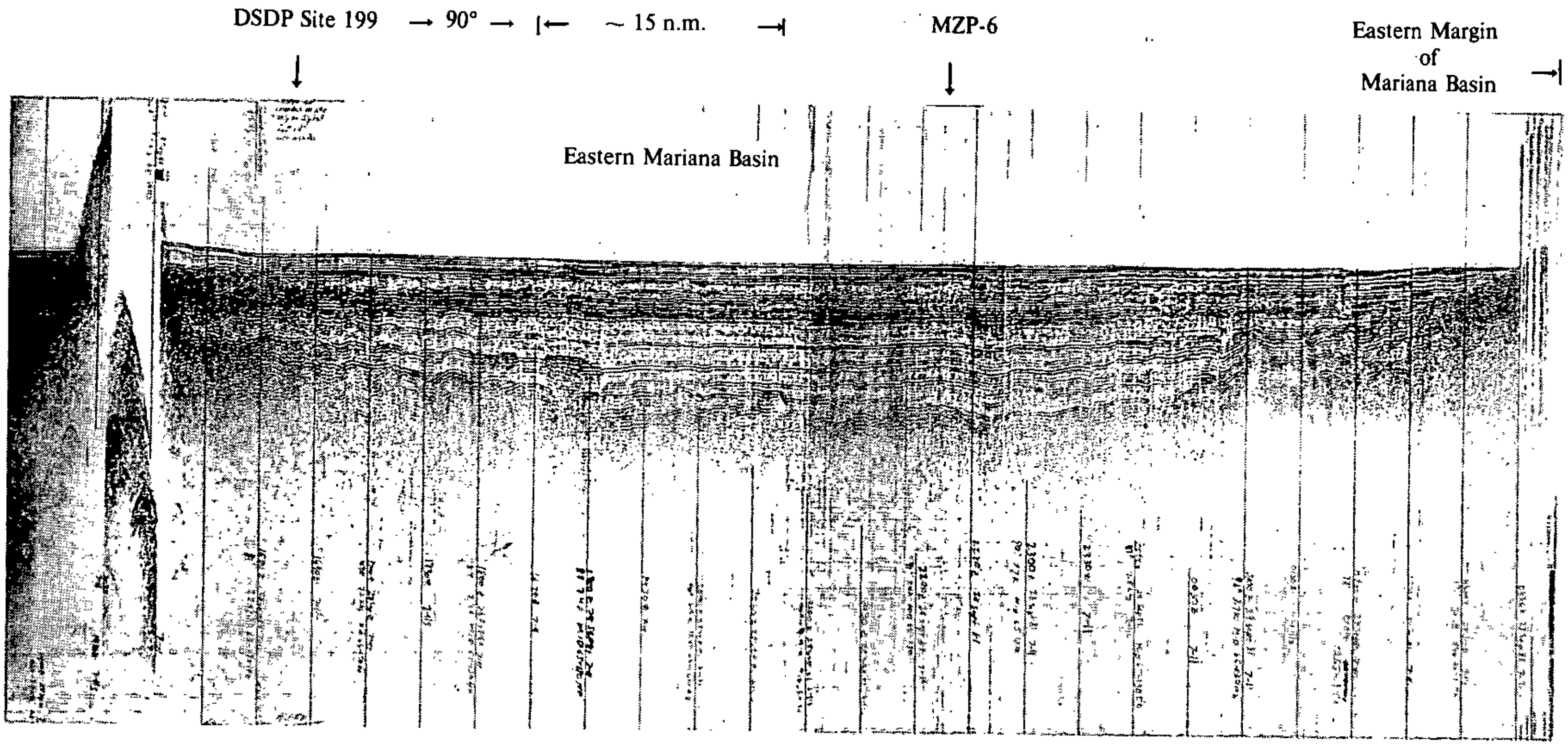


Figure 89-2. Seismic profile, west to east, across eastern Mariana Basin showing MZP-6 and its relationship to DSDP 199.

The specific questions to be addressed on Leg 89 include the following:

- How did the early evolution and radiation of the oceanic plankton (coccoliths, radiolarians, benthic and planktonic foraminifers) influence the composition of pelagic sediment and how does this biota reflect Mesozoic ocean chemistry?

- Did the opening of the North Atlantic Ocean affect the circulation and chemistry of the world ocean in a way similar to what has been proposed for the opening of the South Atlantic?

- Are "pelagic" sediments exposed in Tertiary fold belts (ribbon radiolarites, ammonitico rosso, etc.) characteristic of open ocean environments?

- Can we establish an early Mesozoic pelagic bio- and magneto-chronology?

- Were the mid-Cretaceous sedimentary environments in the deep Pacific better oxygenated than in the Atlantic and Indian Oceans?

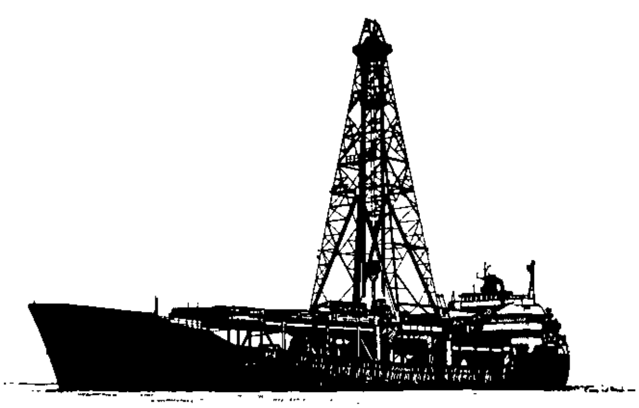
Although numerous outstanding Mesozoic environmental objectives, such as the nature of the Cretaceous/Tertiary boundary, the mechanisms behind mid-Cretaceous oceanic anoxic events, the occurrence of water exchange within partially or completely isolated basins, the structure and stability of deep water masses, and the chemical fractionation between major ocean basins, remain important problems in other oceanic basins, our basic objective during Leg 89 is to recover a truly oceanic sediment record, which is preserved only in the western Pacific.

Time and hole conditions permitting, we plan to log the holes.

Secondary Objectives

The discovery of a major mid-Cretaceous sill-flow complex in the Nauru Basin during drilling at Site 462 (Fig. 89-3) added greatly to our knowledge of the chronology and extent of Cretaceous mid-plate volcanism. The relative shallowness of the Nauru Basin is now thought to be the result of a reheating of the Pacific plate that in effect reset the area to a higher point on the Parsons-Sclater subsidence curve. Time permitting, we will reoccupy Site 462 in an attempt to completely penetrate the sill-flow complex. Determination of the actual thickness of the complex will allow us to make isostatic corrections and so decipher the subsidence history of the Marshall Island area.

Because of time restrictions imposed by the anticipated drilling schedule for the remainder of the 1982-83 program, we will drill the northernmost of the southwest Pacific hydraulic piston core transect during Leg 89 which is an objective of Leg 90. This will save several days of transit time. We will, therefore, HPC Site SW-9 (DSDP Site 289) twice to resistance, estimated at 250 meters, in order to obtain a detailed Neogene oceanographic record of a low latitude western Pacific area. Except for necessary shipboard tests these cores will be turned over to the Leg 90 crew for inclusion in their program. (*Seymour Schlanger, 4 April 1982.*)



DEEP SEA DRILLING PROJECT

INFORMATION HANDLING GROUP

Update

Shipboard Computer

The Hewlett-Packard 1000 system purchased for use on board the *Glomar Challenger* is currently "up and running" at DSDP. We are checking the myriad details involved in generating a new computer operation and are developing software and documentation to accompany the computer to its home onboard ship. DSDP currently plans to install the system on *Challeger* in Yokohama during the scheduled drydocking period (22 Sept.- 6 Oct. 1982).

The computer will greatly improve data collection and data handling activities at sea, as well as help ensure drilling safety. Initially, the shipboard scientists will use the computer to acquire and process gas-chromatograph data, and to collect direct digital seismic data, and heat flow data. Shipboard computer operations will be handled by the marine technicians and electronics staff.

Available Data and Data-Handling Tools

Tables DSDP-1 and -2 list data and data-handling systems available from DSDP. Data for legs shown in bold type are those added since last publication of the last *JOIDES Journal.*

We can also supply documents containing background information (without data) on nearly all its data bases. For more information contact

Nancy Freelander
Information Handling Group
Deep Sea Drilling Project - A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3526

(*Nancy Freelander, April 1982.*)

CORE REPOSITORIES

Samples from DSDP Legs 1-78 are available to investigators for study to result in published papers. We encourage investigators who desire samples to first obtain a statement of the NSF/DSDP sample distribution policy and a sample request form from the DSDP Curator. (A statement of the sample distribution policy also appears in the Initial Reports and in the Initial Core Descriptions.) We ask that requests for samples be as specific as possible. Requestors should specify the hole, core, section, interval in centimeters measured from the top of each section, and sample volume in cubic centimeters. Refer to the graphic core descriptions in the Initial Reports and/or the Initial Core Descriptions for core details.

Samples for publication of results elsewhere than in the Initial Reports cannot be distributed until one year after the completion of a cruise or two months after publication of the Initial Core Descriptions for the cruise, whichever occurs sooner. Beginning with Leg 76, the Initial Core Descriptions will be available only in microfiche. This change in production format does not affect the sample distribution policy.

The DSDP Curator can approve many standard requests in office, but requests for material of particularly high interest (e.g., certain hydraulic piston cores, key stratigraphic boundaries) or for large volumes of material must be forwarded by the Curator to the NSF Sample Distribution Panel for review.

Cores from the Atlantic and Antarctic oceans and the Mediterranean and Black seas (Legs 1-4, 10-15, 28, 29, 35-53, and 71-82) are at the East Coast Repository at the Lamont-Doherty Geological Observatory. Cores from the Pacific and Indian oceans and the Red Sea (Legs 5-9, 16-27, 30-34, 54-70, 83, and 84) are at the West Coast Repository at the Scripps Institution of Oceanography. Lack of core storage space at the West Coast Repository precludes the unpacking of the archive halves from Leg 84, therefore the archive halves will remain boxed and inaccessible to investigators. Frozen samples (collected specifically for organic geochemical analyses), interstitial water samples, and gas samples from all DSDP legs are kept at the West Coast Repository. Interested scientists may view the cores,

Table DSDP-1. Data-Base Status (Data Available)

Data File	Legs	Comments
Physical Properties, Quantitative and Analytical Core Data		
Carbon-carbonate (shore lab)	1-79	No data for Legs 46,72.
Grain-size (sand-silt-clay) (shore lab.)	1-76	No data for Leg 64 and 65 not yet available.
GRAPE (gamma-ray-attenuation- porosity evaluator) (shipboard measurements, processed and edited onshore)	1-74	No data collected on Leg 46. Leg 45 GRAPE is not complete.
Hard rock major-element chemical analyses (shipboard and onshore labs)	13-19,22-30,32-39,41,42A,43,45-46,49,51-62,64,65	No data for Legs 2-12,20-21,31,40,47-48, 56-57,63. Includes igneous and metamorphic rock and sediment composed of volcanic material.
Hard rock minor-element chemical analyses (shipboard and onshore labs)	13-19,22,26,28-34,36-39,41-42A,43,45-46, 49,51-55,58-60,62,64,65	No data for Legs 2-12,20-21,27,35,40, 47-48,50,56,63. Same set of data source as major-element file.
Hard rock paleomagnetics	14-16,19,23,25-29,32-34, 37-38,41,42A,45-46,49 51-55,59-66	KEYPUNCHED ONLY TO DATE (12/81). No data for Legs 2-12,17-18,20-22,24,30-31.
Sonic velocity (shipboard, Hamilton frame)	3-84 (82,83,84)	
Water content (shipboard lab.)	1-83(82,83)	No data for Leg 41.
Long-core spinner magnetometer sediment paleomagnetics	68,70-72-75	From hydraulic piston cores. This is a CLOSED data base owing to rust contamination of cores and sediment distrubance.
Discrete sample magnetics, sediment	71-73,75	From hydraulic piston cores.
Alternating field demagnetization	72,73	From hydraulic piston cores.
Lithological and Stratigraphic Core Data		
Paleontology (onshore labs.)	1-44	From *Initial Reports.* Includes 10,000 species from 24 fossil groups.
SCREEN	1-44	Output from JOIDESSCREEN. Computer-generated lithological classifications. Includes basic composition data, average density, and age of layer.
Smear-slide descriptions	1-44	Shipboard observations.
Thin sections	49 only	Legs 37,45,46,51-56,57-64 keypunched.
...tions	1-44	Shipboard observations.

Table DSDP-2. Data-Base Status (Data Handling/Retrieval)

Data File	Legs	Comments
	Underway Data	
Bathymetry	7-9,13-56,61-80	
Magnetics	7-9,12-80	
Navigation	3-80	
Seismic	1-80	Seismic data available only in hardcopy or MICROFILM.
Merged format files (MDG77)	1-80	
	Special Reference Files	
Sitesummary	1-84 (**81-84**)	Hole oriented. Regularly updated.
DSDP Guide	1-34	Core oriented. MICROFICHE or tape.
Ageprofile	1-84 (**80-84**)	Hole,core section. From biostratigraphy.
Coredepth	1-83 (**83**)	Hole-core. Primary reference tool.
	Aids to Research	
DATAWINDOW		Search and retrieval program,data base maintenance.
MUDPAK		Plotting program,handles multiple parameters.
Maps		
DASI/INQUIRY		DSDP affiliated scientists and institutions — searchable.
Keyword Index — Search		Constructed from bibliography and sample request files.
Sample Records		Point data inventory
Data Data		Series of informal specific memoranda containing detailed descriptions of procedures and capabilities of the Information Handling Group.

Bold type indicates data added since JOIDES Journal last published.

core photographs, or other associated data at either repository by making arrangements in advance with the Curator.

Please address your questions or sample requests to:

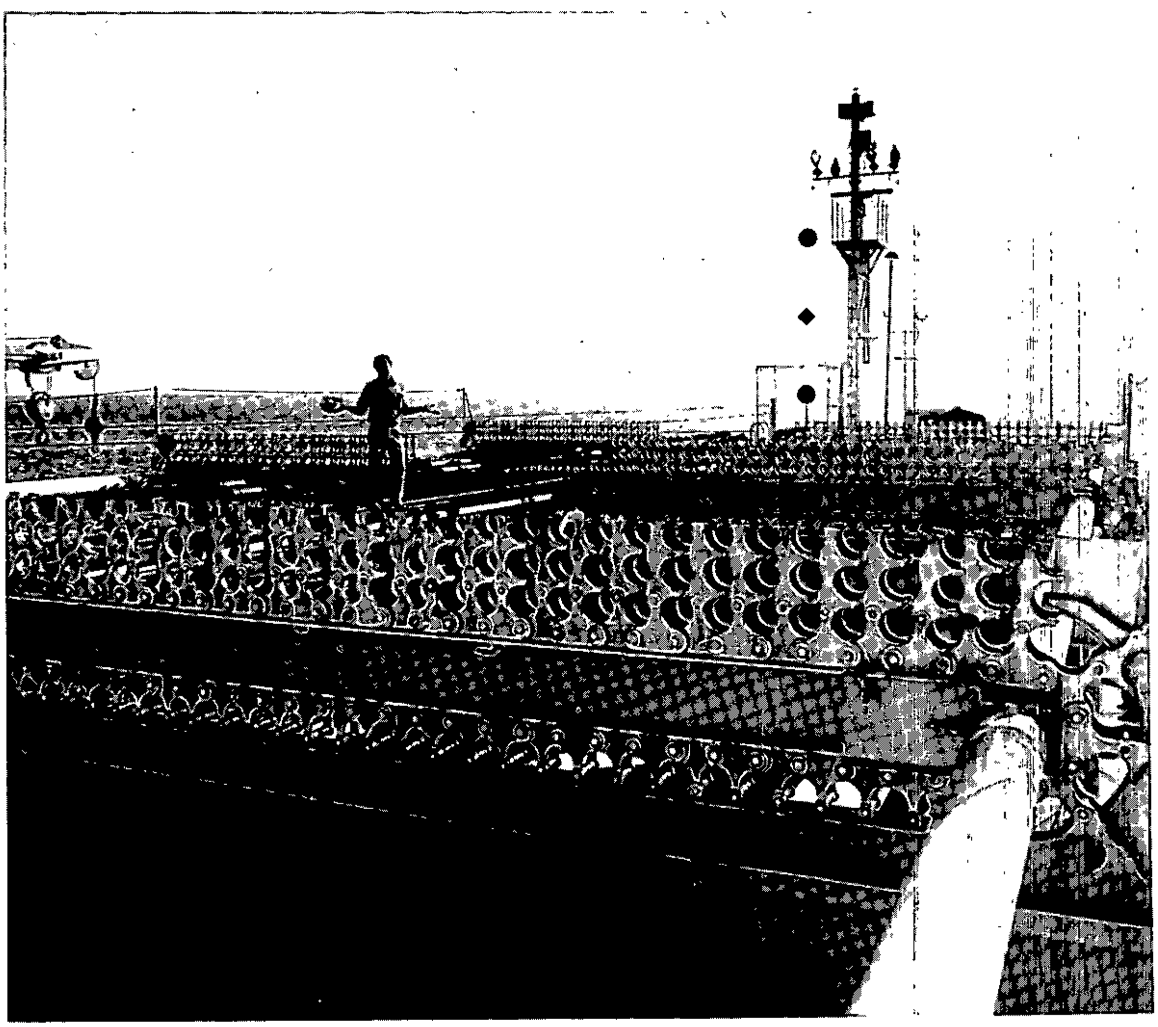
The Curator
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
Universityy of California, San Diego
La Jolla, California 92093
Tel: (714) 452-3528

(Amy B. Altman, DSDP Assistant Curator, 7 April 1982.)

PERSONNEL BRIEFS

Russel Merrill joined DSDP on 1 March 1982 as **Associate Chief Scientist for Science Services.** Merrill is an igneous petrologist and has been administering conferences and publications for the last eight years. His primary scientific interest is high pressure igneous chemistry, particularly the roles of volatile-rich minerals in mantle processes. As ACS for Science Services, he will administer the Data Handling Group, the Publications Department, and Core Repositories.

Audrey Wright joined DSDP as a **Staff Scientist** in April 1982. She is completing her Ph.D. at the University of California, Santa Cruz and is staff representative/sedimentologist on Leg 86 underway in the northwest Pacific.



Anyone for Ping-Pong?

JOINT OCEANOGRAPHIC INSTITUTIONS, INC.

REPORT FROM JOI, INC.

Ocean Margin Drilling Program

As reported in the last issue of the *JOIDES Journal*, a major part of the legacy of the OMD will be the maps produced by the regional synthesis projects. These projects are scheduled for completion this coming summer, and the set of maps from each region will be published as a separate atlas. Using the Oregon-Washington maps as an example, a mock-up of one of the atlases, at publication scale, has been prepared and is being used as the basis for discussions with potential publishers and printers. A major goal is to present the atlases in a format that does justice to efforts of the many who have contributed to them, while at the same time keeping the costs affordable by the individual scientist.

Preparations for the Advanced Ocean Drilling Program

During January W. Hay and T. Davies spent considerable time in discussions with individual scientists at JOI institutions. The discussions were aimed at exploring the characteristics of the U.S. science program related to the future AODP, and at developing responses to the tasks assigned to JOI by the AODP Interface Working Group. The results of these discussions were tabulated and supplied to U.S. members of the JOIDES Planning Committee, together with a rough budget for a possible program, as background for a general discussion held in conjunction with the PCOM meeting in Miami on February 23. Though the general discussion did not reach any firm conclusions it served to draw attention to the diversity of opinions and to the many problems associated with developing a coherent science program related to the drilling. NSF representatives present at the meeting assured participants that they were cognizant of the problems raised, were working to resolve them, and were budgeting to support increased scientific activities related directly to the proposed AODP.

W. Hay also spent time in February in informal discussions with European scientists interested in AODP, with the aim of identifying aspects of the proposed future program of particular concern to non-U.S. participants.

JOI Site-Survey Program

During February we were able to take advantage of an opportunity to obtain GLORIA coverage of a significant part of the area planned for the Mississippi Fan survey, scheduled in support of DSDP Leg 92 drilling. These data will aid considerably in refining plans for the survey and the subsequent drilling, as well as adding to our knowledge of the region. The request for proposal for the survey was released by JOI on March 25, 1982, and responses are due by May 15, 1982.

March also saw the completion of a survey of the eastern Pacific scheduled in support of the hydrogeology leg (DSDP Leg 91). Scientists from Scripps, Lamont and the University of Rhode Island were involved in the survey, for which the R/V *Thomas Washington* was used. The survey work was complicated by equipment failures aboard the *Washington*, nevertheless satisfactory results appear to have been obtained. (*Thomas A. Davies, 6 April 1982.*)

Now Available

Geological Map of the Indian Ocean

The Geologic Map of the Indian Ocean was produced by B. C. Heezen, R. P. Lynde, Jr., and D. J. Fornari to accompany the book, *Indian Ocean Geology and Biostratigraphy* (1977). The colored map shows the location of DSDP sites along with

- a generalized stratigraphic column for each site
- age of oceanic basement
- bathymetry
- fracture and earthquake zones
- biostratigraphy
- magnetic stratigraphy

DSDP has limited number of these maps available at no cost. Contact

Trudy Wood
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093
Tel: (714) 452-3526

IPOD SITE-SURVEY DATA BANK

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

- Microfilms of seismic profiles and computer tape of underway geophysical measurements taken during *Glomar Challenger* Legs 75-81, from S. Smith, Geological Data Center at Scripps Institution of Oceanography.

- Computer tape of underway geophysical measurements (topography, magnetics, gravity) merged with navigation for *Kana Keoki* 81, Leg 4 (IPOD site survey for the Mesozoic Pacific, Leg 89), from F. Duennebier, Hawaii Institute of Geophysics.

- Microfilmed data (5 rolls) from *Kana Keoki* Cruise 810626-4 (IPOD site survey for Mesozoic Pacific, Leg 89) including A log, seismic log, bridge log, shaft RPM, anamometer records, asper log, station sampling log, EPC single-channel seismic records, and *Alpine* 3.5 KHz echo-sounding records, from F. Duennebier, Hawaii Institute of Geophysics.

- Data from Gulf of Mexico (Mississippi fan, Leg 92) site survey including navigation plots, GLORIA replay records, GLORIA 10 KHz replay records, and airgun records, from L. Garrison, U. S. Geological Survey, Corpus Christi, Texas.

The IPOD Data Bank no longer has its direct telephone number (914-359-8883). The new number is (**914-359-2900, x502**).

Sediment Paleomagnetism Data Now Available

The sediment paleomagnetism data base contains shipboard paleomagnetic measurements taken by the discrete-sample spinner magnetometer, the alternating-field demagnetizer and the long-core spinner magnetometer. The file is restricted to paleomagnetic measurements of cores recovered by the hydraulic piston corer. The long-core spinner-magnetometer sediment-paleomagnetism file is complete with measurements from DSDP Legs 68, 70-72 and 75. Discrete-sample spinner magnetometer sediment-paleomagnetism data are available for DSDP Legs 71-73 and 75.

Address requests for these data to:

Donna Hawkins
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3526

DSDP Site Map Updated

Topography of the Oceans with Deep Sea Drilling Project sites now available through Leg 82. To request map contact:

Barbara J. Long
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093
Tel: (714) 452-3506

Shipboard Organic Geochemistry Guide/Handbook

Prepared by the JOIDES Advisory Panel on Organic Geochemistry, Berndt R. T. Simoneit, Chairman.

Copies available from:

Science Operations
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3503

FOCUS

LETTER FROM THE PLANNING COMMITTEE CHAIRMAN

Since the February Planning Committee meeting in Miami, events have moved swiftly.

The big — and good — news is that the U.S. National Science Board, at its meeting on 19 March, unanimously adopted a resolution that supported a long-term program of ocean drilling and endorsed the use of *Explorer* to carry it out. (The text of the resolution appears elsewhere in this Journal.)

The Board heard presentations by Allen Shinn and Ian MacGregor (NSF Office of Scientific Ocean Drilling) on the scientific benefits of the Program and an estimate of the costs. As described at the PCOM meeting, Lockheed estimates the operating costs of *Explorer* at about \$51,000/day, compared to its estimate of 46,000/day for *Glomar Challenger.* Lockheed estimates *Explorer* conversion costs at \$69 million, ± 12 per cent, whereas DSDP estimates *Challenger* refurbishment costs at about \$11 million. NSF suggested that \$26 million of the *Explorer* conversion costs can be amortized over a period of 10 years, leaving only \$43 million to be paid in FY 1984 and 1985. *Explorer* drilling operations would start in FY 1986; *Challenger* drilling would cease in October, 1983. Provision is made for a phasing out of the *Challenger* program (complete publications, provide for information and core handling) and for science planning (JOIDES), site surveys, tool development, during the drilling hiatus. NSF estimates the total costs, in million of dollars, for each year (expected total non-U.S. contribution in parentheses) as: FY 1984, 28.75 (5.75): FY 1985, 29.25 (6.25); FY 1986 and thereafter, 40.44 (17.44). NSF is hoping to join with at least four major non-U.S. partners (at \$3 million/year) and perhaps five or six "associate" partners (at \$1 million/year) for the drilling phase.

My personal impressions, from the discussion at the NSB meeting, are that the Board is now persuaded that the earth science community is of one voice on the benefits of scientific ocean drilling, as set out in the COSOD report. They seemed to accept that drilling is a crucial part of many experiments in the earth sciences, and seemed convinced that a long-term commitment was needed. The desirability of using *Explorer* was discussed in this context of a very long-term program. The Board squarely faced the trade-off implied in electing to put money into drilling: other programs (e.g., radio astronomy) would get proportionately less and the burden would not be borne only by earth and ocean science programs.

Allen Shinn has been meeting with officials from the Office of Management and Budget and the Office of Science and Technology Policy (the President's Science Advisor) to get their approval of the NSB-recommended program and its budget. He has told me he is optimistic about the outcome of these meetings.

No overall management scheme for the *Explorer* has yet been adopted. NSF has some ideas on this that were discussed at a JOI Board of Governors meeting in March, but nothing was endorsed. Several alternate schemes have been proposed by various members of the JOIDES community.

As to our own JOIDES planning, the science narrative for eight years of post-1983 drilling has been revised according to the suggestions made at the Planning Committee meeting. A copy of the revised narrative has been given to NSF and JOI Inc., DSDP and Lockheed. Printed copies will be available in May.

We have now received the final versions of White Papers from all JOIDES panels, which we will reproduce as an appendix to the Science Narrative.

DSDP is preparing a formal proposal to carry out the drilling program described in the JOIDES narrative.

As to *Challenger* operations, I happily report that through the efforts of Dennis Hayes, the DARPA site has been shifted so as to accomplish the objectives of OPP site NW-6, thus saving many days of ship time. DSDP has now ordered the drill pipe needed to replace what was lost on Leg 84. It will be delivered in Japan in September, which means we can now carry out the drilling on Leg 89 ("Old Pacific").

Meanwhile, Larry Mayer, Fritz Theyer and all the Leg 85 team have been going great guns with their work in the Equatorial Pacific. (*E. Winterer, 23 April 1982*)

NEWS BRIEFS

PCOM Chairmanship/JOIDES Office Moves

The JOIDES Office begins operations at the Rosenstiel School of Marine and Atmospheric Science (University of Miami) on 1 July 1982. At that time **Jose Honnorez** assumes chairmanship of the JOIDES Planning Committee.

The JOIDES Office staff will comprise **Donald S. Marszalek, JOIDES Science Coordinator** and **Editor** of the **JOIDES Journal**, and **Jacquelyn Johnson**, Administrative Assistant.

REPORT FROM NSF

Office of Scientific Ocean Drilling

On March 19 the Office of Scientific Ocean Drilling made its presentation to the National Science Board of the plans for the successor program to the Deep Sea Drilling Project. The National Science Board unanimously endorsed this plan. The successor program, called the Advanced Ocean Drilling Program (AODP), is formulated largely around scientific objectives outlined in the report of the Conference on Scientific Ocean Drilling (COSOD), which outlined the need for a continuation of exploration of the ocean floors by drilling. One important aspect of AODP is that it will make use of the *Explorer* as a drillship. Conversion of the *Explorer*, a task that is expected to take eighteen months to two years, will give the AODP drilling capabilities beyond those of the present vessel, *Glomar Challenger.* Additionally, the new ship promises a longer life to the scientific ocean drilling because it is not likely that the needs of the program will outgrow the potential capabilities of the *Explorer* in the foreseeable future.

Following is the full text of the resolution endorsed by the National Science Board.

> **RESOLVED, that the National Science Board believes that a program of scientific ocean drilling is and will continue for an extended period to be an essential component of basic research in the earth and ocean sciences.**
>
> **In recognition of that fact, the Board approves the establishment of the Advanced Ocean Drilling Program; further, the Board authorizes the application to this program of the general authority of the Director, under the resolution approved by the Board at its 189th meeting on April 21-22, 1977, to take final action on grants, contracts, or other arrangements without the prior approval of the Board.**
>
> **Further, the Board endorses the efforts of the Director to secure commitment of the Government-owned ship Explorer to this program, to seek resources to complete design and planning efforts for Advanced Ocean Drilling during FY 1983, and to undertake negotiations with current and potential future international partners for scientific participation and financial support of the Advanced Ocean Drilling Program.**

The endorsement of the National Science Board is a very important first step. Decisions by the Administration and Congress on the plans for the new program are expected in the next several months. In the meantime another important aspect of AODP is being pursued, and that is to expand international participation. The model for this expanded international participation will be the International Phase of Ocean Drilling (IPOD) which has proven so successful for the Deep Sea Drilling Project. On May 19 and 20 the annual IPOD meeting will be held in Washington, D.C. This year observers will be invited from countries which have expressed an interest in the ocean drilling program so that they may be brought up to date on the current plans, ask questions from present IPOD partners, and obtain a flavor of the scientific and administrative proceedings. We hope that in this way the interest of a broad section of the marine geoscience community in many countries will be stimulated, thereby facilitating expansion of international participation. (*Stefan Gartner, Office of Scientific Ocean Drilling, 22 April 1982*)

Major- and Minor-Element Analyses

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 Legs 63-65. For information contact:

Donna Hawkins
Information Handling Group
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3526

STATUS OF IPOD REFERENCE CENTER

Work Completed to Date

W. Riedel and J. Saunders have completed sample selection through Leg 46. Preparators at the National History Museum at Basel and Scripps Institution of Oceanography have processed samples as follows.

Foraminifers (Basel)

Samples requested: 2466
Samples received: 1597
Samples processed: 1147
Legs completed: 1-12, 16-23
Samples in hand
but not processed
(legs): 13-15, 24-26

Nannofossils and lithology (S.I.O.)

Legs completed: 1, 2, 7, 8, 9
Legs two thirds
completed: 16-23
Samples in hand
but not processed
(legs): 10-15

Planners originally proposed five reference centers but have now raised this number to eight. Thus the volume of some of the samples taken earlier is inadequate (em sufficient only for four-way splits. About 54 samples from Legs 1 through 6 have been resampled (as close to the original levels as possible) and are in transit to N. de B. Hornibrook in New Zealand, who will do the additional work.

The foraminifer samples completed by the Basel Reference Center (Legs 1-12, 16-23) will be dispatched to other Centers by 31 May 1982.

The nannofossil and lithologic samples prepared at Scripps Institution of Oceanography are in the form of mounts on glass slides. These should be hand carried and their distribution will await visits to DSDP of suitable scientists who will carry them to the countries involved.

Status of Individual Centers

Scripps Institution of Oceanography: formally designated in 1980; processing nannofossils and lithologic smear slides. Curator, W. R. Riedel.

Lamont-Doherty Geological Observatory: situation being clarified; expected to process radiolarian samples.

Smithsonian Institution: formally designated in 1981. Curator, R. Cifelli.

Natural History Museum, Basel: formally designated in 1975; processing foraminifer samples. Curator, J. B. Saunders.

New Zealand Geological Survey, Lower Hutt: formally designated in 1981; processing some additional foraminifer samples. Curator, N. de B. Hornibrook.

Japan: formally designated in 1981; initial arrangements being made on behalf of Japanese IPOD organization by Takayanagi of Tohoku University, Sendai. Processing diatom samples.

U. S. S. R.: collection is to be housed in the Institute of the Lithosphere *or* the Institute of Paleontology; both are in Moscow.

Future Plans

Continued sample selection is planned for January 1983, provided that Saunders is able to visit S.I.O. at that time.

Owing to administrative delays in setting up centers in the various countries Riedel and Saunders probably will not meet with other curators during 1982. A possible goal is a meeting at the New Zealand Repository in February 1983, at the time of the Pacific Science Congress to be held in Dunedin, New Zealand.

(Extracted from a memo prepared by W. Riedel and J. Saunders to the JOIDES Information Handling and Stratigraphic Correlations panels. February, 1982.)

Recipients of DSDP Samples and Data

Remember to send five reprints of any paper you have published using data or samples collected by or in conjunction with the Deep Sea Drilling Project to the DSDP Curator.

Curator
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

PUBLICATIONS

We thank the DSDP Curator for supplying us with this list of recent publications.

Davies, Thomas and S. P. Worsley, 1981. Paleoenvironmental implications of oceanic carbonate sedimentation rates. *SEPM Spec. Publ.*, No. 32, p. 169-179, October, 1981.

Depaolo, D. J., F. T. Kyte, B. D. Marshall and J. Smit, Rb-Sr, Sm-Nd and K-Ca studies of Cretaceous-Tertiary boundary sediments: posssible evidence for an oceanic impact. Submitted: *Lunar Planetary Science*, XIII, 1981-82, 2 pages.

Govorov, I. N., I. P. Ilupin, A. D. Kharykiv, Z. L. Denisov, E. D. Golubeva, 1980. Geokhimiya glybinnykh vulkanicheskikh porod i ksenolitov. (Geochemistry of deepseated volcanic rocks and xenoliths), V. S. Sobolev, ed. Moscow, 331 pp. Akademiya Nauk CCCP, Dalnevostochyi Nauchnyi Tsentr, Dalnevostostochyi Geologicheskii Institut. Publ: Izoatelstvo "Nanka," Moscow.

Haaland, T., 1981. A Tertiary palynological study on DSDP material (Site 346) from the Jan Mayen-Ridge. Hovedfagsoppgave (publisher), Oslo, 103 pp.

Keller, Gerta 1981. Origin and evolution of the genus *Globigerinoides* in the early Miocene of the northwestern Pacific, DSDP Site 292. *Micropaleontology*, v. 27, p. 293-304.

Ledbetter, Michael T., 1982. Tephrochronology at DSDP Site 502 in the western Caribbean. In *Tephra Studies*, S. Self and R. S. J. Sparks, eds., NATO Advanced Study Series. D! Riedel Publishing Co., p. 281-288.

Mikkelsen, Naja, 1980. Experimental dissolution of Pliocene diatoms. *Nova Hedwigia*, v. XXXIII, Braunschweig, p. 893-911.

Petrushevskaya, M. G., 1981. Radiolyarii otryada nassellariia mirovogo ideana. Izdavaemye Zoologicheskii Institutom, Opredeliteli po Faune CCCP, Akademii Nauk CCCP, #128, 405 pp.

Poore, Richard Z., 1981. Late Miocene biogeography and paleoclimatology of the Central North Atlantic. *Marine Micropaleontology*, v. 6, p. 599-616.

Poore, Richard Z., 1981. Temporal and spatial distribution of ice-rafted mineral grains in Pliocene sediments of the North Atlantic: Implications for Late Cenozoic climatic history. *SEPM Spec. Publ.*, No. 32, p. 505-515.

Rea, David K. and Thomas R. Janecek, 1981. Late Cretaceous history of eolian deposition in the Mid-Pacific mountains, central North Pacific Ocean. *Palaeogeog., Palaeoclim., Palaeoecology*, v. 36, p. 55-67.

Rullkotter, Jurgen, Christopher Cornford and Dietrich H. Welte, 1982. Geochemistry and petrography of organic matter in northwest African continental margin sediments: quantity, provenance, depositional environment and temperature history. In *Geology of the Northwest African Continental Margin*, U. von Rad, K. Hinz, M. Sarnthein and E. Seibold., eds., Springer-Verlag, Berlin, p. 686-703.

Summerhayes, Colin P., Organic facies of middle Cretaceous black shales in deep North Atlantic. *Amer. Assn. Petrol. Geologists Bull.*, v. 65, p. 2364-2380.

Van Andel, Tjeerd H., G. Ross Heath and T. C. Moore, Jr., 1975. Cenozoic history and paleoceanography of the Central Equatorial Pacific Ocean. *Geol. Soc. Amer. Memoir* 143, 127pp.

CHANGES OF ADDRESS

We have received the following "new" addresses within the last few months. (P. W.)

Dr. Syed A. Ali
Gulf Oil E&P Company
P. O. Box 61590
New Orleans, LA 70161

Dr. Richard H. Bennett
Naval Ocean Research and
Development Activity (NORDA)
Sea Floor Division, Code 360
NSTL Station, MS 39529

Dr. Robert Coleman
Department of Geology
Stanford University
Stanford, CA 94305
Tel: (415) 497-2537

Dr. Donald H. Dailey
Cities Service Company
Energy Resources Group
Exploration & Production Research
Box 3908
Tulsa, OK 74102
Tel: (918) 561-5300

Dr. Tom Davies
Institute for Geophysics
University of Texas at Austin
Austin, TX 78712

Dr. Rolf Emmermann
University of Giessen
Senckenberg St. 3
63 Giessen
Federal Republic of Germany
Tel: 49-641-708-8370

Dr. Robert M. Goll
Cities Service Technology Center
P. O. Box 3908
Tulsa, OK 74102
Tel: (918) 561-5331

Dr. Bilal U. Haq
Exxon Production Research Company
Box 2189
Houston, TX 77001

Dr. Michel Hoffert
Université de Bretagne Occidentale
GIS Oceanologie et Géodynamique
6 Avenue Le Gorgeu
29283 Brest Cedex
France
Tel: (98) 03-16-94

IPOD Data Bank
New telephone number
Tel: (914) 359-2900, Ext. 502

Dr. Kerry Kelts
Dept. de Geologie Structurale
Universite Pierre et Marie Curie
4 Place Jussieu
75230 Paris, Cedex 05
France

Dr. Paul Loubere
Department of Geology
Northern Illinois University
Dekalb, IL 60115

Dr. Arthur Maxwell
Institute of Geophysics
University of Texas at Austin
Austin, Texas 78712
Tel: (512) 471-6156

Dr. James M. Mazzullo
Department of Geology
Texas A&M University
College Station, TX 77843

Dr. Gregory Mountain
Lamont-Doherty Geological Observatory
Palisades, NY 10964

Dr. A. Conrad Neumann
12-5 Venable Hall 045A
University of North Carolina
Chapel Hill, NC 27514
Tel: (919) 962-1253

Dr. David G. Roberts
British Petroleum Development Ltd.
Britannic House/ Moore Lane
London, EC2Y 9BU
England
Tel: 01-920-8474

Dr. Seymour Schlanger
Department of Geological Sciences
Locy Hall
Northwestern University
Evanston, IL 60201
Tel: (312) 492-5097

Dr. Manik Talwani
Gulf Research and Development Company
P. O. Drawer 2038
Pittsburgh, PA 15230
Tel: (412) 665-6597

Dr. T. L. Thompson
580 Euclid Avenue
Boulder, CO 80302
Tel: (303) 443-7005

Dr. Staphanos Vaos
Amphitritis St. 17
Old Phaleron
Athens, Greece

Mr. William Walton
Chas. T. Main, Inc.
Prudential Center
Boston, MA 02199
Tel: (617) 262-3200

Dr. Graham L. Williams
Atlantic Geoscience Center
Geological Survey
Bedford Institution of Oceanography
Box 1006 Dartmouth
Nova Scotia, Canada B2Y 4A2

Dr. Henk Wories
Union Oil Company of California
Dept. of Internatiional Oil Div.
461 South Boyleston Street
P. O. Box 7600
Los Angeles, CA 90051

APPROVED JOIDES COMMITTEE AND PANEL MEETINGS

	COMMITTEE / PANEL	Nov 1981	Dec 1981	Jan 1982	Feb 1982	Mar 1982	Apr 1982	May 1982	Jun 1982	Jul 1982	Aug 1982	Sep 1982	Oct 1982
	Executive Committee (EXCOM)		2-3 San Francisco					21-22 Wash.,DC				1-2 Kyoto, Japan	
	Planning Committee (PCOM)	11-13 Corvallis			23-26 Miami				Fujinomiya,	7-9 Japan			
SUBJECT / AREA	Ocean Crust Panel (OCP)			18-20 WHOI									
SUBJECT / AREA	Ocean Margin (Active) Panel (AMP)	9-10 SIO	(Sub-com.)			4-5 SIO							
SUBJECT / AREA	Ocean Margin (Passive) Panel (PMP)								9-11 L-DGO				
SUBJECT / AREA	Ocean Paleoenvironment Panel (OPP)	30 - 1 USC							8-9 L-DGO				
DISCIPLINE	Inorganic Geochemistry Panel (IGP)	23-24 SIO											
DISCIPLINE	Organic Geochemistry Panel (OGP)						28-30 Oregon						
DISCIPLINE	Sedimentary Petrology & Physical Properties Panel (SP^4)		3-5 SIO										
DISCIPLINE	Stratigraphic Correlations Panel (SCP)												
OPERATIONS	Downhole Measurements Panel (DMP)							25-26 L-DGO					
OPERATIONS	Industrial Liaison Panel (ILP)												
OPERATIONS	Information Handling Panel (IHP)				4-5 SIO								
OPERATIONS	Pollution Prevention & Safety Panel (PPSP)	5-6 SIO				11-12 SIO							
OPERATIONS	Site Surveying Panel (SSP)		3-4 SIO										
	Ad hoc Panel				18-19 SIO	OPP *ad hoc*							
	Working Group												

JOIDES COMMITTEE AND PANEL REPORTS

EXECUTIVE COMMITTEE

The minutes of the last Executive Committee meeting, held in December 1981, appeared in the February 1982 issue of the JOIDES Journal. The Executive Committee will next meet 21-22 May 1982 in Washington, D. C.

PLANNING COMMITTEE

Edward L. Winterer, Chairman

The Planning Committee last met 23-26 February 1982 in Miami, Florida. We have included here items from the preliminary minutes of that meeting.

National Science Foundation Report

Review

A. Shinn reviewed planning for the Advanced Ocean Drilling Program (AODP). With the demise of the Ocean Margin Drilling Program, NSF has considered three options for future drilling: (1) scrap scientific ocean drilling at the end of the current program (end of FY 1983), (2) extend *Glomar Challenger* drilling for as long as possible, (3) replace *Challenger* with a converted *Explorer* capable of operating for up to 20 years. (A fourth option to fit *Explorer* with a riser and blow-out preventor for ocean margin drilling is impossible at this time without industry support.)

The National Science Foundation favors converting *Explorer* to replace *Challenger.* This would ensure many years of future drilling and hold open the possibility of converting the vessel for riser drilling at same future date. Moreover, the *Explorer* is available now, but might not be available five years hence, thus NSF favors early conversion of *Explorer* rather than continued, but limited, *Challenger* drilling. Although most marine geologists and geophysicists strongly support an ongoing program of scientific ocean drilling, the National Science Board must be convinced. Members are not necessarily predisposed to "big science" programs and must be shown the value of the science obtainable from the drilling.

Decision Criteria

In making any decision about a future program and/or platform NSF must consider:

- the scientific benefits to be gained,
- the comparative costs of converting *Explorer* versus those of refitting *Challenger,*
- relative operating costs of the two ships, and
- the degree of international support and commitment.

NSF has contracted Lockheed to estimate the costs of converting *Explorer* and to evaluate the relative operating costs of the two vessels. Lockheed will submit a preliminary cost analysis to NSF early March (1982), but early budget comparisons show that *Explorer* can be operated for less than 20 per cent more than *Challenger.*

Conversions costs depend heavily upon shipyard selection and other economical factors. If shipyards are "hungry" for work, bidding would be more competitive and conversion costs less.

Shinn emphasized that international participation is critical and involvement of additional partners would provide needed additional funds. The larger vessel, of course, would accommodate more scientists from more countries. NSF is now talking to twelve potential participants; some are extremely interested. Reprentatives of the IPOD countries and potential new members will meet 19 May 1982 in Washington to discuss plans for 1984 and beyond.

Program Review Time Table

The NSF Office of Scientific Ocean Drilling (OSOD) will present a drilling plan (Advanced Ocean Drilling Program) to the U. S. National Science Board (NSB) on 17-18 March 1982, (moved up from the previously scheduled April 1982 dates). If the NSB reviews the plan favorably, it then passes to the U. S. Office of Management and Budget and Office of Science Technology Policy for consideration.

OSOD will stress the importance of long-term scientific ocean drilling to the Board. It will organize the presentation to

- stress the excitement generated from the results of the *Challenger* drilling,
- relay the ambitious future plans developed by JOIDES and COSOD and presented in the JOIDES scientific narrative, and
- discuss operational capabilities of *Explorer* and *Challenger.*

1982-83 program

Germany, France, and the United Kingdom have agreed to support the 1982-83 *Challenger* program; Japan is expected to sign a memorandum of understanding soon. No agreement, however, has been made with the Soviets owing to a complex political situation. The Soviets had been prepared to commit $2 million for 1982, $2 million for 1983 and $900 thousand for 1984. Their participation now, however, is very unlikely.

Loss of the Soviet contribution, high logging costs, and the $1.4 million needed to replace lost drill string and logging tools have created additional problems in an already very tight 1982-83 budget.

Discussion. The Planning Committee discussion and questions to NSF concerned mainly (a) problems surrounding loss of the drill string, (b) nature of the OSOD presentation, and issues to be addressed by the National Science Board, (c) basis for comparative cost figures, (d) FY 1982-83 budget constraints and (e) action required by JOIDES or NSF.

In response to a query, Shinn said the issue before the National Science Board is support for a long-term drilling program and whether or not to program funds for continued *Challenger* drilling or for *Explorer* conversion.

Deep Sea Drilling Project Report

Leg 84 - Jurisdiction Problem DSDP came very close to diverting *Challenger* to an alternative site owing to difficulties in securing permission from the Guatemalan government to drill within Guatemalan territorial waters. Although the current Guatemalan government was not opposed to the drilling, DSDP had insufficient time to process the request through normal channels. Lancelot made two trips to Guatemala to secure the necessary permission; it was ultimately granted at the "eleventh hour," but meanwhile a team was standing by to return to Hole 504B, should the Guatemalan drilling be aborted.

Lancelot reiterated that permission to drill in non-U. S. waters cannot be obtained until the cruise prospectus is completed. DSDP must rigorously enforce deadlines for receipt of cruise prospectuses to alleviate similar problems in the future.

Drill Pipe Loss

The drill pipe parted 150 meters beneath the hull of *Challenger* during Leg 84. This resulted in the loss of 5.4 km of drill pipe and logging tools at a total estimated replacement cost of about $1.4 million. The crew was retrieving logging tools when the pipe parted.

Preliminary investigation shows that the failure occurred in new pipe which apparently contained a manufacturing flaw — an inclusion of slag in the pipe wall. DSDP is awaiting a full report on the pipe failure from Battelle Institute, and although the manufacturer's liability is being examined, the full burden of replacing the pipe at this time falls upon DSDP/NSF.

The presence of the flawed pipe raises the question of the adequacy of pipe inspection. Although the drill pipe is at present inspected up to American Petroleum Institute specifications, inclusions can be detected only by an x-ray inspection. *Challenger* will make port in Long Beach (instead of Manzanillo) following Leg 84 to pick up more pipe. DSDP will arrange for a thorough inspection of the entire string during that port stop, but because no inspection is 100 per cent reliable, DSDP fears that flawed pipe may continue to pose problems.

Drill pipe previously failed during Legs 36 and 48. In the Leg 36 accident, strong currents bent the pipe at the lower end of the horn; the Leg 48 accident was caused by failure of the "pop-joint" connecting the drill string to the hydraulic motor. The Project now uses "knobby joints" to absorb some of the stress in the upper portion of the string. The pipe failed (twice) during Leg 83 owing to cracks near the joints in the lower part of the drill string in a low-stress area. All these previous failures are of a totally different nature from the Leg 84 failure.

Acquisition of Additional Pipe. DSDP has arranged to bring *Challenger* to port in Los Angeles to load 28,000 feet of additional pipe, 23,000 feet of which is new. (The Long Beach port stop will delay the beginning of Leg 85 for seven days, but part of this time will be regained, as some work planned for the Honolulu port call can be completed in Long Beach.) The 28,000 feet constitutes **all** the pipe DSDP owns; it now has no "back-up" pipe. Lead times to acquire new pipe are about nine months and replacement cost are close to $1.4 million.

DSDP is not now budgeted to purchase additional drill pipe, but has written NSF, citing, in addition to the present danger to the program, the contractual agreements with Global Marine to leave *Challenger* with a full pipe complement (38,000') at the end of the program. DSDP is requesting that the pipe be purchased now.

Impact on Future Program. The length of pipe which can be suspended from *Challenger* varies with weather conditions and proportion of new to old pipe. DSDP estimates that, assuming the Long Beach inspection reveals no more flawed pipe, it can on average safely suspend a 6100-meter string. The lack of a backup string, however, requires a very conservative approach. The drill-string loss may influence drilling of future legs as follows.

Leg 85 - No problems; most objectives are to be reached with the HPC in relatively shallow holes.

Leg 86 - Several sites are near the 6100-meter safe limit, but they can probably be drilled.

Leg 87 - No problems except one deep site in the Nankai Trough.

Leg 88 - Drilling the Leg 88 DARPA site in relatively deep water poses some risk — especially because of potentially rough weather in the area.

Leg 89 - Drilling the Old Pacific site would require 7.4 km of drill string — greater than the conservative limits placed by DSDP and is thus a high risk (to the drill string) site. Additional drill pipe could. be delivered to Yokohama next summer (1982) in time for the Leg 89 drilling, provided DSDP can order it in time.

DSDP is investigating inclusion of aluminum drill pipe in the string, but if any aluminum pipe is included it must comprise at least 10 per cent of the string. Preliminary results of the simulation tests using aluminum pipe are favorable. The exfoliation problems appear to be resolved.

Discussion. Planning Committee members and guests discussed ramifications of the drill-string loss at length expressing support for purchase of additional pipe and frustration over such deeply damaging losses.

Fiscal 1983 Budget

NSF has told DSDP that funding for FY 1983 will probably be very close to the FY 1982 level (i.e., $21 million). In view of anticipated higher costs, this represents an actual ±10 per cent reduction from the already bare-bone 1982 budget. Lancelot noted that under the circumstances, the Project would be operating only marginally and that termination of drilling before Leg 95 might be judged preferable to doing a poor job over the full period. (The SIO administration has also voiced concern over its capacity to perform a job for amounts significantly less than what it originally proposed.)

Lancelot also noted that among the many consequences of budget reductions shipboard staffing could be affected in that salary coverage of U. S. scientists may have to be reduced. The extremely high overhead costs of some institutions (e.g., M.I.T. at 72%) is a factor that could prohibit such coverage for certain scientists.

Publications

Initial Report Volumes. At the last Planning Committee meeting, Lancelot reported that DSDP had reduced its production staff in response to NSF's (Government Printing Office's) ability to budget printing of only four volumes (plus two volumes delayed from FY 1981 to pay for logging) during FY 1982. NSF has more recently indicated it can print five new volumes during FY 1982. DSDP accordingly has redirected its efforts and plans to produce five volumes (64, 65, 68, 69 and 70 and/or 71) during FY 82. The G.P.O. currently has in hand volumes 60 and 66 which it expects to print and distribute shortly.

DSDP encourages authors to submit finished art for the volumes. In the past, DSDP has devoted a great deal of time to special art projects requiring excessive amounts of illustraters' time (e.g., large color fold-outs, back-pocket materials, complex sections requiring extensive interpretation or revision. The Project will continue to ensure a consistent format and high standards for art reproduced in the volumes, but will only accept well prepared and problem-free art.

The Planning Committee agreed with Lancelot's suggestion that the production staff be increased as necessary, perhaps at some modest expense to other operations.

Initial Core Descriptions. DSDP now produces the Initial Core Descriptions on microfiche instead of in the green soft-covered, publication. The staff will continue to compile the visual core descriptions soon after the cruise. Earlier on (at the time of the last PCOM meeting), DSDP had decided simply to reproduce and distribute core descriptions from the shipboard Hole Summaries on microfiche, in lieu of the Initial Core Descriptions. Further review, however, has shown the Hole Summaries to be unsuitable for such widespread distribution.

Recent efforts to speed completion of the site reports are paying off; DSDP expects to produce volumes 26 months after the respective cruise soon.

A. Shinn commented that NSF will ensure that all volumes DSDP produces are printed in a timely fashion. Means can be found to "bridge" the funding gap should volumes be submitted to the Government Printing Office toward the end of the fiscal (1982) year.

Sedimentary Petrology Technical Manual. DSDP now has in hand all contributions (17 papers) for the Sedimentary Technical Petrology Manual, but does not have funds to pay off its publication. M. Loughridge of the National Geophysical and Solar-Terrestrial Data Center has offered to publish the manual (in an NGSTDC format) provided he can sell it to cover costs. (Discussed further under Information Handling Panel, below.)

Atlantic Site-Survey Volume. The DSDP staff continues to prepare — on a time-available basis — camera-ready-copy for a publication comprising the North Atlantic site-survey data. As with the technical manual, the Project does not have funds to publish the volume and must seek an outside source. JOI has been contacted as a possible "printer," but has made no commitment as yet. (JOI also has recently received a large budget cut.)

Nature, Geotimes, Press-Release. *Nature* has published its first DSDP news bulletin (Leg 83). (Copies were distributed at the PCOM meeting.) The PCOM is very pleased with the *Nature* arrangement and urge DSDP to ensure its continuance. The cruise scientific parties continue to submit a general summary to *Geotimes*, but the focus of this is somewhat different than the *Nature* article.

G.S.A., however, will no longer accept contributions to its Bulletin on a routine basis. Articles will instead compete in a normal way with other potential contributions. The Project thus is not necessarily tied to G.S.A. It still encourages the shipboard party to publish cruise results (authored by the entire shipboard party), but leaves the choice of periodical to the authors.

Discussion. The PCOM and guests reiterated the importance of timely dissemination of drilling results. NSF apparently has not received any press releases following the cruises for several months. Shinn commented that NSF is prepared to review and approve press relases very quickly. Some JOIDES institutions are not receiving press releases (e.g., Miami). Members urged DSDP to review information distribution procedures and to speed information to the general public through timely press releases and other means.

In response to a query Y. Lancelot stated that the DSDP policy is still to produce volumes in the order that they are completed, but ideally he would like to see a return to publication in numerical (leg number) sequence.

Tool Development

Wireline Re-entry. DSDP will test a wireline re-entry system during Leg 88 (DARPA experiment); the test should take about 22 hours.[1]

The Von Herzen HPC-Nose Cone Heat Probe is not ready for testing during Leg 85 (as earlier planned), but will probably be tested during Leg 86.

The Extended Core Barrel was tested during Leg 84. Nine cores were taken with about 23 per cent recovery. Some problems with collapsed liners and plugged circulation jets will be corrected and the instrument will be tested on later legs.

[1]*DSDP subsequently decided to test the wireline re-entry system during Leg 87.*

Problem: Development Slowdown. Because of budget constraints and highest priorities being given to fund logging, DSDP has had to "put the brakes" on developing tools and systems. DSDP has no funds specifically budgeted for tool development and the Project is very concerned that slowing this aspect will adversely impact the ability to reach future scientific objectives.

Two key systems which need to be developed immediately are **high-temperature** and **bare-rock drilling**. Drilling in areas of young oceanic crust and to test hydrothermal systems — targeted as a major focus of the post-1983 program — require a capability to spud into a thin cover of sediments and to drill into sequences hotter than 350°C. Neither *Challenger* nor *Explorer* have these capabilities at present.

Project engineers are poised to develop advanced models of the piston corer and pressure core barrel (including an aseptic core barrel to collect live organisms for biological research), but funds must be available to support the tool and system development.

Lancelot urges that the decisions regarding the future of scientific drilling be made very soon. In response, A. Shinn reiterated that the NSB review of a long-term scientific program and platform has been moved up to 19 March 1982. All decisions will be made as soon as possible. Nonetheless, budgetary problems remain and are exacerbated by the inability to acquire the Soviet membership. NSF is pushing ahead with discussions so that firm planning and budgeting can proceed. (Other discussions concerning an independent funding to support tool development appear below.)

Shipboard Procedures and Equipment

Shipboard Computer. The minicomputer will be installed at the Yokohama port call (fall 1982). All hands are enthusiastic about the improved shipboard data handling capabilities, but the Project is aware it must balance its staff to ensure that routine jobs are also accomplished in addition to programming the new system. DSDP has neither sufficient funds to hire additional seagoing computer technicians, nor funds to purchase a sister system for use on shore.

Paleomagnetic Vans. The paleomagnetic gear needs to be repaired and upgraded but DSDP has no funds to do this at present.

New shipboard acquisition is reduced to zer[o]. DSDP has funds only barely to maintain existi[ng] equipment.

DSDP Staffing

The Project has recently increased its scientific staff, which has been seriously depleted for the past several months. DSDP has hired three new staff scientists: Keir Becker (geophysicist), Ellen Thomas (micropaleontologist), Miriam Baltuck (sedimentologist-stratigrapher). In addition William Coulbourn has returned from a year's leave of absence in Germany. One additional staff scientist may be hired.

Budget constraints have complicated and slowed the procedure of hiring an Associate Chief Scientist for Science Services but an appropriate person should be on board by some time in March.

Co-Chief Scientist Staffing

At its 11-13 November 1981 meeting, the Planning Committee asked DSDP to speed invitations to potential co-chief scientists and made several recommendations for co-chief scientist nominations.

DSDP has now issued invitations to at least one potential co-chief scientist through Leg 92 and has received either written or verbal acceptance from the following.

Leg	Co-Chief Scientist
85	Larry Mayer and Fritz Theyer (Leg 85 is completely staffed; it begins 8 March 1982)
86	Lloyd Burckle and Ross Heath
87	Hideo Kagami and Dan Karig
88	Fred Duennebier
89	Seymour Schlanger
90	James Kennett
91	Margaret Leinen
92	Arnold [illegible]

Lancelot is making every attempt to staff the scientific parties at high competency levels, but continues to be plagued by last-minute withdrawals of potential participants. Lancelot urges the Planning Committee to develop drilling plans well in advance, so that potential participants can resolve their schedules.

JOIDES Committee, Panel, and Working Group Reports

Each panel chairman or his designated representative reported on recent panel meetings or summarized his panel's business. We include here only those reports not appearing elsewhere in this or past issues of the JOIDES Journal. P. W.

Executive Committee

E. Winterer reported the highlights of the 2-3 December 1981 Executive Committee meeting. (*The February 1982 JOIDES Journal contains abridged minutes of this meeting.*)

He reminded the Planning Committee that the Executive Committee will not meet again until 21-22 May 1982 — 3 months instead of the usual ± 3 weeks after the Planning Committee meeting. **Winterer urges the Planning Committee members to confer and report Planning Committee results immediately to their Executive Committee counterparts and otherwise ensure close liaison during this "hiatus."**

Ocean Crust Panel

J. Fox reported for the Ocean Crust Panel. (*See also abridged minutes from the 18-20 January 1982 OCP meeting, below.*)

The OCP recommends that a better and more coherent engineering program be developed to (a) better conduct regional field experiments, (b) develop new tools — especially those for bare-rock drilling and to conduct experiments in hot (above 300°C) environments, and for other downhole experiments. The Panel **recommended that a separate research and development organization be established and funded to identify, develop, and test tools and systems required to address ocean crust objectives.**

The Ocean Crust Panel supports deepening Hole 504B, but Fox noted that means to improve recovery rates would have to be found (only 10% on Leg 83) to ensure a reasonable chance of success.

The OCP white paper is complete and may be distributed as an appendix to the science narrative as stands.

Ocean Paleoenvironment Panel

R. Douglas reported for the Ocean Paleoenvironment Panel which last met 30 November-1 December 1981 in Los Angeles. An *ad hoc* group also met 18-19 February 1982 at Scripps Institution of Oceanography to refine the Pacific drilling plans. (*The February 1982 JOIDES Journal contains a report of the November-December OPP meeting. Discussion of the Pacific drilling program appears below.*)

The OPP white paper has been extensively rewritten and the new version combines the original white paper with recommendations from the Conference on Scientific Ocean Drilling. Douglas will submit the final white paper to Winterer shortly after the PCOM meeting.

Active Margin Panel

Don Hussong reported for the Active Margin Panel. (*Items relating to the Japanese margin drilling are discussed below.*) The Panel has not met since the last Planning Committee meeting, but will meet 4-5 March 1982 at SIO to finalize Japanese margin planning.

Items of other business include

- Volume 67 (East Pacific) is nearing completion; 15 March is the cut-off day for completed manuscripts.
- Volume 78A (active margins of the Caribbean) is moving ahead. Site chapters were completed at the post-cruise meeting last July, and interpretive chapters will be submitted late spring or early summer (1982). Biostratigraphic data now shows that four thrusts occur at the top of the decollement separating subducted and scraped-off sediments. This excellent fossil control has allowed the shipboard party to identify the very thin "finger-size" thrust slices. Other data obtained after the cruise has further documented that dewatering of sediments has led to overpressured pore fluids. Members of the Active Margin Panel urge additional drilling in the Barbados region.

Hussong also urged that downhole packer tests be run across the Nankai Trough and that all sites be logged. (R. Anderson is willing to do the packer work but does not have the funds.)

- The Active Margin Panel is now focusing more on physical properties and alteration products of rocks and sediments along the active margin. It recommends that the hydropacker be routinely used in sampling accretionary prism environments.

- The Panel will update its white paper at its upcoming meeting.

Passive Margin Panel

The Passive Margin Panel has not met since the last Planning Committee meeting. D. Roberts, however, reported that

- changes will be made shortly (and forwarded to E. Winterer) in the Passive Margin Panel White Paper.

- the Panel assigns highest priority to drilling ENA-3 and the Mississippi Fan.

Roberts also reviewed the results of Legs 79, 80, and 81 drilling.

L. Montadert indicated that the French will conduct a "post-drilling" survey this summer (1982) in the area drilled during Leg 80.

Sedimentary Petrology and Physical Properties Panel

G. Klein, Acting Chairman of the Sedimentary Petrology and Physical Properties Panel, reported for that panel, which last met 2-3 December 1981, at Scripps Institution of Oceanography. (*The February 1982 JOIDES Jounral contains an SP⁴ and SP⁴ Long-Range Plans Working Group report and recommendations.*)

Discussion. The SP^4 had recommended that an *ad hoc* committee be formed to evaluate existing techniques and equipment on board *Glomar Challenger* and obtain information from Project engineers and sea-going personnel. The SP^4 requests funds to support the committee's travel to *Challenger* during a port stop to inspect existing equipment.

In response, **the Planning Committee encouraged the SP^4 to discuss facilities with appropriate DSDP people and recent cruise participants, but declined to approve travel funds to Challenger for a site visit.**

In response to the SP^4 recommendation that DSDP produce color microfilm of all cores, Y. Lancelot commented that high-quality color photographs of all cores are produced routinely on board *Challenger*, only selected sections, however, are reproduced with the U. S. G. S. color-strip system.

Y. Lancelot also noted that DSDP has not discontinued special close-up color core photography, but had restricted it to a "real need" and "time-available" basis. Large amounts of time and money cannot be spent on special projects for purposes other than those associated directly with Initial Report preparation.

Inorganic Geochemistry Panel

Miriam Kastner reported for the Inorganic Geochemistry Panel which last met 23-24 November 1981 at SIO.

Focus. The emphasis of the Inorganic Geochemistry Panel has previously been the geochemistry of interstitial water; in the future it will be on solid-phase geochemistry of the sediments. The Panel will develop programs to find answers to questions of chemical exchange (a) between seawater and basalt (high and low temperatures) between seawater and sediment by deep-sea drilling. It will address the geochemistry of hydrothermal systems, water to rock ratios, temperatures within the systems, helium fluxes, water/rock and temperature of formation.

The Panel will also address

- paleohydrothermal and geothermal systems,

- seamounts — where hot water is actively depositing materials,

- diagenesis (Kastner noted that to the surprise and dismay of the Inorganic Geochemistry Panel, COSOD gave little or no attention to diagenesis in marine sediments. Many problems of carbonate and silicate diagenesis and diagenesis in red clay sequences have not been solved. H. Beiersdorf responded that COSOD did indeed address the problems of diagenesis, but gave them somewhat lower priority than other problems).

Tools. Tools required to study the solid geochemistry phases include

- the Barnes-Uyeda in-situ temperature probe and sampler,

- a sealed-off packer system — a system in which an area can be sealed off to conduct experiments without contamination. Researchers need to know the residence time of fluids, concentrations of trace elements, and permeability of the rocks,

- temperature probe on hydraulic piston corer. (Von Herzen is currently developing the instrument),

- televiewer — resistivity log,

- high-temperature log,

- particularly the **capability to drill into bare rock and into hot (above 350°C) zones.**

Hydrogeology Working Group

Roger Anderson reported that the Hydrogeology Working Group has been very effective in developing a white paper and defining a strategy to study a major hydrologic system at work within the sea floor. Discussions involving 15 to 25 people — including many who are not working group members — resulted in a cohesive program.

Strategy. Transects across (a) active ridge crests, (b) flank and (c) basin sites will test the model and provide a 3-dimensional view of the system.

Ridge crests - are areas of most active hydrothermal convection; nearly all heat may, in fact, be carried away in these areas which are unprotected by a sediment blanket and are extensively fractured.

Flank Area - The lower crust probably remains fairly hot in this regiion where sediment cover is broken by basement outcrops.

Basins - Convection is probably halted or slowed in basins under blankets of thick unbroken sediment resulting in hot, reheated basement.

The HWG has an overall strategy to test models on the location and geometry and circulation rates of convection cells on locations. It has proposed a particular drilling strategy for the 1982-83 program comprising operations to reoccupy Hole 504B (Leg 83), conduct heat probe and basalt logging in the equatorial Pacific (Leg 85), temperature, geochemistry and permeability tests in a basin site where convection is assumed to have ceased (Leg 89), and a special geochemistry transect (Leg 93).

Tools and Systems. Tools and systems which must be developed to drill into the various environments and to correlate the geochemistry, temperature and permeability data include

- capability to drill into bare rock,

- capability to drill where the temperature is above 350°C — to drill in on an active ridge crest in a discharging area of the hydrothermal system,

- Wireline-packer with hydraulic pump — to develop multiple pore-pressure and permeability profiles and sample *in situ* fluids for geochemical analyses. (The hydraulic pump would pump drilling solution out of the packed off interval so uncontaminated formation fluids could be sampled),

- down-hole chemical analysis techniques — to yield "real time" determinations so experimenters can know when to sample uncontaminated solutions and record *in situ* pore pressures.

- temperature probe for the hydraulic piston corer — (the Von Herzen probe should be ready to test on Leg 86).

Separate Funding Structure. The HWG strongly recommends that a new organization, separate from the DSDP Developmental Engineering Group, be funded to develop the tools and systems required (i.e., packers, water samples, pumps, etc.) Anderson cited the need for a dramatic new technology, but decried the present long lead times required — about one year to process proposals, and develop and deliver the instruments — at a time when adhering to the ship's schedule demands immediate solutions. The research and development is at present being done at a frustratingly slow rate.

The HWG recommends that an independent research and development section be created, comprising scientists and engineers developing the tools, plus management of tool construction and appropriate seagoing engineers and technicians.

The PCOM discussed with interest the HWG recommendation but made no specific recommendation.

Funding (U. S.) science in support of the drilling program (mostly related to geophysical surveys was also addressed in a "rump session" under the auspices of JOI and chaired by D. Hayes.

Downhole Measurements Panel

Richard von Herzen recently assumed chairmanship of the Downhole Measurements Panel which will next meet 25-26 May 1982 at L-DGO. Members have been active since the last meeting, however, and von Herzen relayed the following.

Within its overall charge of characterizing the physical and chemical properties of the ocean crust, the DMP operates in two modes: (1) as a service panel providing advice concerning downhole experiments and (2) as an advocate for specific legs. The Panel, in close cooperation with DSDP, develops meaningful and complementary downhole experiments. Good logging has detected very subtle, but significant variations in acoustic impedance with depth.

In the future, experimenters should have the capability to:

- leave instrument packages in the holes to monitor properties and conditions over long periods.
- re-enter the holes from non-drilling vessels through a wireline re-entry system. As restrictions on instrument size are fewer when the instrument is lowered directly into the hole (not strung through pipe), many additional tools and instruments could be deployed via a wire-line system.
- drill and conduct experiments in high-temperature environments.

The DMP also recommends that a tool be developed to continuously monitor the spectral distribution of gamma rays. (Y. Lancelot noted that DSDP had, at one time, monitored gamma rays routinely on board ship. The gear, however, was removed from the ship many years ago.)

The Panel urges DSDP to "staff up" to support at least a minimal logging program. M. Salisbury noted that DSDP is extremely sympathetic to the DMP's concern, but cannot at present engage in any extensive in-house program. The Schlumberger arrangement, however, is working very well; the Schlumberger tools are good and for the reasonable cost of renting them, DSDP can tap into Schlumberger's vast underlying support structure. DSDP has, at present, an adequate, highly trained staff to develop the tools; only the lack of sufficient funds is delaying development.

R. Von Herzen questioned if perhaps the Schlumberger arrangement could be enhanced by liaison with a specialized logging engineer on the DSDP staff.

R. Anderson reiterated that people were just "beginning to see the glories" of logging. Deep-sea logging can produce fantastic and unique results; but new specialized tools are needed right away. Tools designed for an oil patch operations are not easily adapted to *Challenger* conditions and tend to produce poor results.

Stratigraphic Correlations Panel

The Stratigraphic Correlations Panel last met 6-8 May 1981 at Scripps Institution of Oceanography. J. Creager reviewed the results for R. Poore, who was unable to attend the Planning Committee meeting.

The Stratigraphic Correlations Panel

- has strongly recommended that paleontologic data appearing in the Initial Reports include preservation and abundance data for species and assemblages. (The PCOM resolved to support his recommendation at its July meeting in Hannover, FRG.) The Panel has forwarded to DSDP a set of instructions for authors and has assigned a panel member as liaison to each leg to encourage adherence to the scheme.
- supplied DSDP with a list of potential paleontologists for shipboard duty. (Y. Lancelot noted that in the past many people contacted on the SCP list had been unable or unwilling to participate on *Challenger.* He suggested that SCP screen potential participants and include only those who are interested in serving.)
- prepared a white paper "Marine Biochronology and Biologic Discontinuities", which was subsequently integrated into the JOIDES 8-year science narrative.
- identified gaps in the Eocene-Oligocene magnetobiostratigraphic record which need to be filled to better calibrate the stratigraphies.
- suggested improvements to the *Challenger* and on-shore DSDP laboratory facilities.
- gave E. Winterer suggestions and comments concerning *Explorer* laboratory space and facilities. (*E. Winterer, interested Panel chairmen, and representatives of Lockheed met after the PCOM session to further discuss Explorer* laboratories.)

J. Kennett agreed to serve as PCOM liaison to the SCP (replacing J. Creager who will continue to provide liaison with the Information Handling Panel).

During discussion, the PCOM noted some overlap of function between SCP and the Ocean Paleoenvironment and Information Handling panels. At the next SCP meeting, Kennett will ask the panel to consider the other organizational possibilities: acting as a working group of the Ocean Paleoenvironment Panel, splitting its function among other panels, or remaining a discrete panel.

Information Handling Panel

D. Appleman reported for the Information Handling Panel which last met 4-5 February 1982 at Scripps Institution of Oceanography.

The Information Handling Panel

- **emphasized the importance of completing and maintaining the DSDP data base**. The Panel considers the information gained from the drilling as basic science and urges that information gathering continue beyond production of the Initial Reports and across any drilling hiatus. Any future program must include plans for data and sample management whether or not drilling is continuous. The best insurance against loss of data systems is to have all bases completely up to date by the end of September 1983, and in such a form that they could be transferred to other groups for continued development should this be necessary. To this end the Information Handling Panel has

  a. recommended that sufficient funds, personnel, and space be provided to the DSDP Information Handling Group to complete all data bases by 30 September 1983,

  b. recommended that the DSDP group be given additional resources to develop some of the software which the scientific community is requesting to aid in data syntheses, and

  c. urged that Information and Curatorial efforts be maintained at full strength during any proposed hiatus in drilling, both to complete any backlog and prepare for future phases.

- recommended that **Cenozoic and Mesozoic zonal data** (as reported in the Initial Reports) be encoded for future legs and that these data be added for past legs when possible. The IHP supports this recommendation of the Stratigraphic Correlations Panel, but recognizes that zonal definitions are highly interpretive and that including the information will pose some problems.

- recommended that encoding of the GUIDE be continued, noting that although its original function has been superceded by directly searchable primary data files, the guide still contains some important information not found elsewhere and can be maintained with a minimum of effort.

- urges DSDP to work with M. Loughridge and others to find a means to produce and distribute microfiche of the **Keyword Index** — the index to published papers and subsequent investigations. The Panel notes that it is extremely useful to first-time users of DSDP data. (Owing to budget constraints, DSDP plans to halt its microfiche distribution of the index to libraries.) The IHP further recommends that chapters from the Initial Reports be included in the Keyword Index as soon as possible.

- recommends that JOIDES continue to support the development and operation of the Paleo Reference Centers and continue to support W. Riedel and J. Saunder's travel to coordinate these efforts as necessary. Riedel and Saunders have prepared a statement of the status of the reference centers. (*See also Focus, this issue.*)

- reported that with regard to transfer of data to other organizations that

  a. DSDP has transferred the site summary file to NGSDC (Boulder) which in turn has sold 13 copies at $100 per copy. (Oil companies have been the biggest buyers.)

  b. the French data center headed by Marthe Melguen is extremely successful. The French have produced an excellent publication describing the Data Bank and how to use it. Requests for data began shortly after the center began operations last summer and have increased since that time. The IHP strongly supports the work being done at the CNEXO Data Bank and urges DSDP to transfer all files to the Bank as soon as possible.

c. the Germans do not intend to support a full-fledged data bank, but encourage individual scientists (example: the Cepek Mesozoic data base) to develop data repositories. The IHP hopes the German government will encourage more data handling in Germany — perhaps by establishing at least a system to access the Site Summary and Keyword Index Files for basic information.

- recommended that the NGSDC be considered to publish the Sedimentary Petrology Technical Manual and the Pacific Lithologic logs if DSDP cannot find funds to publish them within FY 1982.

- noted that although France and the U. S. S. R. have produced and distributed excellent documents about availability and use of DSDP data, DSDP has not produced a comparable guide. **The IHP recommends that DSDP produce a descriptive brochure and comprehensive bibliography as soon as possible.**

- is pleased that a shipboard computer will, at last, be installed, but strongly recommends that a sister system be installed on shore so that software can be developed and problems solved on shore without loss of time on board ship.

  (Y. Lancelot commented that whereas DSDP had originally planned to install a sister system; it now has insufficient funds to do so.)

  The IHP also noted that whereas it recognizes the great utility of the shipboard computer and the need for the DSDP group to spend time developing software, it hoped DSDP could minimize disruption to the development of the data base.

- recommended that DSDP investigate archiving formats of some of the geophysical underway data.

The Panel also recognized the excellent job the DSDP Information Handling Group is doing in the area of data management.

D. Appleman relayed that the Paleontologic data base is now encoded through Leg 44. The Cenozoic data are handled at DSDP whereas the Mesozoic data are handled by Pavel Cepek at the B. G. R. in Hannover. This split creates some logistical problems and to maintain coninuity, the Panel recommended that DSDP answer all requests for paleontologic data, but fully credit Cepek for the Mesozoic base and also keep him informed of all users. The Panel expresses its graditude to Pavel Cepek, who has made a significant contribution in developing the Mesozoic paleontologic data base.

Discussion. During discussion, **the Planning Committee cited the great value of the work being done by the CNEXO Data Bank and hoped that CNEXO would continue to support that group.**

Organic Geochemistry Panel

Although the Organic Geochemistry Panel has not met since August 1980, Berndt Simoneit (Chairman) and other members addressed several items of business. *(Simoneit's report to the Planning Committee appears elsewhere in this issue and is not repeated here.)*

Discussion. Microbiologists are becoming increasingly more interested in studying the bottom sediments. They want to determine how deep into the sediments biological processes are active. In response DSDP has developed preliminary plans to design an aseptic core barrel to sample biota intact. The PCOM did not act on a suggestion to develop a microbiology working group, but noted that such a group might fall within the purview of Hydrogeology Working Group.

M. Kastner stated that the **inorganic geochemists also need dedicated samples** from the HP cores for routine water analyses. Different groups are obviously interested in the same samples and some better mechanism needs to be worked out (two "dedicated cores?") to accommodate the interest of all panels.

Site Survey Panel

The Site Survey Panel met 14-15 May 1981 at Lamont-Doherty Geological Observatory, and 3-4 December 1981 at Scripps Institution of Oceanography . E. John W. Jones reported that, with the exception of the Gulf of Mexico work, the site surveys for the 1982-83 program were completed or had been planned. The site-survey work is at last keeping pace with the drilling program.

(Abridged minutes from the Site-Survey Panel meeting, containing much of Jones' report appear elsewhere in this issue.)

Discussion. Most PCOM discusion centered around site-survey plans relative to the post-1983 proposal. Members noted that no specific section dealing with the site survey is contained in the science narrative. E. Winterer pointed out that because site survey is handled as a separate proposal to NSF, it need not be included as a section within the science narrative, but he will include some phrases in the narrative to clarify this.

Funding science in support of drilling — especially that of geophysical surveys — was also discussed in a separate meeting under the auspices of JOI.

Pollution Prevention and Safety Panel

The Safety Panel last met 5-6 November at Scripps Institution of Oceanography to review Leg 84 sites in the Middle America Trench. (*The results of that review were reported in the February 1982 JOIDES Journal.*)

L. Garrison, PPSP Chairman, arrived in Miami aboard the British research ship *Farnella*, having just completed the GLORIA survey of the Mississippi Fan. In lieu of a formal presentation, Garrison distributed a written summary of Safety Panel action and operation over the past year, abridged as follows.

1981 Safety Reviews. The JOIDES Safety Panel met three times during 1981 to review Legs 80 through 84. A total of 70 sites were proposed; 52 were margin sites and 18 oceanic. Of these sites, the Safety Panel apaproved 63 as proposed, 5 with modification, and disapproved 2 sites.

Membership. Dr. Rustum J. Byramjee, Director of the Research and Energy Department for TOTAL in Paris has replaced Jean Leherrere as the French representative on the PPSP.

Safety Review Presentations. The Safety panel has noted a marked improvement in the quality of safety review presentations over the past two years and wishes to bring this to the Planning Committee's attention. Clearly, the site proponents and working groups, especially those involved in continental margin drilling, are devoting more attention to the details that provide safe locations. The increased use of structure, isopach, and facies maps, the better quality of processed geophysical data, and more intensive review of regional geologies and exploration histories has resulted in fewer disapproved sites at safety reviews. The panel is pleased at this trend toward the elimination of hazardous drill sites prior to safety review by the site proponents themselves, rather than depending upon the Safety Panel to weed out the potential disasters.

JOI Site Survey Planning Committee

LeRoy Dorman commented briefly on activities of the JOI Site Survey Planning. JOI will issue a Request For Proposal for the Mississippi Fan work in March 1982. A GLORIA survey was just completed in cooperation with the U. S. Geological Survey aboard the British vessel *Farnella.*

L. Dorman will resign from the committee in July 1982. He has submitted suggestions for his replacement to JOI.

Membership — All Panels

(*The Planning Committee made several recommendations regarding JOIDES Panel membership which the Executive Committee subsuquently approved (by mail). Changes are reflected in the Directory of JOIDES Committee, panel, and Working Groups, this issue. P. W.*)

Discussion. Members of the PCOM noted that for the first time in recent history panels are attempting to expand their membership. The PCOM does not, in general, endorse this trend but chose not to make binding recommendations at the current meeting owing to the uncertainties surrounding the post-1983 program (and possible drilling hiatus beginning in FY 1984). At present, the PCOM has few guidelines on Panel size and membership other than its charge (from the EXCOM) to maintain numbers of panel members at pre-established levels. NSF decisions regarding the Advanced Ocean Drilling Program and drilling platform later this spring (1982) will have a strong bearing on the JOIDES planning structure.

The PCOM thus postponed making specific recommendations on panel structure and membership until its July 1982 meeting. Matters to be taken up at that time include

- develop more specific guidelines for panel organization and membership.

- consider disposition of the Hydrogeology Working Group. Unlike panels which provide ongoing recommendations and advice, working groups are created to address a specific goal. The Hydrogeology Working Group was created to plan the hydrogeology leg, now well underway, but because the need still exists for stimulating new ideas in this highly interesting field, a case could be made to maintain it. Alternatives include raising the HWG to Panel level, or reorganizing the Inorganic Geochemistry, Ocean Crust, and Downhole Measurements panels to ensure adequate coverage of the topic.

- consider changes to the Stratigraphic Correlations Panel. The SCP has areas of overlap with the Ocean Paleoenvironment and Information Handling panels. It could perhaps be a working group of the Ocean Paleoenvironment Panel. J. Kennett will ask the SCP for its suggestions at its next meeting.

- consider the request for increased membership in the Downhole Measurements Panel and review increased membership in Inorganic Geochemistry Panel.

The PCOM agreed that although the Industrial Liaison Panel has not met formally for several years, it should be maintained as a discrete panel. The Panel potentially serves as a means by which JOIDES/DSDP can seek industry advice and also helps keep industry apprised of the program through distribution of the Initial Reports and other information. Some members may no longer be with oil companies. P. Worstell agreed to check on members currently listed and solicit suggestions for new members if this seemed appropriate.

JOIDES Office Business

Meeting Budget Schedule

NSF has significantly reduced JOI Inc.'s operating budget; some of the cuts have been passed through to JOIDES. The line item for the FY 1982 travel in conjunction with JOIDES planning stands at $154,000, down from an expected $210,000. (Of the $154,000 budgeted, $89,300, or about 60 per cent had already been spent as of 8 January 1982.) Winterer has protested the budget cuts and suggested that inasmuch as JOIDES is now involved with *Explorer* planning, funds from the *Explorer*-related budget might be found to supplement JOIDES travel. Nonetheless, Winterer emphasized that the budget constraints are real and that the JOIDES office will continue to restrict guest lists and approve meetings at the most cost-effective sites. Winterer urges panel chairmen to be responsible in proposing meeting sites and date (and guests) to cut costs (and certainly to avoid unnecessary costs) wherever possible.

Supplement to JOIDES Journal

Every two to three years the JOIDES Office publishes a supplement to the JOIDES Journal containing information on all new sites identified by the JOIDES Planning groups. The supplement is a compilation of the "DSDP/IPOD Site Proposal Sheets" prepared by the JOIDES panels. It serves as a ready reference to site coordinates, water depths, objectives, and special staffing requirements.

P. Worstell asked panel chairmen to submit site proposal sheets for all sites identified since last publication of the supplement by mid-March (not later than the end of March). The S.I.O. JOIDES office has only three months to complete and distribute two issues of the JOIDES Journal plus any sort of supplement and material must be in hand by that time if it is to be included.[1]

Planning Committee Chairman/JOIDES Office Transition

Jose Honnorez will assume chairmanship of the Planning Committee and the University of Miami, Rosenstiel School for Atmospheric and Marine Sciences, will assume operation of the JOIDES Office beginning 1 July 1982. A Miami staff will replace the S.I.O. JOIDES Staff at that time.

The S.I.O. JOIDES staff is working closely with J. Honnorez to effect a smooth transition. Funds are budgeted to bring the Miami Science Coordinator to Scripps for ± two weeks so that he can familiarize himself with the JOIDES and DSDP operations.

Pacific Program (Legs 85-91)

Equatorial Pacific Paleoenvironments (Leg 85-91)

R. Douglas reported the objectives in the Pacific Ocean Paleoenvironment program. It comprises a 3-leg transect (Legs 85, 86, 90) to develop a vast regional picture of the Cenozoic environments and climates that developed at different latitudes and within different water masses and a program (Leg 89) to study earliest (Mesozoic) Pacific environments.

[1] *We did not receive a sufficient number of site proposal sheets to justify publication of a special supple- ment to the JOIDES Journal. P. ...*

The Cenozoic program, beginning with Leg 85, calls for using (primarily) the hydraulic piston corer to obtain undisturbed samples to develop a highly resolved biostratigraphy.

The Leg 85 team will attempt to

- establish high-resolution bio- magneto-, seismic- and stable-isotope stratigraphy,
- resolve oceanographic and biological (evolutionary) changes associated with the Eocene/Oligocene boundary,
- establish the termination of Atlantic-Pacific circulation across the Central American isthmus and the evolution of modern Pacific circulation,
- study the low-latitude response to Miocene Antarctic glaciation and to Pliocene glaciation of the Northern Hemisphere,
- determine the origin of the fine-scale cyclicity seen in Pacific Oligocene to Quaternary sediments, and
- study the carbonate and silica diagenesis in thick biogenic sections.

R. Douglas summarized the objectives of the proposed sites, Table PCOM-1. (*See also "Site Summaries", elsewhere in this issue.*)

Co-chief scientists for Leg 85 are Larry Mayer (URI), and Fritz Theyer (HIG).

PCOM discussion (Leg 85). Most discussion centered around a recommendation that EQ-1B be drilled during the leg. The recommendation, initiated by R. von Herzen and strongly supported by the Hydrogeology Working Group and Inorganic and Ocean Crust panels, targets this site (originally identified by the OPP to sample the Neogene record) to test models of fluids convection through the sediments. Although sediments at the site are reasonably thick (300 m) the region is characterized by unusually low heat flow and non-linear temperature (exponential decreases) gradients.

To the east heat flow is normal; to the west it is lower. The *Sonne* seismic data shows a marked differences in basement between the two regions with basement rougher in the regions of low heat flow. The "missing heat" is presumed to be somehow related to the basement rock outcrops. Drilling EQ-1B would provide an opportunity to test one part of the convection system — at little loss in ship time. (*See also the HWG report for additional background.*)

R. Douglas and R. Moberly explained that the OPP had rejected Site EQ-1B for ocean paleoenvironmental objectives because the thinner sequence would not provide a complete Neogene record — the prime objective of the leg. Proponents have spent many hours selecting the best site for the OPP work and this thinner section could possibly contain hiatuses. A possible alternative is to do the heat flow work at EQ-1B, but not at the other sites thereby making up some of the time.

During the discussion Douglas also explained that each site will be cored twice with the hydraulic piston corer to ensure recovery of a complete section and adequate material for comparative studies.

Plans also include collecting samples of basement at EQ-4. J. Fox said his panel would like to see basement cored 100 meters or to bit destruction, but even a 10-20 meter basement sample would be most useful.

(*PCOM recommendations for the entire Pacific Program appear below.*)

Northwest Pacific Paleoenvironments (Leg 86)

Earlier dropped as slightly lower priority, a northwest Pacific leg was reinstated by the Executive Committee to satisfy Soviet interests in the area. Douglas reported that the Ocean Paleoenvironment Panel has since developed the science program and now considers drilling in the northwest Pacific of paramount importance to provide data across critical productivity and current regimes. Drilling will test the history of Neogene siliceous productivity, Cenozoic volcanic activity, and aeolian and red-clay sedimentation.

At its recent meeting at SIO an OPP *ad hoc* group defined the following Leg 86 objectives and proposed sites to

- obtain a detailed Neogene record of water-mass fluctuations between the warm Kuroshio and the cooler transitional zones,
- unravel the late Cenozoic history of volcanic activity in the Japanese arc in the NW Pacific,

Table PCOM-1. Proposed Leg 85 Sites

Site	Coordinates	Water Depth (m)	Estimated Penetration	Coring Operations	Days on Station	Objectives
EQ-1A (=DSDP 81)	1°26.5'N 113°49'W	3800	450	(a) HPC twice + rotary drill to basement	6.2	Latest Miocene-Quaternary sediments and climatic history; repeat of DSDP Site 81 using HPC
				(b) Heat flow expt. in 3rd hole—Burns-Uyeda probe	0.33	
EQ-3	0°28.9'N 113°13.7'W	4300	550	(a) HPC twice + rotary drill to basement	7.6	Upper Eocene-Quternary sediments and climatic history; recover Eocene/ Oligocene boundary; repeat of DSDP Site 77 using HPC.
				(b) Heat flow expt.	0.33	
EQ-4	4°15'N 133°36'W	4250	550	(a) HPC twice + rotary	7.6	Same as EQ-3; determine basement age.
				(b) Heat-flow expt.	0.33	
				(c) Drill basement 100 m or to bit destruction	0.75	
EQ-5	6°N 135°05'W	4300	550	(a) HPC twice + rotary drill to basement	29	Same as EQ-3
				(b) Heat-flow expt.	1	
				(c) Drill into basement	0.75	
				Total Days on Station	30.75	
				Steaming Time	24.00	
				TOTAL	54.75	
EQ-6 (Alternative Site)	7°12'W 137°36'W	4600	300	(a) HPC twice + rotary	6.7	Same as EQ-3; recover basement
				TOTAL DAYS WITH EQ-6	61.5	

- study the Neogene climatic changes between the subarctic and transition zone boundary,
- establish the late Miocene to Pliocene history of siliceous productivity in NW Pacific,
- establish the Cenozoic history of aeolian and chemical red clay sedimentation,
- obtain a high-resolution stratigraphy of the early Cenozoic and Cretaceous/Tertiary boundary on the Shatsky Rise.

Table PCOM-2 summarizes the proposed sites for Leg 86.

PCOM Discussion (Leg 86). Site NW-6, the most northerly site is within 200 miles of the Kurile Islands, and could require special permission to drill. Drilling there would also require a considerable amount of steaming time. Members discussed the possibility of DARPA moving its site to the southwest where it could sample a comparable section. Again, the problem is that the section must be sufficiently thick to provide the best stratigraphic record, (for OPP), yet not so thick as to compromise the chances of the DARPA hole reaching competent rock. (See also discussion under Leg 88, below.)

The von Herzen HPC-nosecone-temperature sensor will probably be tested during Leg 86. The test should require very little time but needs to be left in the bottom for 5 minutes to record. Some panel members suggested that NW-9 might be a good place to triple HPC (a) with nosecone heat probe, (b) for stratigraphy and (c) geotechnical studies.

Some PCOM members suggested that because (1) the NW Pacific leg had earlier been eliminated as addressing somewhat lower priority science, (2) the Soviets (major proponents for NW Pacific drilling) are not now directly contributing to the effort and (3) the NW Pacific review group placed other objectives (e.g., Bering Sea) above it, the leg should be eliminated.

The PCOM as a whole, however, accepted the northwest Pacific drilling recognizing that the science has now matured and fits well into the overall program.

Co-chief scientists for Leg 86 are Lloyd Burckle (L-DGO) and Ross Heath (OSU).

Japan Margin (Leg 87)

The Active Margin Panel will meet 2-3 March at SIO, shortly after the PCOM meeting, to finalize site selection and drilling strategy for Leg 87. D. Hussong, however, reported on the **preliminary planning** for the Japan margin drilling.

Drilling has two major objectives: (a) to explore the tectonic subsidence and subduction mechanisms and evolution of the Japanese margins and (b) to determine the extent and history of the ancient Oyashio landmass. Studying paleoceanography of the Kuroshio current is another important objective — one of special interest to the Japanese.

The Leg is divided into two parts: Japan Trench and Nankai Trough, to which the Active Margin Panel gives equal priority. In the Nankai Trough, it assigns highest priority to drilling NK-1 and -2 to compare porosity, pore pressure, structural and geophysical characteristics in increasingly deformed sediments of the trench and lower slope. In the Japan Trench area, it gives high priority to sites to study the seaward extent and history of the Oyashio landmass. The Neogene ocean-environment and the upslope Nankai sites are of somewhat lower priority. The Nankai sites are ranked

NK-2	highest priority
NK-1	↓
NK-4	
NK-3	lowest priority

(See also Planned Challenger Drilling, this issue for table showing proposed Leg 87 sites.)

PCOM Discussion (Leg 87). Some PCOM members questioned the advisability of driiilling certain Nankai sites located over bottom-simulating reflectors in what looked like structural traps, or where drilling would penetrate overpressured zones which could pose safety problems. K. Kobayashi reported that in the opinion of the Japanese Safety Panel these sites do not pose safety problems. The Japanese have extensive seismic coverage of the area so that finding a safe site should be relatively easy.

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Winterer suggested that for safety review the site proponents have available time sections, structure contour maps, and an analysis of the thermal history of the area.

Table PCOM-2. Proposed Leg 86 Sites

Site	Coordinates	Water Depth (m)	Estimated Penetration	Coring Operations	Days on Station	Objectives
NW-3B	35°38'N 142°12'E	2510	400+	(a) HPC and rotary drill to reflector V (base of Pliocene)	5	Neogene history of water-mass fluctuation between Kuroshio and transition zone waters
(OPP ad hoc group recommends that this site be moved southward.)						
NW-5A	41°45'N 154°00'E	5575	300	(a) HPC twice + rotary[1] drill to (chert) basement	7	Neogene climatic changes to monitor subarctic front—fluctuation between subarctic and transition water boundary; productivity
NW-6	44°02'N 152°56'E	5365	380	Same as NW-5A	7.6	Same as NW-5A, in area of high accumulation (10 cm/my), tephrochronology
NW-7A	38°40'N 153°50'E	5675	225	Same as NW-5A Rotary drill to chert	5.2	Same as NW-5A and -6, to sample southern margin of subarctic front
NW-8A	33°50'N 157°00'E	6150	190	Same as NW-5A, -6, -7 (No rotary drilling)	4	Same as NW-5, -6, -7, to gain tropical part of record
NW-8B (≈DSDP 47)	32°27'N 157°43'E	2800	150	HPC twice to chert horizon (Sediments are very soft here)	3	HPC record of Cretaceous/Tertiary boundary and early Cenozoic carbonates
NW-9	32°20'N 164°00'E	6100[2]	60	HPC twice to base of Cenozoic (~60 m)	4[2,3]	Cenozoic history of aeolian and chemical red clay sedimentation
				Total Days Operations	35.8	
				Steaming Time	19.4	
				TOTAL	55.2	

[1]OPP members noted that not drilling to basement here would save considerable time. At NW-5A co-chief would simply like to penetrate the section to the chert, but not attempt to drill through the chert.

[2]Site at present operational limit of drill string (6100 m).

[3]OPP originally estimated 1.8 days; E. Winterer noted 4 days probably needed.

D. Hussong emphasized the need to conduct a complete suite of logging as well as heat probe, pore-water, and pore pressure (packer) experiments. Measuring and comparing physical properties is a requisite to understanding the dynamics of subduction.

M. Kastner urged DSDP to place a pore-water geochemist on both parts of Leg 87. R. Anderson also suggested that a USGS packer specialist be included in the shipboard party as problems in packing off the overpressured parts of the section are likely.

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PCOM Consensus. More Leg 87 work is planned than can be accomplished within the time available. The PCOM, recognizing that Leg 87 originally comprised two full legs, appreciates the difficulties in compressing the work into a single leg.

The Leg 87 co-chief scientists are Hideo Kagami and Dan Karig.

DARPA Experiment (Leg 88)

Ralph Alewine and Al Ballard outlined the DARPA (Defense Advanced Research Project Agency) experiment planned for Leg 88.

Background (Alewine). Planning to implant a marine seismic system in the floor of the Northwest Pacific began in earnest in 1980 when NSF and PCOM agreed to a cooperative program. The system will provide geophysical data on tectonic processes at a subduction zone and on the degree of plate coupling with depth along the leading edge of a downgoing plate.

During Leg 78B in the North Atlantic, the DARPA team, Global Marine, and DSDP experimented with the techniques of placing the seismometer into Hole 395A. The successful test has led to the next step — the experiment in the Northwest Pacific scheduled for August/September 1982.

Site Survey (Ballard). The USNS *De Steiguer* will set out an array of ocean bottom ssseismometers (OBS) and conduct a detailed sparker survey for about 70 km around the site. The OSU/HIG analog OBSs will record for the total length of the experiment. OSU's digital ocean-bottom siesmometers will only record for a few hours and will have to be recalled, reloaded and redeployed after the first refraction profile.

Following implantation of the marine seismic system and in cooperation with the Hawaii Institute of Geophysics, the *De Steiguer* will assist in conducting a detailed refraction survey, shooting about 400 shots along 510 km tracks (long axis) parallel to the regional axis of spreading. Time and (forecasted) weather permitting, refraction data will be recorded on board *Challenger*. Otherwise recording modules will be deployed before the refraction shooting and recovered later by another ship.

On-Site Operations

A. Ballard relayed the following drilling plan.[1]

- Locate (with *Challenger*) a site on a flat spot with thin sediment cover and no evidence of current scour.
- Drill a pilot hole to basement.
- Deploy the Duennebier borehole seismometer. (Shoot sensor orientation circle with *De Steiguer* and deploy recording package upcurrent.)
- Offset *Challenger* and set the re-entry cone. Drill the second hole to basement. (Seismometer to be set in any competent basement.)
- Implant DARPA marine-seismic system (shoot orientation circle).
- Begin refraction shooting program.
- (Deploy recording package if time and weather conditions permit.)
- Record on *Challenger* for two days. The instrument will continue to record for up to 45 days; another ship will return to recover the recorder.

DARPA estimates 14 to 18 days to complete the on-site operations. This includes four days of "contingency time." Bad weather could easily pose problems.

[1] *The sequence of Leg 88 operations has been modified since the Planning Committee met. The Leg 86 team will drill the pilot hole; the Duennebier experiment will be conducted after the emplacement of the DARPA seismic system.*

Staffing. Conducting the Leg 88 experiments will require 3 people to install the instrument, 3 people working on the seismometers, 3 people to handle the OBS, 1 DARPA/NORDA representative (Ballard), 1 Duennebier technician, and 2 co-chief scientists.

This leaves only 3 positions open for other scientists— sedimentologists and paleontologists.

Data. NORDA will work up the data collected by *De Steiguer* and produce bathymetric and isopach maps and structural and isochron charts of the area. Data will be published in the Initial Reports and/or NORDA reports, and placed on file at the IPOD Data Bank at L-DGO. The National Geophysical and Solar-Terrestrial Data Center also receives routinely all NORDA's unclassified data.

The shooting data will be handled by the Office of Naval Research in cooperation with Oregon State. The earthquake data will be available from a data bank in Washington.

Co-chief Scientists. Fred Duennebier has agreed to serve as a Leg 88 co-chief scientist. (DARPA has indicated it does not need a DARPA/NORDA person in a co-chief scientist's slot. A second co-chief scientist recommended by the Planning Committee subsequently declined the invitation.)

Discussion (Leg 88). The PCOM discussed the possibility of drilling the DARPA sites at a location which would satisfy the objectives of the Ocean Paleoenvironment Panel's site NW-6 (Neogene climatic patterns). This would save perhaps 8-9 days time during the NW Pacific program (mostly in steaming to NW-6) and would also allow the DARPA drilling to begin earlier, thereby improving the weather outlook.

The DARPA site needs to be (a) about 10° east of the Kuril Islands to be out of a seismic "shadow zone," (b) north of the effects of the Kuroshio currents, (c) in a region of relatively thin sediment cover with no impenetrable chert, (d) north of the E-W fracture zone at about 45°N latitude. The OPP site needs a sufficiently thick sedimentary sequence to ensure a complete record of small-scale Neogene environmental changes. A small area of overlap may exist.

Consensus. The Planning Committee instructed the Legs 86 and 88 proponents to "look very hard" at locating the DARPA site somewhat to the south of the present DARPA target (at ~45°41'N, 162°08'E) so as also to fulfill the main OPP objectives for NW-6.

Old Pacific Environment (Leg 89)

R. Douglas relayed the OPP's planning for Leg 89. The major objective here is to drill MZP-6 to basement, sampling the presumed oldest sediments of the Pacific. A recent site survey conducted by the Hawaii Institute of Geophysics has located a site without intervening younger volcanics at which oceanic basement can possibly be reached. Deep water here would require perhaps 7200 meters of drill pipe — more than is currently available, but within limits of what could be available by September 1982. (DSDP hopes to acquire additional drill pipe and load it in Yokohama just before Leg 89.)

Major objectives are to

- establish the early Mesozoic (pre-mid Cretaceous to Jurassic) history of the Pacific Ocean,
- establish the early evolutionary history of oceanic plankton and their influence on the composition of pelagic sediment,
- determine the effect of the opening of the North Atlantic Ocean on the chemistry and circulation of the world ocean,
- obtain improved early Mesozoic pelagic bio- and magnetochronology,
- determine the effect of Cretaceous mid-plate volcanism on the paleobathymtry, sea level changes, and tectonic history of the Pacific basins.

(See also "Planned Challenger Drilling," elsewhere in this issue. P. W.)

Southwest Pacific (Leg 90)

R. Douglas reported for the Ocean Paleoenvironment Panel's objectives in the southwest Pacific. Sites SW-4, -5, and -6 provide a transect to sample responses to (a) subarctic, (b) temperate and (c) subtropical water masses.

Major objectives are to

- establish the Neogene climatic history of the southwest Pacific,
- unravel the history of fluctuations in tropical, subtropical, transitional, and cool temperate water-mass during the Late Cenozoic,

- test evolutionary models of mechanisms of speciation (gradualism *vs* punctuated equilibrium).

Hydrogeology (Leg 91)

Roger Anderson reported on the preliminary planning for the hydrogeology leg.

Drilling on the East Pacific Rise (15°-20°S) is planned to study hydrothermal circulation and heat flow as a function of age of crust, and thickness of sediment cover in fast-spreading crust. Three sites would be drilled in 5, 10, and 20 million-year old crust (i.e., at greater distances from the ridge crest). Drilling here would extend the results of the Costa Rica drilling (Hole 504B) into an area of fast-spreading crust.

Plans call for 36 days on site: 14 days to drill re-entry site into 20 million-year old crust (200 m into basement); 6 days to conduct a suite of experiments including packer, logging, borehole televiewer, electrical resistivity and seismic experiments; 16 days to drill, sample, and log sites on 5- and 10-million year old crust (collect a piece of basement). About 22 days steaming time would also be required. Each site would be hydraulic-piston cored to sample upwelling and downwelling cells.

SIO and URI are jointly conducting a site survey of the area of Leg 91 in the western Pacific. The sites must be south of 13°S because biogenic sediments constitute too much of the section north of that latitude, diluting the hydrothermal signal. Sites are tentatively planned for west of the East Pacific Rise where surveys have shown strong helium anomalies. The survey could demonstrate that hydrothermal convection is strongest west of the rise, but proponents are not "closing the door" to drilling on the eastern side.

Discussion. M. Kastner emphasized that Leg 91 is a **geochemical transect**; geochemical experiments must have priority. R. Anderson noted that hydrothermal drilling proponents are also interested in sampling a red-clay site.

PCOM Consensus. The PCOM views the Leg 91 program with great interest but agreed that it **must fit into 33 operational days**. The scope of the leg cannot be expanded in such a way that more drilling time would be required.

Co-chief scientists: Margaret Leinen (URI) has agreed to serve as a co-chief scientist on Leg 91 (hydrogeology). The PCOM made several recommendations for the other co-chief scientist.

Atlantic Program

Mississippi Fan (Leg 92)

Dave Roberts outlined the goals and proposed strategy for the Mississippi Fan and Orca and Pigmy Basin drilling.

Drilling the Mississippi Fan will allow investigators to study the 3-dimensional anatomy of a major fan. Major objectives are to

- study facies distributions and characterize their sedimentary properties and relate them to bottom morphologies,
- study slumps and debris flows,
- analyze erosional and constructional phases to see to what extent they correlate with sea-level variations,
- establish time horizons and relate them to reflectors and the geometry of the fan,
- establish accumulation rates of the constructional phases,
- study the physical and chemical properties of the various components and determine origins of source material.

Drilling in Orca Basin would be planned to characterize the developing environments in an anoxic environment. This isolated basin is surrounded by salt diapirs and is filled with water much more saline than normal seawater — possibly a result of dissolution of flanking salt diapirs. The behavior of organic matter under such conditions may shed some light on the development of Cretaceous black shale sequences.

Drilling in the Pigmy Basin would give good stratigraphic control to record changes in sea level and modes of sediment transport.

Strategy for coring the Mississippi Fan calls for three to four HPC holes in the upper part, five holes in the middle part, and four holes in the lower part of the fan. Coring would sample the channels, levees, interchannel areas, and overbank and lobe deposits, as well as the distal portion of the fan.

Discussion (Leg 92). Some members questioned whether the Mississippi Fan is really the best example from which to extrapolate ancient fan environments. Because it is so large, the scanty pattern of coring may not resolve problems of changing environments.

Roberts replied that the study of other fans— especially those which can be studied on land pose the opposite problem — be of too fine a scale.

Jim Kennett added some comments about drilling the Orca Basin. Although anaerobic bottom conditions precluded benthic organisms, planktonic forms abounded and the post-depositional chemical environment has allowed exquisite preservation of both siliceous and calcareous forms. Developing highly resolved Pleistocene models would be possible here — possibly resolving climates to 100-year intervals.

ENA-3, Western North Atlantic (Leg 93)

J. Ewing reported that ENA-3 (35°08'N, 69°10'W) remains highest priority to the Passive Margin Panel. Located on USGS Line 25, ENA-3 would provide a complete stratigraphic section for comparison with the COST wells, and a complete paleoenvironmental history for a large region of western North Atlantic. Here reflector J-1 could be sampled; its age has been somewhat uncertainly extrapolated from other drilling in the area as late Jurassic.

Drilling at nearby Site 105 did not penetrate J-1 as the site is on a basement high against which the reflector pinches out.

Site 391 and 534 in the Blake-Bahama Basin cannot be satisfactorily tied seismically to ENA-3 because the depositional regimes north and south of Cape Hatteras are quite different.

ENA-3 provides a more complete record than ENA-1 as it has been less well protected by carbonate ridges. The SP^4 people are also interested in the sediment properties at this site. Drilling ENA-3 will take 6800 meters of drill pipe— more than DSDP can now string (6100 meters), but within reasonable limits if DSDP acquires the additional pipe.

Northeast Atlantic Paleoenvironments (Leg 94)

R. Douglas reviewed briefly the planned Leg 94 drilling.

Leg 94 is planned to complement the N-S transect legs in the Pacific by studying Neogene climates and oceanic conditions in the northeast Atlantic. Proponents have suggested moving NA-1 to a site in the King's Trough (= K-1). Sites K-1(?), NA-2, -3, -4, -6, and -7 would then form the transect. Plans are to hydraulic piston core each site twice. Although the major objective is coring the Neogene, some drilling would presumably touch basement. The program is planned for 55 days.

The OPP is still actively discussing the Leg 94 program, and it will be the subject of later PCOM meetings.

Leg 95 Alternatives

The Planning Committee previously recognized three alternative objectives for Leg 95: (a) return to the Caribbean. (b) drill northwest Africa to test models of eolian deposition, (c) the New Jersey transect to test the Vail sea-level curve.

The Planning Committee discussed these alternatives, but noted that uncertainties about the drilling program beyond October 1983 precluded selecting an objective at this time. Whether or not this is the last *Challenger* leg, and how much time available to the leg would significantly influence the choice of the Leg 95 objective. The PCOM will resolve this and related questions after NSF has indicated the type of program and platform to be employed after FY 1983.

New Alternatives

Proponents have suggested other possible targets for the 1982-83 program. These include (a) deepening Hole 504B and (b) returning to Hole 547B.

The Ocean Crust Panel and Hydrogeology Working Group strongly support deepening Hole 504B to Layer 3.

Hole 547B, drilled previously during Leg 79 re-entry site, was abandoned for lack of time. The Passive Margin Panel supports drilling it to basement and the logging. Logging had been scheduled but was cancelled because a shipping strike delayed delivery of the logging equipment to the ship. Hole 547B penetrated a thick Cretaceous and Jurassic sections deep on the Morocco margin.

Planning Committee Discussion and Consensus, 1982-83 Program

Pacific Program

The Planning Committee agreed, in a general sense, to the schedule the Pacific drilling as shown in Table PCOM-3.[1] It agreed that no single leg or entire objective should be eliminated; instead days should be shaved from objectives as necessary throughout the entire program. The Planning Committee thus agreed to

- keep the northwest Pacific paleoenvironment leg (86) in the program, but, if possible, to locate the DARPA test hole where it could also accomplish the OPP objectives (now site NW-6). This would save considerable steaming and drilling time during Leg 86 and would move the DARPA drilling into a more favorable weather window.

[1]*The tentative Challenger schedule prepared 13 May 1982 updates this table.*

Table PCOM-3. Proposed Drilling Schedule - Pacific Program
(Developed 26 February 1982)

			Days					
Leg	**Begin**	**End**	**On site**	**Steaming**	**otal Ops**	**In Port**	**Total**	**Objectives**
85	Los Angeles	Honolulu	19	11	30		30	DARPA
	8 Mar 82	2 May 82	31	24	55	3	58	Equatorial Pacific
								Paleoenvironments
86	Honolulu	Yokohama						
	5 May 82	21 Jun 82[B]	32(28)[A]	19	51(47)[A]	4	55	Northwest Pacific
							(51)	Paleoenvironments
87	Yokohama	Hakodate						
	25 Jun 82	19 Aug 82[C]	47(50)[B]	5	51(55)[B]	5	(60)[B]	Japanese margins
88	Hakodate	Yokohama	19	11	30		30	DARPA Experiment
	24 Aug 82	23 Sep 82						
			-	-	-	14	14	
Dry-	Yokohama	Yokohama						
dock	23 Sep 82	7 Oct 82						
			34	14	48	5	53	Old Pacific
89	Yokohama	Rabaul						Paleoenvironments
	7 Oct 82	24 Nov 82						
			28	15	43	0	43	Southwest Pacific
90	Rabaul	Wellington						Paleoenvironments
	29 Nov 82	11 Jan 83						
			-	11	-	5	16	
Transit	Wellington	Papeete						
	11 Jan 83	22 Jan 83						
			33	22	55	5	60	Hydrogeology
91	Papeete	Balboa						
	27 Jan 83	23 Mar 83						

[A]Numbers in parentheses presume shortened Leg 86 (objectives of one hole drilled druing Leg 88).

[B]Dates beyond this point presume shortened Leg 86 (i.e., numbers in parentheses).

[C]Dates beyond this point presume lengthened Leg 87 (i.e., numbers in parentheses).

- conduct the Duennebier experiment (requiring two days) during the DARPA leg (Leg 88) and within the time currently planned for Leg 88 operations.

- give the Japanese margin leg (87), which began as two legs and has been compressed, additional days as possible.

- attempt to complete the heat-flow experiments during Leg 85; the Leg 85 shipboard team would make a reasonable try to devote up to two days to the heat-flow work at EQ-1B.

- keep the Old Pacific drilling (Leg 89) in the program, recognizing that availability of drill pipe and decisions concerning technical capabilities of *Challenger* may impact the operations there.

- constrain additional slippage in the Pacific drilling program to the Pacific schedule. Leg 91 ends no later than 23 March 1983.

Atlantic Program

The PCOM agreed to postpone decisions regarding the Atlantic program until after NSF has made a decision concerning choice of platform for the post-1983 period. If drilling were to be halted for 2 years (beginning in October 1983) this would clearly influence planning for the later 1983 drilling. The PCOM agreed to hold with the program developed at its last meeting (Leg 92: Mississippi Fan; Leg 93: ENA-3; Leg 94: Northeast Atlantic Paleoenvironments; Leg 95: Caribbean or New Jersey slope or North Africa). At its next meeting the Planning Committee will address the questions of

- returning to Hole 504B
- returning to Hole 547B
- selecting the Leg 95 objective
- otherwise resolve planning for the remainder of the 1982-83 program.

In response to a query about a possible short extension to *Challenger* drilling, beyond October 27, 1983, I. MacGregor suggested that the PCOM focus on long-term planning at this critical time. Funds would be limited during a conversion period and introduction of a short-term plan might diminish stability of the long-term project. Any attempt to extend the *Challenger* drilling should tie into the overall plan, perhaps tying additional *Challenger* drilling to preparation for the ongoing program.

Results of the Conference on Scientific Ocean Drilling

Owing to the late hour, Helmut Beiersdorf reported briefly on COSOD. (A complete report had been distributed to PCOM members.)

The conference and its resulting scientific report was organized around four major topics:

- origin, evolution and tectonic processes of the ocean crust,

- origin and evolution of marine sedimentary sequences,

- tectonic evolution of continental margins,

- causes of long-term changes in the atmosphere, oceans, biosphere, cryosphere and magnetic field.

The only change from the original format is that tectonic processes in the ocean crust are now included under "origin and evolution of ocean crust."

The COSOD report will comprise three parts: an introduction, the working group reports with scientific priorities indicated and a general summary and recommendations by the steering committee. The report will be camera-ready by the end of February and should be printed soon thereafter.

The general recommendations of the steering committee are that addressing the science will require a long-term (10 or more years) program and that *Explorer* (converted to a drilling vessel) is the most suitable platform to address the program.

Roger Larson (Chairman, Steering Committee) has reported results of the conference to the National Academy's Committee on Ocean Drilling. The Committee seemed favorably impressed with the results.

E. Winterer thanked Beiersdorf both for his report and for his efforts in serving on the COSOD Steering Committee.

JOIDES Science Narrative (Eight-Year Proposal)

Winterer had distributed a revised version of the science narrative to PCOM members prior to the meeting. The revised version included suggestions made at the November PCOM meeting and expanded the program from five to eight years as instructed by the Executive Committee.

The Planning Committee thanked the Panel chairmen and Winterer for their hard work in preparing the narrative. NSF will use the document in its presentation to the National Science Board.

Some members are concerned that the ship's tracks presented will be (or will be viewed) as too constrictive. The PCOM recommended that Winterer (a) reinforce the statement that the included ship's tracks are illustrative material to demonstrate that objectives can be accomplished: that is, make explicit that the tracks given are but possibilities and are in no way "final," (b) note in the proposal that a "first step" the planners will take will be to devise alternative tracks.

Members also suggested that Winterer list additional targets and/or otherwise reinforce objectives that have been defined but are not shown by the model tracks.

- reinforce high-latitude, especially Antarctic, drilling, by adding more legs in the Southern Ocean and Weddell Sea or make the track more "fuzzy" in the Southern Ocean to accommodate an expanded program.
- add a section emphasizing that site survey is a necessary part of the science program. It is not addressed specifically in the narrative as it will be the subject of a complete complementary proposal.

Following discussion **the Planning Committee recommend adoption of the science narrative.**

Winterer will make suggested changes and distribute a final version of the narrative and white papers sometime after the meeting.

Explorer Conversion Planning

The National Science Foundation has contracted Lockheed Missiles and Space Company to develop a plan to convert *Explorer* to a scientific ocean drilling vessel and to analyze the comparative operating costs of *Explorer* and *Glomar Challenger*. NSF will use the cost figures, in conjunction with other information, to evaluate suitable platforms for future drilling (Advanced Ocean

John Nowicki, Robert Steinbach and William Perkins, all from Lockheed, reported to the Planning Committee on the results of the cost studies and *Explorer* conversion.

Interface Working Group

John Nowicki provided an overview of the Lockheed effort and on operations of the Interface Working Group developed to coordinate planning. The Working Group comprises representatives from NSF, Lockheed, JOIDES, and JOI Inc. It provides liaison between Lockheed, the scientific community, funding agencies, other government agencies, and private firms concerned with the drilling program.

The Group is working actively to

- provide *Explorer* operating characteristics,
- review scientific laboratory facilities and requirements,
- review special core-handling and logistical requirements (Lockheed is communicating with DSDP and JOIDES on this),
- identify special ship-to-shore communications systems,
- identify types of geophysical drilling and downhole measurements data/operations required,
- identify requirements for onboard computers, remote terminals, and computer communications systems,
- identify special operational considerations, e.g., available ports.

Ship Conversion/Laboratory Space and Facilities

R. Steinbach reported on planning and modifications to convert the *Explorer* to a drill ship. The *Explorer* has approximately 10,000 square feet available compared with 2450 square feet on *Challenger*. Room for increased pipe storage, berthing space (= 50 scientific party) is greatly increased. *Explorer* also has adequate space to house fully equipped scientific laboratories and a full riser system.

Explorer conversion would b-
cess. C---

the ship could be converted to a riser system and full well-control capability at a future date.

The first step, involving a major effort, has been to document *Explorer* characteristics in its present condition. Lockheed has also devoted a large effort to planning core handling and scientific laboratory facilities. Steinbach relayed some detail of the current planning and philosophy in laboratory and space utilization. Plans call for a large capability to handle numerous routine analyses on board. Lockheed is actively working on these plans and anticipates additional changes.

Operating Costs

William Perkins summarized the preliminary evaluations of relative (*Challenger* versus *Explorer*) operating costs. Lockheed will submit a detailed report on the cost analysis to NSF in the early part of March (1982). It developed the operating costs primarily on the basis of personnel, fuel, and support (provisions, spare parts, other consumables, and drydocking). The day-rates are summarized as follows.

	Explorer[1]	*Challenger*
Ship's Crew[1]	18,454	15,088
Shore support	2,014	1,230
Fuel[2]	11,118	3,520
Support	3,606	7,598
Communications	333	220
Others[3]	10,880	8,815
Total	46,405	36,471

[1]SEDCO supplied data for *Explorer* and NSF supplied data for *Challenger* personnel costs.

[2]Fuel costs estimated on the basis of expected horsepower requirements per actual *Explorer* usage and long-term historical data for *Challenger.*

[3]Other costs include bits, *ad valorem* taxes, casing, travel, logging operation.

Taking into account return on investment (=$4641 for *Explorer* and $9980 for *Chalenger*, Lockheed estimates the relative operating costs as *Explorer* - $51,046; *Challenger* - $46,451.

The operating cost for *Explorer* is thus 10 per cent higher than that of *Challenger.*

Many assumptions and explanations are built into the cost analysis. The figures are preliminary and details of the cost break-down, assumptions, and sources will be supplied in a report to NSF shortly.

Discussion. Owing to the late hour, the PCOM discussion was somewhat curtailed. It focused mainly on how costs were determined and what the figures mean in terms of a realistic program.

E. Winterer thanked the Lockheed group for their presentation and participation at the meeting..

Potential Additional Non-U.S. Participation

JOIDES continues to encourage additional non-US membership. NSF is developing a plan to involve additional non U.S. membership (some at reduced cost and reduced priveleges) which it will present at the May Executive Committee meeting. Canada, Australia, the Netherlands, and Norway have actively expressed an interest and/or have participated as observers at recent committee meetings. NSF has invited several additional nations to a May (1982) meeting in Washington to review the program.

John Keene, representing Australia, attended the present meeting and reported that the Consortium for Ocean Sciences (COGS) initiative for joining IPOD remained strong and was in fact even gaining support within the Australian scientific community. The Australians will soon decide which government agency will represent the Australians. The Bureau of Mineral Resources strongly supports the program and is a likely candidate. The Australians hope that government to government negotiations can begin early next year (1983) so that Australia can join in on the planning of the 8-year program. Keene noted that the Leg 90 drilling in the Australian region has stimulated interest among his countrymen.

Future Meetings

The Planning Committee will next meet

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

6-8 October 1982
Lamont-Doherty Geological Observatory
Palisades, New York
(Dennis Hayes - coordinator)

25-28 January 1983
Texas A&M University
College Station, Texas
(William Bryant - coordinator)

J. Cann invited the PCOM to hold its summer 1983 meeting in the United Kingdom; specific dates and sites will be discussed at a later meeting.

Closing Remarks

E. Winterer thanked Jose Honnorez for the excellent meeting arrangements; the meeting was exceptionally complicated by evening sessions and a large attendance.

The Planning Committee applauded E. Winterer for his job as Planning Committee chairman during the very critical 1980-82 period. It particularly noted his very large contribution in addressing the forward scientific planning and in bringing JOIDES through a very busy and difficult period.

E. Winterer adjourned the meeting at 1200 on 29 February 1982.

Recipients of DSDP Samples and Data

Remember to send five reprints of any paper you have published using data or samples collected by or in conjunction with the Deep Sea Drilling Project to the DSDP Curator.

Curator
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, California 92093

ACTIVE MARGIN PANEL

Donald M. Hussong, Chairman

The Active Margin Panel last met 4 to 5 March 1982 at Scripps Institution of Oceanography.

Report on Planning Committee Meeting

Items from the February Planning Committee meeting of particular interest to the Active Margin Panel include the following.

Post-1983 Drilling

The NSF, after considering various options for future drilling, favors converting the *Explorer* to conduct deep-ocean scientific drilling, in place of the *Glomar Challenger. Explorer* drilling, involving international participation, might begin in early 1985. Initially the *Explorer* program would be one of world-wide drilling with the vessel in a riserless configuration, similar to that of the *Challenger.* The *Explorer* would offer a longer drill string (~ 10 km), better station-keeping capabilities, and possible future reverse circulation (riserless drilling) — all important systems in active margin drilling.

1982-83 Drilling

D. Hussong presented the preliminary planning for Leg 87 to the PCOM. The committee expressed some concern over potential safety problems in the Nankai Trough transect.

The PCOM recognized that the drilling plans for Leg 87 near the Japan Trench and the Nankai Trough are too extensive for the one leg, largely because two full legs had initially been allocated for these regions. It thus amended the *Challenger* schedule to add 4 days, giving a total of 60 days to Leg 87. This additional time was found by moving the DARPA hole to the southwest, where it would also satisfy the objectives of NW-6, thereby reducing the time needed on Leg 86.

The last leg of the present drilling program (Leg 95) remains unplanned. One candidate target is active margin drilling in the Caribbean. This could include a return to address the largely unmet objectives of Leg 78A, or drilling some arc and backarc (CAR-2) objectives that were not part of that short leg. The AMP will prepare recommendations for Leg 95 drilling in the Caribbean for presentation at the July 1982 PCOM meeting.

Leg 84 Drilling

R. von Huene and K. Kvenvolden reported on the preliminary results of Leg 84 on the Middle America Trench. The leg was very successful, sampling ophiolite suite rocks at all the sites where acoustic basement was penetrated. The results indicate that the Guatemala margin has not been subjected to extensive accretion during the Cenozoic, although older periods of accretion may have occurred. The Guatemala forearc seems to be composed of the same rocks as the adjacent continent.

The gas hydrate investigations during Leg 84 were particularly valuable; shipboard geochemists obtained clathrate samples at several sites. They analyzed the clathrates aboard ship and also stored them in frozen and pressurized vials for continued onshore studies. Gas hydrates were even found in the fractured ophiolitic basement. Continuous monitoring during drilling in gas hydrate regions ensured that drilling was safe in the zones above the bottom-simulating reflector (BSR). No free gases were detected.

Japan Margins (Leg 87) Planning

The Panel reviewed the various sites that have been championed by proponents for both the Japan Trench and Nankai Trough region with the following results:

Nankai Trough

The proposed sites at NK-3 on the Japan shelf was put aside at this time because of insufficient site survey data, relatively shallow BSR combined with targets requiring deep penetration (i.e., safety problems).

The panel decided that inasmuch as the targeted objectives of sites NK-1, NK-2, and NK-4 were quite general, all the sites could be located on one cross-strike seismic profile to provide maximum continuity to the study. The panel then selected all the sites to be presented to the Safety Panel along JAPEX CDP reflection seismic profile 55-3-1. In the order in which the Panel recommended that they be drilled, the selected targets are:

1. Site NK-1C (water depth 4870 m). The oceanic reference site will be drilled just seaward of the first observed deformation of the trench-fill sediments. Drilling the site will provide a record of the sediments converging on the Nankai Trough accretionary prism and will yield a late Pliocene to Recent tephrachronology of the Nankai region. Its location seaward of the convergent deformation front (near SP 1907) will also permit analysis of the physical properties of the sediments prior to deformation. Because oceanic basement is approximately 1400 meters sub-bottom, we do not anticipate that the proposed hole will reach igneous rocks. The approximately 900 meters penetration should, however, sample well into the late Pliocene claystone. This sequence was deposited above the terrigenous turbidites in the Shikoku Basin just after the formation of the Nankai Trough blocked the turbidite flow. Thus, although proposed Site NK-1C will sample mostly trench fill and will not go to basement, it will go sufficiently deep to overlap with nearby Hole 297 (Leg 31), that sampled most of the actual Shikoku Basin sediments. (Hole 297 penetrated 697.5 m and stopped an estimated 100 m above basement.)

2. Site NK-2C (water depth 4650 m) will penetrate a seismically well defined thrust plane in the toe of the Nankai Trough accretionary prism. The hole is proposed near SP 1790, where it will penetrate the apparent thrust plane at a sub-bottom depth of about 450 meters. The shipboard party will make extensive physical properties measurements at this hole, and if possible emplace a downhole package. The hole will be drilled to bit destruction beneath the fault plane, where some of the sediment column penetrated above the fault should be repeated. **The panel agreed that NK-2C, which will provide extensive data on the physical properties of deforming sediments and on shallow subduction tectonics, is the highest priority site of Leg 87.**

(Note: The week following the AMP meeting, the Safety Panel approved NK-2C only on the condition that a pilot hole first be drilled at SP 1795, where the apparent fault plane is at a depth of about 300 meters. At this relatively shallow-penetration site, no structural trap is apparent on the reflection profiles. If the shipboard team detects no evidence for hydrocarbons above background levels by the depth of the fault plane in the pilot hole, the main objective at SP 1790 can be drilled.)

3. **Site NK-2D** (water depth ~ 4100 m) will be located in slightly deformed sediments somewhere between the undeformed sediments of NK-1C and the extensively folded and faulted sediments of NK-2C. Precise location of the site will depend on the preliminary results of the first two holes. NK-2D will thus complete the set of three deep holes in the Nankai Trough deformation front that will trace the initial deformation and lithification of trench fill sediments as they are incorporated into an accretionary prism.

4. **Site NK-4C** (water depth ~ 4100 m) is a set of two holes proposed about 650 meters apart that span the landward edge of a small trench slope basin. The hole in the basin will penetrate the well stratified sediments filling the basin to a sub-bottom depth of about 450 meters (~1000 m above a prominent BSR); the hole to landward should penetrate through about 175 meters of trench slope deposits and then reach the same basin deposits as sampled in the trenchward first hole. The set of holes will determine the nature of the landward dipping interface marking the northwest edge of the basin, provide data for interpreting the mode of origin and tectonic deformation of the trench slope basin, and provide samples of accreted sediments which are even more disrupted than at Site NK-2C.

5. **Site NK-4A** (water depth 4150 m) is located at SP 1652 on the same profile (JAPEX 55-3-1), and would penetrate 300 meters into prominent landward dipping reflectors above a strong BSR at 400 meters. This site is the furthest from the trench axis where well identified landward dipping reflectors are observed in the seismic profiles.

Japan Trench

A minimum of 16 days on station is reserved for a set of Japan Trench holes to be drilled during the second portion of Leg 87. The sites recommened by the panel, again in the recommended drilling order, are as follows.

1. **JT-13A** near SP 265 on the Ocean Research Institute (ORI) CDP reflection seismic line 78-3, is planned to follow-up Legs 56-57 results which documented Neogene margin subsidence and apparent subduction erosion off northern Honshu. The Leg 87 drilling will sample the upper trench slope structure to help delineate the seaward extent of continental rocks and to investigate the cause and timing of the apparent Cretaceous/Neogene sedimentary hiatus detected at the critical Sites 438 and 439 on Leg 57. Although proponents have identified shallower objectives, to be fully successful, this hole must penetrate nearly 1400 meters. This is very deep for a single-bit hole.

2. **JT-3B** was selected somewhat landward of JT-13A, at SP 30 on Line ORI 78-3. The two sites hve complementary objectives. Since the targets for JT-13A are very deep, the site was positioned where the Neogene section is quite abbreviated. JT-13B is slightly upslope where, on the basis of the seismic data, the Neogene section appears to be more compelete. The two sites will then provide a complete section. JT-13B should only require about 600 meters penetration. (Note that on some early documents JT-13B is labeled JT-13B′ or JT-13b′.)

3. **JT-16B**, at SP 580 on Line ORI 78-4, was selected as an alternate site to JT-13A. The sites are located at similar structural positions on the trench wall, but JT-16B is significantly deeper (~5100 m). JT-16B is an alternate site because although the Panel supposes the major Cretaceous unconformities at only about 800 meters sub-bottom — a much easier target than at JT-13A — the site has a less well defined shallow section. The seismic data at JT-16B are confused, and reflector at JT-16B cannot be correlated with interfaces upslope and on the continental shelf.

4. **NW-3A** is located on the upper trench wall on the edge of the continental shelf of Honshu. The site was selected to provide landward conrol on the subsidence history of the Japan Trench transect and a detailed post-middle Miocene tephrachronology. The site is also part of the northwest Pacific objectives of the Ocean Paleoenvironment Panel. Penetration should go to 800 meters sub-bottom. (Note: The JOIDES Safety Panel did not approve this site because of inadequate site-survey data. It also declined to approve a proposed alternate site, NW-3B, for the same reasons.)

The Leg 87 team will attempt to [illegible] all the holes and [illegible] to careful measurements of the physical properties of the sediments.

DSDP is just beginning to staff Leg 87. Co-chief scientists, H. Kagami and D. Karig, are working with Y. Lancelot at DSDP in this regard. In light of the cruise objectives, more emphasis than normal will be placed on obtaining expertise in organic geochemistry and physical properties. As little igneous rock is anticipated on the cruise, the need for igneous petrologists will be less.

Leg 95

The Active Margin Panel will appeal to the Planning Committee at its July 1982 meeting to schedule Leg 95 to return to the region of the Barbados Ridge. The first attempt at this set of objectives, Leg 78A, was reduced to a half-leg and then technical problems further reduced the useful drilling time. Since Leg 78A, proponents have obtained even more site-survey data in the region. The AMP feels that with adequate station time the original objectives of drilling CAR-1 — to sample a well-developed, relatively mature accretionary prism — can be met. The Panel favored further efforts at CAR-1 over plans to drill CAR-2 or other Caribbean sites.

White Paper

The AMP thanks its previous chairman, R. von Huene, for his efforts in preparing a draft white paper. After minor editing, the white paper will be submitted to the JOIDES Planning

Table AMP-1. Active Margin Panel Targets for 1983-1989

Highest Priority ⟶ Lower Priority

	Marianas	Peru	Barbados	New Hebrides	Japan Sea	Makran-Oman	Banda-Sunda	Bering Sea	Hellenic Trench	South Chile	Aleutian
Structural evolution of the forearc	x	x	x	x				x	x	x	x
Sedimentary sequences in trenches and forearc basins		x	x			x				x	x
Evolution of island-arc magmatism	x			x	x						
Evolution of backarc basins	x				x						
Evolution of collision margins						x	x	x	x		x
Temporal relationships of magmatic and tectonic processes	x	x			x						
AMP proponent	Hussong	Hussong	Cadet	Karig	Nakamura	Karig	von Huene	Cadet	Barker	von Huene	Barker

Committee (E. Winterer) on 1 April 1982 for inclusion in the post-1983 drilling narrative and proposal being prepared for the National Science Foundation.

D. Hussong will prepare an abstracted version of the white paper for submission to *EOS* in early summer, 1982. Other panel members will submit comments to Hussong on the white paper relative to the *EOS* version by 1 May 1982.

Post-1983 Drilling Proposal

E. Winterer described the proposal being prepared for submission to NSF for eight years of deep-ocean drilling beyond the present *Glomar Challenger* program. The AMP was satisfied that the present proposal, and the model drilling schedules accompanying it, represent the desires and objectives of the AMP. The Panel made some modifications to the prioritized summary of AMP drilling objectives and prepared a new table (Table AMP-1).

In light of the significant, and often surprising, results of active margin drilling, the panel feels that a thorough re-evaluation of long-term drilling objectives should be made as soon as the post-1983 drilling capabilities (e. g., *Challenger* or *Explorer* type vessel, duration of program, potential for reverse circulation, blow-out prevention) are better known. Problems in regions that are not presently of highest priority to the panel may warrant additional emphasis. The Panel will plan its next meeting for at least four days to thoroughly re-evaluate potential active-margin drilling problems and regions. Proponents for each region will attend the meeting with appropriate data to make a presentation of possible drilling objectives. Where possible, these proponents will be panel membersl; if no panel member can adequately propose drilling in a region, the panel will invite an appropriate proponent to the meeting.

Future Site Suveys

Difficulties with obtaining Safety Panel approval for the Leg 87 drill sites again emphasized the need for more complete and timely site surveys for active-margin drilling. Although no further site surveys are required for the sites in the current (1982-83) program, the highest priority AMP sites for post-1983 drilling do need site surveys. For example, drilling the Peru-Chile Trench remains of highest priority, and has been tentatively scheduled early in the future program. Extensive site surveying is required for this region. The AMP requests that site surveys be initiated for high priority post-1983 target regions as soon as possible in order to efficiently prepare for future drilling.

Panel Membership

The Active Margin Panel is a relatively small panel that addresses a quite diverse set of geologic and geophysical problems. Of the many areas where more expertise would be beneficial, the Panel views petrologic and geochemical problems associated with arcs and backarcs most critical. Panel members, after consultation with colleagues, will submit names of individuals for nomination to the AMP to D. Hussong by 1 June 1982.

Next Meeting

The Active Margin Panel tentatively plans to next meet on 16-20 November 1982.

OCEAN CRUST PANEL

Paul J. Fox, Chairman

The Ocean Crust Panel last met 18-20 January 1982 at Woods Hole Oceanographic Institution.

COSOD Meeting Report

P. Robinson reviewed the results of the Conference on Scientific Ocean Drilling. The Panel endorsed a draft of the document and felt that the emphasis on processes and the selection of a few key environments was timely. The Panel reiterates that the noble objectives of the next round of drilling into the crust will not be realized unless **significant technological advances are made with regard to bare rock drilling, high temperature instrumentation, and better recovery rates.**

National Science Foundation Report

S. Gartner reviewed the structure, responsibilities, and the composition of the new Office of Scientific Ocean Drilling (OSOD) at NSF. His presentation was clear, forthright and very helpful in apprising the Panel of the new organization. The Ocean Crust Panel is very thankful for the information and noted that this kind of open communication between the administrators at the Foundation and the Panel was very helpful.

Following discussions, the Panel clearly saw a need for an administrator and a separate budget to solve problems associated with research and development. In the past, important components of a well rounded drilling program (i.e., high-resolution studies to precede drilling; development of down-hole instruments; new technology like bare-rock drilling) have all too often been overlooked in the rush to solve more immediate problems. The OCP urges that when the new administrative structure for the next phase of drilling is defined, a separate and administratively healthy Research and Development Office be established. COSOD and the new drilling proposals have formulated outstanding science but these goals will not be met if ancillary programs are not robust.

Deep Sea Drilling Project Report

J. Natland reviewed the progress made toward the timely publication of Initial Reports. The Panel notes that DSDP has done a remarkable job considering the harsh budget cuts and rising expenses it has experienced.

Drilling Results

Leg 82

H. Bougault reviewed the results of Leg 82. The major result is that although heterogeneities exist in the mantle, the processes that lead to the extraction of basaltic melts from the upper mantle are clearly more complicated than petrologists previously believed. On-going studies of the models had led petrologists to believe. On-going studies of the Leg 82 samples will provide results that will certainly refine models of basalt petrogenesis. An unexpected result of Leg 82 was the recovery of gabbroic and serpentinized ultramafic rock at shallow levels at three localities, suggesting that the crust in the North Atlantic is much more heterogeneous than geophysical models had suggested.

Leg 83

R. Anderson, J. Honnorez, R. Emmermann, and R. Stephen reviewed the combined results from deep drilling at Hole 504B. Hole 504B was deepened to 1075 meters and ended in partially altered diabase dikes. The hole was drilled to the deepest penetration into the oceanic crust to date. It is in excellent condition and a return to the site offers an ideal opportunity to directly sample, for the first time, the foundation of the oceanic crust.

Current Program

Leg 85

R. von Herzen reviewed the rationale for carrying out a series of heat-flow measurements during Leg 85 in the equatorial Pacific. The OCP supports the von Herzen request and J. Fox will write a letter to PCOM supporting the proposition. (*At the PCOM meeting in Miami in late February, the von Herzen request was accepted. P. J. F.*)

Future Programs

Sandia Proposal - Nares Abyssal Plain

The Panel reviewed a proposal submitted by Sandia Laboratories to drill a hole in the southeastern portion of the Nares Abyssal Plain on Cenomanian age crust. The basement samples recovered from Cenomanian crust would be of considerable interest to the oceanic crustal community, especially for studies of magnetic quiet zone and alteration history of the crust. The Ocean Crust Panel supports the scientific merit of the proposal.

Okal Proposal - Tuamotu Archipelago

The Panel reviewed a document by Dr. Okal of Yale University proposing to drill a few holes in the Tuamotu Archipelago. The Panel felt that the problem is local in nature and is, at present, not well constrained. Leg 33 demonstrated that the Archipelago had been subjected to a complex volcanic history not typical of a "well behaved" hot spot. Dredges taken by the Hawaii Institute of Geophysics from the southern end of the Line Islands recovered Eocene rocks (dated on the basis of K-Ar ages). The age progression of the chain is clearly not simple and the Panel agreed that more dredging and regional geophysical studies are needed before a drilling campaign is launched.

Cyprus Drilling Project

P. Robinson reviewed the status of the international Cyprus Drilling Project. The program to map the extrusive carapace has documented disruption and rotation of discrete blocks on faults with a few hundred meters of throw. Evidence for hydrothermal alteration is spatially restricted and ore deposits are concentrated within the lower pillow lava. Drilling will begin in the spring of 1982 and plans have been made to drill one 2-km hole through the pillows and into the sheeted dikes and another 1-km hole around an ore deposit (stock work).

Wireline Re-entry

R. Stephen reviewed the results of a Woods Hole study to develop ACNAV re-entry for non-drilling operation and logging in DSDP holes (ARNOLD). The plan involves deploying standard logging cable and logging tools from a conventional oceanographic ship. Using satellite navigation, the crew would position the ship near a DSDP hole and deploy an array of bottom transponders. They would locate the re-entry cone with ANGUS, and once found, lower a donut-shaped sled containing downhole instruments into the cone.

The OCP endorses the concept of wireline re-entry and encourages Woods Hole to continue its development of ARNOLD.

Explorer Laboratory Facility

The Panel compiled a list of equipment required for a hard-rock laboratory aboard *Explorer.* The Panel stresses future efforts must be made to upgrade and standardize the quality of basic descriptive information collected during the cruise. Proponents should prepare a manual that outlines guidelines for the production of systematic results. The Panel also notes that the greatest need on board ship is for adequate laboratory space and trained technicians.

(*OCP recommendation for Leg 92 (Hydrogeology) co-chief scientists and changes to panel membership are reflected elsewhere in this issue.*)

ORGANIC GEOCHEMISTRY PANEL

Bernd R. T. Simoneit, Chairman

The following summarizes the business carried out by the Organic Geochemistry Panel since its last meeting in June 1980.

Summary of Business Conducted

- The OGP continues to maintain and update a list of organic and petroleum geochemists for potential participation on board *Glomar Challenger.*
- The OGP has completed and distributed the Shipboard Organic Geochemistry Guide and Handbook. Additional copies are available from Bernd Simoneit (Panel Chairman) or from Matt Salisbury at the Deep Sea Drilling
- The OGP has prepared a white paper for post-1983 drilling program which has been incorporated into the JOIDES Science Narrative (8-year proposal). It will also be reproduced as an appendix to that proposal and to the COSOD report.
- Frozen samples for contributors to the Initial Reports up to Leg 80 have been distributed; those from Legs 81 and 82 have or will be distributed shortly. Investigators interested in receiving samples for contributions to future Initial Reports should submit requests to the Organic Geochemistry Panel (c/o Bernd Simoneit).
- The panel is actively participating in the planning for laboratories and instrumentation onboard the *Explorer.*
- The availability of samples from the hydraulic piston core from Leg 75, Hole 532, dedicated to organic geochemistry, has been announced in *JOIDES Journal, Geochim. Cosmochim. Acta, EOS and Org. Geochem.*, and a further announcement has been submitted to *Science.* Sampling is planned to satisfy requests in hand after the next OGP meeting (late April 1982).
- This panel strongly supports efforts of the Engineering Department at DSDP to improve recovery by the hydraulic-piston-coring system during operations in sand and mud.
- Organic geochemists are continuing to contribute results obtained both onshore and on board ship to the *Initial Reports.* They are analyzing lipids, gases, pigments, carbohydrates, amino acids, humic substances, and kerogen by using a suite of instrumental techniques such as gas chromatography, gas chromatography-mass spectrometry, stable-isotope mass spectrometry, pyrolysis, and elemental analysis. The results are interpreted to assess problems dealing with maturation, source-rock potential, hydrothermal effects, paleoenvironments, sources of organic detritus, and general organic geochemistry. Both the numbers of investigators and investigations continue to increase. The panel again urges **the shipboard co-chief scientists to ensure core material is sampled and frozen for organic geochemical studies on a routine basis.**

The DSDP Repository has also filled a [illegible] for frozen core [illegible] [illegible] assess to what sub-bottom depth evidence for microbial activity can be found and what general types of organisms are present.

- The OGP will evaluate the implementation of a gas stripping apparatus on *Glomar Challenger* to obtain better gas chromatograph analyses of the C_2-C_{12} hydrocarbons which are being encountered more frequently. The Panel will evaluate the feasibility of changing to flexible-fused-silica-capillary columns on the Hewlett-Packard gas chromatographer.

The Organic Geochemistry Panel will next meet 29-30 April 1982 in Oregon.

SITE SURVEY PANEL

E. John W. Jones, Chairman

The JOIDES Site Survey Panel last met 3-4 December 1981 at Scripps Institution of Oceanography. We have extracted and abridged the following report from the preliminary minutes of that meeting. Some items from the minutes are reported elsewhere in this Journal and are not duplicated here. (P. W.)

U. S. Site Surveys, 1981-1983

Western Pacific

T. Shipley described the recent JOI-funded site surveys completed by *Kana Keoki* in the Western Pacific (Guam-Majuro). Good high-resolution data were recorded using a water gun in conjunction with a digital acquisition system. The principal problem was to find areas where Cretaceous sills are thin or absent so that the older Mesozoic rocks could be sampled during the Leg 89 drilling. He presented arguments, on the basis of lateral amplitude variations and depth changes of reflectors, that a site close to DSDP 199 offers a favorable opportunity for drilling well below the level of basic sills encountered in earlier drilling. Members of the SSP agreed that the seismic records presented are a considerable improvement on earlier data and recommended that they should be examined by the Ocean Crust and Ocean Paleoenvironment panels with a view to selecting precise locations for the "Old Pacific" sites.

Equatorial Pacific

Shipley then discussed plans for surveys around the equatorial Pacific locations (Leg 85). The survey will be carried out on a *Washington* cruise beginning 9 January and ending in Tahiti on 8 Febuary 1982. The *Washington* team will employ the same seismic system as did the *Kana Keoki* team, together with Seabeam. Because there will be only three weeks between the end of the survey and the start of the *Challenger* leg (85), as much data preparation (isopach maps, especially) will be carried out aboard ship. D. Hayes emphasized the need for detailed bathymetric data in this area, as this will greatly help in the selection of sites where sedimentation is likely to have been continuous. W. Weigel pointed out that R. V. *Sonne* is now working around site EQ-1 with Seabeam, a single-channel airgun and a 3.5 kHz profiler. The data from the survey (55 x 55 km^2 with a 2.0 km line spacing) will be made available to E. Winterer and R. von Herzon immediately after the cruise. *Washington* is expected to survey sites EQ-1A, EQ-3, -4, -5, and -6. Between 14 February and 28 March then continue surveying in the area of the scheduled "hydrogeology" drilling leg. The *Washington* will use Seabeam and the water-gun seismic systems.

Middle America Trench

D. Hussong reported the results of reprocessing a small part of the University of Texas multichannel data from the Middle America Trench. This project was funded by JOI with the expectation that the bottom-simulating reflector (BSR) on the landward wall would be better defined. Reprocessing has, in fact, considerably improved the resolution of the BSR, enabling the Active Margin Panel to shift proposed drilling sites to more favorable locations.

Northwest Pacific (DARPA Site)

The question of surveys around the DARPA sites in the NW Pacific was considered. The Site Survey Panel could not yet endorse these sites in as much as members had not been given access to any site-survey reports on which the precise drilling locations are based. Jones reported seeing a *Silas Bent* reflection profile near one of the proposed sites at the Ocean Paleoenvironment Panel meeting (30 Novemeber) but the only other data he was aware of is at Lamont.

Since the Site Survey Panel had not been able to gain access to survey information in the area of the DARPA sites, the Panel recommends that L. Dorman, R. Douglas, and DARPA personnel meet to examine site survey data in the area to locate a site which is agreeable to both DARPA and the Ocean Paleoenvironment Panel.

Gulf of Mexico and New Jersey Transect

The Gulf of Mexico sites will be surveyed by one or more U. S. institutions in 1982. The U. S. Site Survey committee will ensure that requests for proposals are written by early January. L. Dorman will also investigate the desirability of further site surveys off the New Jersey continental margin (for ? Leg 95).

French Site Surveys, 1980-1983

V. Renard reported that no IPOD-specific research cruises had been organized during 1980-1981, but, nevertheless, valuable data relevant to drilling had been collected in the course of more general geological/geophysical studies. A magnetometer and Seabeam were operated along each *Jean Charcot* line and a few lines have single-channel reflection seismic profiles, as well.

In 1981 the French conducted the following investigations in the areas given below

- Clarion-Clipperton Fracture Zones: close coverage of a 4° square near 135°W using Seabeam and including a detailed coring operation
- East Pacific Rise between 21°N and 30°N: Seabeam and deep-tow photography
- One month on the Blake-Bahama escarpment and one month on the Barbados Ridge to carry out surveys around CAR-1 and examine the extension of the El Pilar fault
- Transect between Barbados-Ridge and Lisbon which included a traverses across the Hayes Fracture Zone; tracks and Seabeam morphology were displayed.

L. Montadert has planned further multichannel seismic work near the Leg 80 drill sites for early 1982. A diving program, which will include photographic work and water sampling, will also be carried out in the area of hydrothermal vents on the East Pacific Rise at 30°.

In 1983 areas to be investigated by *Jean Charcot* include the Mid-Atlantic Ridge, the Barbados Ridge, and the Middle America, Peru and Japan trenches. V. Renard will provide more details at the next Panel meeting.

Federal Republic of Germany Site-Surveys, 1981-1983

W. Weigel described the following surveys.

EQ-1 (4°N, 115°W), Equatorial Pacific — Leg 85

R. V. *Sonne* is to carry out a three-day survey with Seabeam, a 3.5 kHz profiler and single-channel airgun system. R. von Herzen is fully aware of this work which covers 55 x 55 km^2 with 2-km line spacing. The survey has been coordinated with the Scripps survey for the remaining equatorial Paacific sites. The data will be sent to R. von Herzen and E. Winterer when the *Sonne* arrives in Manzanillo.

Coral Sea, Southwest Pacific — Leg 90

A *Sonne* survey (cruise SO-16 — BGR) in the region of the Leg 90 sites was completed in December 1980 and January 1981. The cruise included a multichannel reflection seismic, gravity, and magnetic suveys, together with geological sampling. Details of the data are available from BGR upon request. Proposed drill sites are in the Western Coral Sea Basin (SW-1, -2), the central Papuan Plateau (SW-3), the northern Papuan Plateau and extension of the Moresby Trough (SW-4), the southern margin of the Papuan Plateau (SW-5), the Osprey Embayment (SW-6, -7) and the northern Queenland Trough (SW-8).

Western Atlantic

In the summer of 1981 a large-aperture seismic experiment was undertaken in the Western Atlantic using S/V *Prospekta* and R/V *Fred H. Moore.* About 2542 km of CDP wide-aperture seismic data were recorded together with expanding spread profiles (116 km) and 30-fold CDP data (225 km). The Bundesanstalt für Geoweissenschaften und Rohstoffe, Lamont-Doherty Geological Observatory and the University of Texas are currently evaluating the data.

Eastern Atlantic Paleoenvironments — Leg 94

NA-5. The abstract and track charts of a published report of surveys near proposed Site NA-5 are included in a report prepared by Hinz *et al.* (1979). Site proponents can obtain further information on the geophysical data by contacting K. Hinz.

NA-8. The Germans recorded reflection profiles near this site (off southeast Iceland) in 1975, using a sparker and airgun. The seismic data are held at the University of Kiel (Dr. Theilen) and at the German Hydrographic Institute, Hamburg (Dr. Figge). Site proponents can obtain copies of records by contacting either Dr. Figge or Dr. Weigel.

NA-9. A considerable amount of multichannel data has been recorded by Bundesanstalt für Geoweissenschaften und Rohstoffe near this Norwegian Sea site. Site proponents should contact K. Hinz or W. Weigel.

Northwest Africa — Leg (?) 95

The Bundesanstalt für Geoweissenschaften und Rohstoffe has recently recorded a 48-fold multichannel seismic line across DSDP Site 135 (BGR cruise, October 1981). A review of surveys around DSDP Site 527 has shown them to be adequate for drilling objectives off northwest Africa.

Post-1981 Surveys

Vessels contributing to regional site surveys will operate in the following regions during 1982 and 1983:

- **Bahamas**: Deep structure of a passive margin; cooperative seismic program between Lamont and the University of Hamburg (1982).
- **Sula Sea**: Multichannel reflection seismic, magnetic and gravity measurements; geological sampling (1982).
- **Norwegian-Greenland Sea**: Multichannel seismic records (1983).

United Kingdom Site Surveys 1980-1983

J. Jones reviewed the following U. K. surveys.

Hayes Fracture Zone — Leg 82

R. Searle (Institute of Oceanographic Scinces) was conducting a GLORIA survey at Sites 556-558 aboard M. V. *Farnella* at the time of the Panel meeting (Sites 559-562 were surveyed later in December). Jones presented a provisional GLORIA track chart; a final plot will be available from R. Searle in late January.

Site south of King's Trough (NE Atlantic) — Leg 94

A proposal to shift the Site NA-3 about 100 km to the east (to 42°49.6'N, 23°03.8'W; water depth 3520 m) was strongly supported by the Ocean Paleoenvironment Panel at its meeting on 30 November. R. Kidd (Institute of Oceanographic Sciences) has compiled a large amount of survey data in the region (reflection seismic, magnetics, and gravity data, and core and dredge samples), which Jones briefly reviewed. Gravity cores reveal that the site was situated near the Polar Front during the last two glacial episodes and may meet the OPP requirements for drilling in this part of the Atlantic. The site lies at the intersection of two *Discovery* reflection profiles; further profiling across the site is planned for 1982.

The Institute of Oceanographic Sciences may be able to further contribute to data from around the Leg 94 sites in the NE Atlantic. Jones will investigate this possibility.

Japanese Site Survey, 1980-1983

S. Nagumo presented a report on two areas which have received close attention.

Japan Trench

In the summer of 1981 R. V. *Hakuho-Maru* of the Ocean Research Institute carried out additional multichannel seismic surveys around sites proposed for Leg 87 drilling. Nagumo presented a track chart of the seismic lines, prepared by H. Kagami of the Ocean Research Institute. Several tie-lines were run across earlier E-W tracks.

Nankai Trough

In December 1980, the Japan Petroleum Exploration Company (JAPEX) conducted a multichannel seismic survey for IPOD, and in July 1981 the *Hakuho-Maru* recorded further seismic profiles which crossed the earlier JAPEX tracks. These lines reveal a very complex bathymetric structure at the accretionary toe. The final processing of the JAPEX lines has recently been completed and will be available in published form from the Ocean Research Institute, University of Tokyo (in a series 'Basic Data Sheets of IPOD'). Nagumo presented a migrated depth section along the line of drill sites. Proponents deem four holes as clearly necessary to resolve the history of the accretion process in this region. The first site should be on the accretionary toe, very close to the trench axis where overthrusting is clearly seen on the records. The second hole should be drilled into the trench floor for a reference section. A third hole, upslope from the first site, would reveal the dynamic history of the accretion, and a fourth site, located on the upper part of the landward wall would provide a reference section through the sedimentary prism.

Nagumo also presented several track charts of *Hakurei-Maru*, a vessel operated by the Geological Survey of Japan, which cover three areas: Equatorial Pacific (5°N - 14°N, 176°E - 166°W); the Izu-Bonin Ridge-Trench area (22°N - 33°N, 138°E - 145°E); and the Sea of Japan, with compiled geology.

Post-1981 Surveys

Japanese vessels plan to be in the following areas during 1982 and 1983:

North Phillipine Sea Japan Sea	July 1982
Eastern Pacific, fracture zone study	December 1982
East China Sea	1983

Details about these cruises will be available at the next Panel meeting.

Additional Geophysical Surveys Required for the 1982-83 Program

Gulf of Mexico

All members of the Panel agreed that there is inadequate survey data to meet the requirements of drilling in the Gulf of Mexico on Leg 92. Since HPC work will be of the highest importance, detailed bathymetry should be available for each proposed site (ideally from GLORIA or Seabeam coverage). There should also be a close-gridded (1 km or less line spacing) high-resolution seismic survey to investigate the details of the seismic stratigraphy in the upper 200 - 300 meters of the sedimentary section. L. Garrison reported that M. V. *Farnella*, with a GLORIA system aboard, will be in the Gulf during January and Febuary (1982), to carry out U. S. G. S. contract work. Jones agreed to contact N. Kenyon of the Institute of Oceanographc Sciences, who will be on board, to investigate whether traverses over some sites could be made immediately before or after the U. S. G. S. lines. The panel had no information at the time of the meeting on the proposed sites, but Jones will get additional information from Arnold Bouma as soon as possible. Apart from the possibility of GLORIA traverses, the Panel sees no additional support for site surveying in this area by non-U. S. participants.

New Jersey Transect

Drilling a transect off the New Jersey coast is one alternative for Leg 95. L. Dorman will investigate the present status of site surveys in this region and present a report at the next SSP meeting.

Northeast Atlantic Paleoenvironments

The Ocean Paleoenvironment Panel had originally planned nine sites for the northeast Atlantic leg. To reduce transit times and for other reasons, the OPP deleted Site NA-1 (south of Azores), NA-5 (Labrador Sea) and NA-9 (Norwegian Sea) from the drilling schedule. It also shifted Site NA-3 approximately 100 km to the east. Although each site has some seismic coverage, the data density is variable. Site proponents and Panel members need to make further compilations of available data. Jones will coordinate with W. Ruddiman about the planned drilling. If necessary, Jones will convene a meeting of European members of the Panel to investigate possibilities of conducting further surveys over the OPP sites.

Future (Post-1983) Site Survey Planning

Problems and Possible Solutions

T. Davies (JOI) reviewed events leading up to the collapse of the Ocean Margin Drilling program. He then summarized the main conclusions of the Conference on Scientific Ocean Drilling held at Austin, November 16-18. The unanimous view of the COSOD attendees is that *Explorer* is the preferred vessel for drilling in the mid-late 1980's. How the transition from *Challenger* to *Explorer* drilling would take place is still under consideration, but clearly the Panel must now investigate planning site surveys for a drilling program which will continue for at least five years.

D. Hayes stressed that the Panel must ensure that there is adequate time between the execution of site surveys and the actual drilling, so that the survey data can be properly evaluated and, if necessary, supplemented by further work. The Panel has long recognized that the past and present approach to site survey planning has been inadequate in both scope and concept to ensure that

- optimum sites are selected to help solve the specific geological/geophysical problems posed,
- all appropriate information is provided to the panels reviewing safety and pollution matters — and with an adequate lead time,
- the results of drilling can be extrapolated and interpreted in a regional or global framework.

In the past, workers relied solely upon the existing data base for the problem-definition phase of the scientific program. Sometimes this was adequate; often it was not. Much of the global reconnaissance geophysical data was collected five to fifteen years ago and is no longer suitable in defining many problems currently being addressed. Hence acquiring complementary geophysical work to ensure the effective use of the drillship in solving problems will require **both** regional surveys and site-specific surveys. In many cases, both pre-drilling and post-drilling surveys will be necessary.

Apart from the limited level of support for past site-surveying efforts (these have been restricted almost exclusively to single , pre-drilling site-specific surveys), the lead-times for surveying have been far too short, often pre-empting any opportunity for a second look at the site or even at the data in hand. As a consequence workers have often been faced with the dilemma of either drilling in a surveyed area with undesirable characteristics, drilling in an area with unknown characteristics, or not drilling at all.

Proponents must greatly improve this situation by developing a model for geophysical and other surveys consistent with drilling and downhole experiments and recognize that each of these components is necessary — that they are an integral part of the comprehensive problem-solving process.

The Panel is well aware that much longer lead-times are necessary between surveys and drilling. In view of the long period between application to acquire a ship and the start of sea-going work, funds for site surveys should be committed about three years before drilling begins. Because the drilling program is funded in only 2-year phases, planning well coordinated surveys has been impossible. A commitment to drilling for five years would clearly have a very beneficial effect on site surveying. Hayes argued that even if the proposed locations were not drilled, valuable contributions to oceanographic science would still be made. In fact, surveying in some instances may eliminate the requirement for drilling, thus allowing the drill-ship to be used exclusively for problems that can **only** be solved by sample recovery.

To solve some of the problems outlined above, Jones suggested that serious consideration be given to **the use of an internationally funded vessel which is dedicated to site surveying**. Hayes stressed that the ship should be equipped with state-of-the-art instrumentation and should carry out both regional and site specific surveys. Assuming that 280 days are spent at sea, he estimated that the cost would be about $6-7 million, including the data acquisition and reduction costs. This would only be a modest proportion of the total *Explorer* budget.

Surveys for Active Margin Drilling

D. Hussong discussed future requirements for active margin studies. Extensive geological and geophysical data are vital for effectively selecting sites for drilling in active margin regions. Because of their geological complexity, large and variable water depths and safety problems (hydrocarbon potential, gas hydrates) surveys of the active margins are particularly critical. Recent drilling has demonstrated that the level of success realized in active margin drilling is clearly a function of the amount and quality of geophysical data available for site selection. Conventional surveying and sampling techniques have, of course, been useful but, in addition, several special exploration techniques are needed for future work. These include

- high-resolution multichannel seismic work to resolve structures beneath the inner trench wall; a considerable amount of processing is needed, including deconvolution and migration.
- ocean-bottom-seismic or near-bottom experiments to resolve the velocity structure of the arc and fore-arc areas.
- multibeam high-resolution bathymetry (Seabeam, or Seamarc) to examine the general morphology of the trench, arc and back-arc region. Lateral variations in fore-arc structure have been shown to be extensive and have often been observed on detailed bathymetric maps. In the back-arc

basins the geometry of rifting and sea-floor spreading can often be observed on high-resolution bathymetry.

Site Surveys and Drilling Safety

L. Garrison reviewed some of the important points which the Site Survey Panel must take into consideration when planning future work. He emphasized that drilling safety — the avoidance of encountering hydrocarbon accumulations and overpressured zones — must be an overriding concern. This is especially true in *Challenger* drilling which lacks a well-control capability. Safety planning for each leg should be included at every preparatory stage, the most important of which is perhaps during development of the site-survey plans. Site surveys over continental margins should be planned to demonstrate clearly the structure of key horizons with a view to showing migration paths out of the area of the site and an absence of closure. To provide this information, seismic grids of greater density than are usually necessary for general scientific purposes may be required. **In many intances site proponents should consult the JOIDES Safety Panel before survey specifications are finalized to ensure that all safety problems will receive attention.**

Unique safety problems have been encountered in drilling areas of suspected gas hydrates and unique site-survey planning may be required to solve these problems. For example, if near-bottom high-resolution velocity structure could be determined within a known hydrate zone, this knowledge might be applicable to future survey plans for drilling suspected gas hydrates. The Site Survey Panel should consider such an experiment as a means of providing new survey information.

Finally, in the interest of preventing accidental encounters with shallow, high-pressure pockets in areas of rapidly deposited sediments, some proponents should give thought to new and more sophisticated means of high-resolution seismic surveying.

The IPOD Data Bank

C. Brenner reported on the activities of the Data Bank. The Central Atlantic site-survey volume is with the DSDP publications group, but has received low production priority because of budget cuts and emphasis on Initial Report production. The Panel is eager to see that the volume is published without delay. Members suggested that JOI allocate funds to ensure that the volume appears as early as possible in 1982. T. Davies agreed to investigate the level of funding required and will then make recommendations on the timing of publication.

D. Hayes noted that some groups carrying out site surveys believed that once data are deposited in the IPOD Data Bank, they have fulfilled their obligation to archive their surveys in a national data center. This is not the case. The IPOS Data Bank at Lamont-Doherty Geological Observatory has no responsibiliiy to ensure that its holdings are passed to the National Geophysical and Solar-Terrestrial Data Center in Boulder, Colorado.

POLLUTION PREVENTION AND SAFETY PANEL

Louis E. Garrison, Chairman

The Pollution Prevention and Safety Panel last met 11 March 1982 at Scripps Institution of Oceanography to review Leg 86, 87, and 88 sites, and to review Leg 84 results.

Leg 84 Results

The Safety Panel heard a report by R. von Huene and K. Kvenvolden on the results of Leg 84. The Panel was particularly interested in the gas hydrates encountered during that leg, and the shipboard party's success in logging the holes in which they occurred. The Panel has no doubt that the Leg 84 experience will move all those involved closer to a safe approach to drilling in hydrates, and thanks R. von Huene and K. Kvenvolden for their report.

Leg 86 (Northwest Pacific)

The Safety Panel reviewed the initial group of eight Leg 86 sites by mail during February 1982 and relayed approval of Sites NW-5B, NW-6, NW-7A, NW-8B and NW-9 to DSDP and R. Heath and Lloyd Burckle (Leg 86 co-chief scientists).

At its present meeting the Panel reviewed two additional sites, NW-3A and NW-3B, but did not approve either one because data were insufficient to demonstrate that the sites were at safe locations.

Generally, the Panel requires that at least two lines intersect at the proposed location for continental margin sites. In this case, however, because sites are in a gas-producing province, considerably more information is necessary. Some of the additional data needed include

- structure maps on several key horizons showing faults and fault offsets,
- extended seismic profiles (rather than the clips found in review packages, which make it difficult to gain a proper perspective),
- a regional map summarizing hydrocarbon occurrences,
- velocity data and depth sections where available.

The Safety Panel agreed to re-examine the sites if additional data were made available.[1]

Leg 87 (Japan Trench)

NK-1C: Approved as proposed.

NK-2C: The Panel recommends that the site first be tested by penetrating the fault plane at shot point (SP) 1795 on Line 55-3-1 where the fault is within 300 meters of the surface. If no hydrocarbons above background levels are detected, then the original location at SP 1790 can be drilled as proposed.

NK-2D: Approved as proposed. This site can be located anywhere between SP 1815 and SP 1940 on Line 55-3-1 at the discretion of the shipboard party.

NK-4A: Approved to a depth no greater than 100 meters above the bottom-simulating reflector (BSR).

NK-4C(1): Approved to a depth no greater than 100 meters above the BSR.

NK-4C(2): Approved to a depth no greater than 100 meters above the BSR. The Panel noted that the calculated depth to the BSR at NK-4C(1) and -4C(2), based on an estimated velocity of 1.8 km/sec, is only about 550 meters instead of the 650-700 meters indicated on the safety check sheet. **The shipboard party is urged to use the most conservative estimates in calculating BSR depths in all cases (including NK-4A), and to exercise the utmost caution in approaching a total depth on the basis of these estimates.**

JT-13A: Approved with reservation. The Safety Panel strongly recommends that intersecting seismic lines be made with *Challenger* before drilling in order to define shallow structure and avoid cutting a fault.

Two Panel members voiced disapproval of this site on the basis of its location in the southern part of a Neogene basin trend. To the north, on Hokkaido, the basin produces gas from sources believed to have been Cretaceous and early Tertiary. The remainder of the Panel believed that the region south of Hokkaido has a different geologic history and that the proposed sites were in a fore-arc environment during the early Tertiary with temperatures too low for hydrocarbon maturation. Those arguing for disapproval of the site point to the occurrence of dacite rubble in DSDP Hole 439 as evidence of high temperatures. Magnetic evidence, however, suggests that these rocks came from volcanic centers located far landward of Site JT-13A, and that these volcanics could not have caused maturation.

Because of these conflicting views, **the Safety Panel urges extreme caution in penetrating the lower Tertiary beds, and early abandonment if hydrocarbon amounts rise above background levels.**

JT-13B: Approved as proposed. The Panel recommends that at least one seismic line be made with *Challenger* across the site in a north-south direction.

JT-16B: Approved as proposed.

Leg 88 (DARPA)

The Safety Panel reviewed the proposed DARPA Site at its last meeting in November 1981 and saw no safety problems. At the present meeting, seven alternative locations for a combined NW-6/DARPA site were proposed. In view of the oceanic setting and thin sediment cover, the Panel approved drilling anywhere within the area bounded by:

Lat. 44°00′N, Long. 148°00′E
Lat. 41°30′N, Long. 161°00′E

All seven alternative sites are within this area.

[1]Following the PPSP meeting, the Panel reviewed alternative Leg 86 sites, NW-3A and NW-3D, by mail and approved the sites to HPC refusal depth.

DIRECTORY OF JOIDES COMMITTEES, PANELS, AND WORKING GROUPS

Executive Committee (EXCOM)

Dr. William A. Nierenberg, Chairman
Scripps Institution of Oceanography, A-010
University of California, San Diego
La Jolla, CA 92093
Tel: (714) 452-2826

Dr. D. James Baker, Jr.
(Alternate: Dr. Joe S. Creager)
Department of Oceanography, WB-10
University of Washington
Seattle, WA 98195
Tel: (206) 543-7160, (543-9944)

Prof. Dr. Friedrich Bender
(Alternate: Prof. Dr. Hans-Joachim Durbaum)
Bundesanstalt für Geowissenschaften
und Rohstoffe
3 Hannover 51, Postfach 510153
Federal Republic of Germany
Tel: 0511-64681

Dr. Jacques Debyser
Centre National pour L'exploitation
des Océans
B.P. 107, Paris 16, France
Tel: 723 5528, Ext. 420

Dr. G. Ross Heath
(Alternate: Dr. George Keller)
Oregon State University
School of Oceanography
Corvallis, OR 97331
Tel: (503) 754-4763, (754-3504)

Dr. Charles E. Helsley
(Alternate: Dr. Ralph Moberly)
Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, HI 96822
Tel: (808) 948-8760, (948-8765)

~~Sir Peter Kent, F. R. S.~~ Dr. John Bowman
(Alternate: Dr. Anthony S. Laughton, F. R. S.)
Natural Environment Research Council
Polaris House, North Star Avenue
Wilts SN2 1EU, Swindon, England
Tel: (0793) 40101, Ext. 371
(Institute of Oceanographic Sciences
Brook road
Wormley, Godalming
Surrey GU8 5UB, England)
Tel: 042879-4141

Dr. John A. Knauss
(Alternate: Dr. Jean-Guy Schilling)
University of Rhode Island
Kingston, RI 02881
Tel: (401) 792-6222, (792-6102)

Dr. Noriyuki Nasu
(Alternate: Dr. Kazuo Kobayashi)
Ocean Research Institute
University of Tokyo
Nakano, Tokyo 164, Japan
Tel: (03) 376-1251

Dr. Barry Raleigh
(Alternate: Dr. Dennis E. Hayes)
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900, Ext. 345 (Ext. 470)

Dr. Robert D. Reid
(Alternates: Dr. William J. Merrell,
Dr. T. K. Treadwell, Jr.)
Department of Oceanography
Texas A & M University
College Station, TX 77843
Tel: (713) 845-7211

Dr. Alexander V. Sidorenko
(Alternates: Dr. Nikita A. Bogdanov,
Dr. Peter P. Timofeev)
22, Staromonetny Pereylok
Institute of the Lithosphere
U. S. S. R. Academy of Sciences
Moscow, 109180 U. S. S. R.
Tel: 234-29-68, (238-85-88)

Dr. John Steele
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext. 2500

Dr. Warren Wisby
(Alternate: Dr. Christopher G. A. Harrison)
Rosenstiel School of Marine and
Atmospheric Science
4600 Rickenbacker Causeway
Miami, Florida 33149
Tel: (305) 350-7519, (350-7400)

Dr. Melvin N. A. Peterson (Non-voting member)
(Alternate: Dr. Yves Lancelot)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3500, (452-3521)

• • •

Dr. Edward L. Winterer (PCOM liaison)
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-2360

Address and/or phone number in parentheses is that of the alternate.

Planning Committee (PCOM)

Dr. Edward L. Winterer, Chairman
(Alternate: Dr. William R. Riedel)
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-2360, (452-4386)

Dr. Jean Aubouin
Laboratoire de Géologie Structurale
Department de Géotectonique
Université Pierre et Marie Curie
4 Place Jussieu
75230 Paris Cedex 05, France
Tel: 336-25-25, Ext. 5247

Dr. Helmut Beiersdorf
(Alternate: Dr. Ulrich von Rad)
Bundesanstalt für Geowissenschaften
und Rohstoffe
3 Hannover 51, Postfach 510153
Federal Republic of Germany
Tel: 0-511-6468-789 (0-511-6468-788)

Dr. William R. Bryant
Department of Oceanography
Texas A & M University
College Station, TX 77843
Tel: (713) 845-2153, 845-2154

Dr. Joe R. Cann
Department of Geology
The University
Newcastle-Upon-Tyne
NE1 7RU, England
Tel: 0632-328511, Ext. 3090

Dr. Joe S. Creager
(Alternate: Dr. Brian T. R. Lewis)
Department of Oceanography, WB-10
University of Washington
Seattle, WA 98195
Tel: (206) 543-9944, (543-6043)

~~Mr. John I. Ewing~~ Dick Von Herzen
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext. 265

Dr. Dennis E. Hayes
(Alternate: Dr. Marcus Langseth)
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900, Ext. 470, 471 (Ext. 332)

Dr. Jose Honnorez (Chairman designate)
(Alternate: Dr. Wolfgang Schlager)
Rosenstiel School of Marine
and Atmospheric Science
University of Miami
4600 Rickenbacker Causeway
Miami, FL 33149
Tel: (305) 350-7443
(Fisher Island Station
Miami Beach, FL 33139
Tel: (305) 672-1840)

Dr. James P. Kennett
Graduate School of Oceanography
University of Rhode Island
Kingston, RI 02881
Tel: (401) 792-6216

Dr. Kazuo Kobayashi
Ocean Research Institute
University of Tokyo
1-15-1 Minamidai
Nakano, Tokyo 164, Japan
Tel: (03) 376-1251

Dr. Ralph Moberly
(Alternate: Dr. Charles E. Helsley)
Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, HI 96822
Tel: (808) 948-8765, (948-8760)

Dr. Lev Nikitin
Institute of Earth's Physics
of U. S. S. R. Academy of Sciences
10 B. Gruzinskaya Moscow, U. S. S. R.

Dr. Hans Schrader
School of Oceanography
Oregon State University
Corvallis, OR 97331
Tel: (503) 754-2296

Dr. Yves Lancelot (Non-voting member)
(Alternate: Dr. Matthew Salisbury)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3521, (452-3503)

JOIDES ADVISORY PANELS

Ocean Crust Panel (OCP)

Dr. Paul Robinson (Chairman designate)
Department of Geology
Dalhousie University
Halifax, Nova Scotia
B3H 3J5 Canada
Tel: (902) 424-2358

Dr. Roger N. Anderson
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900

Dr. Henri Bougault
Centre Océanologique de Bretagne
B.P. 337
29273 Brest Cedex, France

Dr. John R. Delaney
Department of Oceanography, WB-10
University of Washington
Seattle, WA 98195
Tel: (206) 543-4830

Dr. Donald Elthon
Department of Geology
University of Houston
Houston, TX 77004
(713) 749-4414

Prof. Dr. Rolf Emmermann
University of Giessen
Senckenberg St. 3
63 Giessen
Federal Republic of Germany
Tel: 49-641-708-8370

Dr. Kenneth C. MacDonald
University of California
Santa Barbara, CA 93106
Tel: (805) 961-4005

Dr. Minoru Ozima
(Alternate: Dr. Ikuo Kushiro)
Geophysical Institute
Faculty of Science
University of Tokyo
Bunkyo-ku, Tokyo 113, Japan

Dr. Hans Schouten
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext. 2574

Dr. Ralph Stephen
Department of Geology and Geophysics
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext. 2583

Dr. John Tarney
Department of Geology
The University
Leicester LE1 7RH, England
Tel: 0533-554455

Dr. Andrei A. Tsvetkov
Institute of Geology of Ore Deposits,
Petrology, Mineralogy & Geochemistry
of the U. S. S. R. Academy of Sciences
35 Staromonetny
Moscow, 109017, U. S. S. R.

• • •

Dr. Ralph Moberly (PCOM liaison)
Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, HI 96822
Tel: (808) 948-8765

Dr. James Natland (DSDP liaison)
(Alternate: Dr. Keir Becker)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3538, (452-3508)

Ocean Margin (Active) Panel (AMP)

Dr. Donald M. Hussong, Chairman
Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, HI 96822
Tel: (808) 948-8711

Dr. Peter F. Barker
Department of Geological Sciences
The University
P.O. Box 363
Birmingham B15 2TS, England
Tel: 021-472-1301, Ext. 2081

Dr. Jean-Paul Cadet
Laboratoire de Geologie
Université d'Orleans
Domaine Universitaire de la Source
45045 Orleans Cedex, France
Tel: (38) 66-07-25

Dr. Darrel Cowan
Department of Geological Sciences, AJ-20
University of Washington
Seattle, WA 98195
Tel: (206) 543-4033

Dr. Yury I. Dmitriev
Institute of Geology of Ore Deposits
Petrology, Mineralogy, & Geochemistry
of the U. S. S. R. Academy of Sciences
35 Staromonetny
Moscow, 109017, U. S. S. R.

Dr. Daniel Karig
Department of Geological Sciences
Cornell University
Ithaca, NY 14853
Tel: (607) 256-3679

Dr. John W. Ladd
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900

Dr. Kazuaki Nakamura
Earthquake Research Institute
University of Tokyo
Bunkyo-ku, Tokyo 113, Japan

Dr. Roland von Huene
U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
Tel: (415) 856-7105

Dr. Hansjust Walter
Bundesanstalt für Geowissenschaften
und Rohstoffe
Stilleweg 2, D-3000 Hannover
Federal Republic of Germany
Tel: 0511-64681

* * *

Dr. Joe S. Creager (PCOM liaison)
Department of Oceanography, WB-10
University of Washington
Seattle, WA 98195
Tel: (206) 543-5099 (A. M.)
(206) 543-9944 (P. M.)

Dr. Dennis E. Hayes (PCOM liaison)
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900, Ext. 470, 471

Dr. William Coulbourn (DSDP liaison)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3388

Ocean Margin (Passive) Panel (PMP)

Dr. David G. Roberts, Chairman
British Petroleum Co., Ltd.
Britannic House
Moore Lane, London
EC2 9BU, England
Tel: 01-920-8474

Dr. Mikhail E. Artemiev
Institute of Earth's Physics
U. S. S. R. Academy of Sciences
10 B., Gruzinskaya
Moscow, U. S. S. R.

Dr. Arnold H. Bouma
Exploration and Production Division
Gulf Science and Technology Company
P. O. Drawer 2038
Pittsburgh, PA 15230
Tel: (412) 665-6507

Dr. Karl Hinz
Bundesanstalt für Geowissenschaften
und Rohstoffe, Abt. Geophysik
3 Hannover 51, Postfach 510153
Federal Republic of Germany
Tel: 0511-6468-330

Dr. Hideo Kagami
Ocean Research Institute
University of Tokyo
Nakano, Tokyo 164, Japan
Tel: 03-376-1251

Dr. Charlotte Keene
Geological Survey of Canada
Bedford Institution of Oceanography
Box 1006
Dartmouth, Nova Scotia
B2Y 4A2 Canada
Tel: (902) 426-3413

Dr. Lucien Montadert
(Alternate: Dr. Bernard Biju-Duval)
Division Géologie
Institut Français du Petrole
1 et 4, Avenue de Bois-Preau
B. P. 18, 92 Rueil-Malmaison, France
Tel: 749-02-14

Dr. William B. F. Ryan
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900

Dr. Sigmund Snelson
Shell Oil Company
P.O. Box 481
Houston, TX 77001
Tel: (713) 663-2601

Dr. Jörn Thiede
Institute for Geologi
Universitetet I Oslo
Postboks 1047
Blindern, Oslo 3, Norway
Tel: 46-6800, Ext. 9692

Dr. Brian E. Tucholke
Department of Geology and Geophysics
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext. 2494

Dr. Peter R. Vail
EXXON Production Company
P.O. Box 2189
Houston, TX 77001
Tel: (713) 965-4796

Dr. Jan E. van Hinte
Vrije Universiteit
Aardwetenschappen
P.O. Box 7161
Amsterdam 1007 MC, The Netherlands
Tel: (20) 548-3511

* * *

Dr. William R. Bryant (PCOM liaison)
Department of Oceanography
Texas A & M University
College Station, TX 77843
Tel: (713) 845-2153

Dr. Edward L. Winterer (PCOM liaison)
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-2360

Dr. Yves Lancelot (DSDP liaison)
Deep Sea Drilling Project
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3521

Ocean Paleoenvironment Panel (OPP)

Dr. Robert G. Douglas, Chairman
Dept. of Geological Sciences
University of Southern California
University Park
Los Angeles, CA 90007
Tel: (213) 743-7676

Dr. Michael Arthur (Chairman designate)
Department of Geology
Iniversity of South Carolina
olumbia, SC 29208
l: (803) 777-2410

Dr. Hervé Chamley
Sédimentologie et Géochimie
Université des Sciences et
Techniques de Lille
U. E. R. des Sciences de la Terre
B. P. 36
59650 Villeneuve D'Ascq, France
Tel: (20) 91-92-22 (Ext. 2130)

Dr. Dieter Futterer
Geol.-Paleontol.Inst.der Univ.Kiel
23 Kiel,Olshausenstrasse 40/60
Federal Republic of Germany

Dr. Robert E. Garrison
Department of Earth Sciences
University of California, Santa Cruz
Santa Cruz, CA 95064
Tel: (408) 429-2114

Dr. James D. Hays
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900, Ext. 403, 404

Dr. Robert B. Kidd
Institute of Oceanographic Sciences
Brook Road
Wormley, Godalming
GU8 5UB, England
Tel: 04-2879-4141

Dr. Theodore C. Moore, Jr.
Exxon Production Research Company
P. O. Box 2189
Houston, TX 77001
Tel: (713) 940-4946

Dr. Seymour O. Schlanger
Department of Geological Sciences
Locy Hall
Northwestern University
Evanston, IL 60201
Tel: (312) 492-5097

Dr. Yokichi Takayanagi
(Alternate: Dr. Hakuyu Okada)
Geology and Paleontology Institute
Tohoku University
Sendai, Japan
Tel: 0542-37-1111
(Geoscience Institute
Shizuoka University
Shizuoka 422, Japan)

Dr. Fritz Theyer
Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, HI 96822
Tel: (808) 948-7006 (office)

Dr. Peter P. Timofeev
(Alternate: Dr. Ivar Murdmaa)
Institute of Geology
U. S. S. R. Academy of Sciences
7 Pyzhevsky per
Moscow ZH-17, U. S. S. R.
(Institute of Oceanology
U. S. S. R. Academy of Sciences
22 Krasikoua Street
Moscow, 109387, U. S. S. R.)

• • •

Dr. Helmut Beiersdorf (PCOM liaison)
Bundesanstalt für Geowissenschaften
und Rohstoffe
3 Hannover 51, Postfach 510153
Federal Republic of Germany
Tel: 0511-6468-789

Dr. James P. Kennett (PCOM liaison)
Graduate School of Oceanorаphy
University of Rhode Island
Kingston, RI 02881
Tel: (401) 792-6216

Dr. Ellen Thomas (DSDP liaison)
(Alternate: Dr. Miriam Baltuck)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-4193, (452-4172)

Inorganic Geochemistry Panel (IGP)

Dr. Miriam Kastner, Chairman
Scripps Institution of Oceanography, A-012
La Jolla, California 92093
Tel: (714) 452-2065

Dr. Stephen E. Calvert
Department of Oceanography
University of British Columbia
Vancouver, BC
Canada V6T 1W5
Tel:

Dr. Henry Elderfield
Dept. of Earth Sciences
The University
Leeds LS2 9JT, England

Dr. Michel Hoffert
Université de Bretagne Occidentale
GIS Océanologie et Géodynamique
6, Avenue Le Gorgeu
29283 Brest Cedex, France

Dr. Margaret Leinen
University of Rhode Island
Graduate School of Oceanography
Kingston, RI 02881
Tel: (401) 792-6268

Dr. Igor D. Ryabchikou
(Alternate: Dr. Anatoly Sharaskin)
Institute of Geology of Ore
Deposits, Petrology, Mineralogy,
& Geochemitry of the U. S. S. R.
Academy of Sciences
35 Staromenetny
Moscow, 109017, U. S..S. R.
(Institute of Geochemistry
U. S. S. R. Academy of Sciences
47, a, Vorobiovskoe Shosse
Moscow, U. S. S. R.)

Dr. Sam Savin
Case Western Reserve University
Cleveland, OH 44106
Tel: (216) 368-3690

Dr. Fred L. Sayles
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ex. 2561

Dr. Hubert Staudigal
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900

Dr. Karl-Heinz Wedepohl
34 Gottingen
Geochemisches Institut der Universitat
Goldschmidstrasse 1
Federal Republic of Germany

• • •

Dr. Joe R. Cann (PCOM liaison)
Department of Geology
The University
Newcastle-Upon-Tyne
NE1 7RU, England
Tel: 0632-28511, Ext. 3090/3098

Dr. Miriam Baltuck (DSDP liaison)
(Alternate: Dr. James Natland)
Deep Sea Drilling Project
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-4172, (452-3538)

Organic Geochemistry Panel (OGP)

Dr. Bernd R. Simoneit, Chairman
School of Oceanography
Oregon State University
Corvallis, OR 97331
Tel: (503) 754-2895

Dr. Simon C. Brassell
School of Chemistry
The University
Bristol
BS8 1TH, England
Tel: 02 72-24161

Dr. Egon Degens
(Alternate: Jürgen Rullkötter)
Department of Geology
University of Hamburg
Hamburg, Germany
(Kernforschungsanlage Jülich
ICH-5, P. O. Box 1913
D-5170 Jülich 1
Federal Republic of Germany
Tel: 02461 614336)

Dr. Eric Galimov
(Alternate: Dr. Eugeny Romankevich)
Institute of Geochemistry
U. S. S. R. Academy of Sciences
47 a, Vorobiovskoe Shosse
Moscow, U. S. S. R.
(U. S. S. R. Academy of Sciences
Inst. of Oceanology
23 Krasikoua Street
Moscow, 109387, U. S. S. R.)

Dr. John M. Hunt
Woods Hole Oceanographic Institution
Department of Chemistry
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext.2562

Dr. Keith Kvenvolden
U. S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
Tel: (415) 856-7150

Dr. Philip A. Meyers
Department of Atmospheric & Oceanic Science
University of Michigan
Ann Arbor, MI 48109
Tel: (313) 764-0597

Dr. Colin P. Summerhayes
Exxon Production Research Company
P. O. Box 2189
Houston, TX 77001
Tel: (713) 965-4337

French representative
to be named.

• • •

PCOM liaison to be
determined.

Dr. Miriam Baltuck (DSDP liaison)
(Alternate: Dr. Audrey Wright)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-4172, (452-3508)

Sedimentary Petrology and Physical Properties Panel (SP4)

Dr. George deVries Klein, Chairman
245 Natural History Building
1301 W. Green Street
Urbana, IL 61801
Tel: (217) 333-2076 (office)
333-3541 (message)

Dr. Richard Bennett
Naval Ocean Research and Development Activity
Sea Floor Division, Code 360
NSTL Station, MS 39529
Tel: (601) 688-4657
FTS: 494-4657

Dr. Richard Carlson
Department of Oceanography
Texas A & M University
College Station, TX 77843
Tel: (713) 845-1371

Dr. Walter E. Dean, Jr.
U.S. Geological Survey
Box 25046, DFC, MS 925
Lakewood, CO 80225
Tel: (303) 234-2310

Dr. Leland Kraft
McClelland Engineers, Inc.
6100 Hillcroft
Houston, TX 77081
Tel: (713) 772-3701

Dr. Michael T. Ledbetter
Department of Geology
University of Georgia
Athens, Georgia 30602
Tel: (404) 542-7756

~~Dr. I. Nick McCave~~ Dr. Dorrik A.V. Stow
~~School of Environmental Sciences~~ Grant Institute of Geology
~~University of East Anglia~~ The University Edinburgh EH9 3
Norwich NR4 7TJ, England
Tel: ~~(0603) 56161~~ (0)31-667-1081

Dr. Frédéric Mélieres
Laboratoire de Géologie Dynamique
Université Pierre et Marie Curie
75230 Paris Cedex 05, France
Tel: 336-2525, Ext. 5157

Dr. Gregory Mountain
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900

Dr. Peter Rothe
Geographisches Institut der
Universitat Mannheim
Abteilung für Geologie
6800 Mannheim 1
Schloss, Postfach 2428
Federal Republic of Germany

Dr. Peter P. Timofeev
Geological Institute
U. S. S. R. Academy of Sciences
7, Pyshevsky per,
Moscow 109017, U. S. S. R.
Tel: 231-9418

• • •

Dr. Ralph Moberly (PCOM liaison)
Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, HI 96822
Tel: (808) 948-8765

Mr. Robert E. Boyce (DSDP liaison)
(Alternate: Dr. Matthew Salisbury)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-2778, (452-3503)

Stratigraphic Correlations Panel (SCP)

Dr. Richard Z. Poore, Chairman
National Center
Mail Stop 970
12201 Sunrise Valley
Reston, VA 22092
Tel: (703) 860-7403

Dr. Ivan Basov
22, Staromonetnÿ Pereylok
Institute of the Lithosphere
U. S. S. R. Academy of Sciences
Moscow 109180, U. S. S. R.
Tel: 231-48-36

Dr. Lloyd H. Burckle
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900, Ext. 406.

Dr. D. Graham Jenkins
Department of Earth Science
The Open University
Milton Keynes, MK7 6AA
England
Tel: (0908) 63116

Prof. Dr. Erlend Martini
Geologisch-Paläontologisches Institut
der Universitt
Senckenberganlarge 32-34
D-6000
Frankfurt/Main
Federal Republic of Germany
Tel: (0611) 7982106/07

Dr. Catherine Nigrini
510 Papyrus Drive
La Habra Heights, CA 90631
Tel: (213) 697-8842

• • •

Dr. James P. Kennett
Graduate School of Oceanography
University of Rhode Island
Kingston, RI 02881
Tel: (401) 792-6216

Dr. Ellen Thomas (DSDP liaison)
(Alternate: Dr. William Coulbourn)
Deep Sea Drilling Project, A-031
Scripps Institution of Ocenography
La Jolla, CA 92093
Tel: (714) 452-4193, (452-3388)

Downhole Measurements Panel (DMP)

Dr. Richard P. von Herzen, Chairman
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext. 2577

Dr. Nikolas I. Christensen
Department of Geological Sciences, AK-20
University of Washington
Seattle, WA 98195
Tel: (206) 543-7143

Dr. Timothy J. G. Francis
Inst. of Oceanographic Sciences
Brook Road, Wormley
Godalming, Surrey GU8 5UB, England
Tel: 042879-4141

Dr. Roy Hyndman
Pacific Geoscience Centre
Department of Energy, Mines and Resources
9860 West Saanich Road
P. O. Box 6000
Sidney, B.C. V8L 4B2 Canada
Tel: (604) 656-8269

Mr. Alfred H. Jageler
Amoco Production Research Company
P. O. Box 591
Tulsa, OK 74102

Dr. Reinhard Jung
Bundesanstalt für Geowissenschaften
und Rohstoffe
3 Hannover 51, Postfach 510153
Federal Republic of Germany

Dr. Hajimu Kinoshita
Department of Earth Science
Chiba University
Yayoi-cho, Chiba, 280 Japan

Dr. Mark Mathews
Los Alamos National Laboratory
P. O. Box 1663, Mail Stop 977
Los Alamos, NM 87544
Tel: (505) 667-2884

Dr. Yury Neprochnov
(Alternate: Dr. Alexander Pokryshkin)
P. P. Shirshov Institute of Oceanology
U. S. S. R. Academy of Sciences
23 Krasikova Street
Moscow, 109387, U. S. S. R.

Dr. Vincent Renard
Centre Oceanologique de Bretagne
B. P. 337
29273 Brest Cedex, France
Tel: (98) 45-80-55

• • •

Dr. William Bryant (PCOM liaison)
Department of Oceanography
Texas A & M University
College Station, TX 77843
Tel: (713) 845-2153

Dr. Lev Nikitin (Alternate PCOM liaison)
Institute of Earth's Physics
of U. S. S. R. Academy of Sciences
10 B. Gruzinskaya
Moscow, U. S. S. R.

Dr. Keir Becker (DSDP liaison)
(Alternate: Mr. Robert E. Boyce)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3508, (452-2778)

Industrial Liaison Panel (ILP)

Mr. W. A. Roberts, Chairman
Energy Concepts, Inc.
P. O. Box 3675
Bartlesville, OK 74003
Tel: (918) 333-8833

Mr. R. L. Adams
Executive Vice President, Conoco Inc.
P. O. Box 2197
Houston, TX 77001
Tel: (203) 359-3500

Prof. Nikolai P. Budnikov
Ministry of Geology of U. S. S. R.
4/6 Bolshaya, Gruzinskaya
Moscow 123812, U. S. S. R.

Mr. Melvin J. Hill, President
Gulf Oil Exploration and
Production Company
P. O. Box 2100
Houston, TX 77001

Director Dr. Ing. Guenter Peterson
Gewerkschaft Walter
Postfach 101310
D-4300
Essen 1
Federal Republic of Germany

Dr. Gilbert Rutman
Société Nationale des Pétroles
D'Aquitaine
Tour D'Aquitaine—Cedex No. 4
92080 Paris La Defense, France

Mr. G. Williams
UK Offshore Operators Association, Ltd.
192 Sloane Street
London SW1 9OX, England
Tel: 01-235-0762

Information Handling Panel (IHP)

Dr. Daniel E. Appleman, Chairman
Department of Mineral Sciences
Natural History Building
Smithsonian Institution
Washington, DC 20560
Tel: (202) 357-2632

Dr. John C. Hathaway
U. S. Geological Survey
Bldg. B. Quissett Campus
Woods Hole, MA 02543
Tel: (617) 548-8700
FTS: 837-4155 or 4134

Dr. Alfred Loeblich, Jr.
Department of Geology
University of California
Los Angeles, CA 90024
Tel: (213) 825-1475

Dr. Michael S. Loughridge
Marine Geology and Geophysics Branch
National Geophysical and Solar
Terrestrial Data Center
Code D621, NOAA
Environmental Data Center
Boulder, CO 80302
Tel: (303) 499-1000, Ext. 6487

Dr. Marthe Melguen
Bureau National des Données Océaniques
Centre Oceanologique de Bretagne
B. P. 337 29273 Brest, France
Tel: (98) 45-80-55

Mrs. Judit Nowak
Documentation Service
Bundesanstalt für Geowissenschaften
und Rohstoffe
3 Hannover 51, Postfach 51053
Federal Republic of Germany
Tel: 0511-6468-655

Dr. John B. Saunders
Naturhistorisches Museum Basel
CH-4051, Basel, Augustinergasse 2
Switzerland
Tel: 061-258282

Dr. Valery V. Zdorovenin
(Alternate: Dr. Yury. S. Scherbakov)
Institute of Physics of the Earth
U. S. S. R. Academy of Sciences
10, B. Gruzinskaya
Moscow, 123810, U. S. S. R.
(Ministry of Geology of U. S. S. R.
4/6 B. Gruzinskaya
Moscow, U. S. S. R.)

• • •

Dr. Joe S. Creager (PCOM liaison)
Department of Oceanography, WB-10
University of Washington
Seattle, WA 98195
Tel: (206) 543-9944

Dr. Russell Merrill (DSDP liaison)
(Alternate: Mr. Peter Woodbury)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3529, (452-3526)

Pollution Prevention and Safety Panel (PPSP)

Dr. Louis E. Garrison, Chairman
U. S. Geological Survey
P. O. Box 6732
Corpus Christi, TX 78411
Tel: (512) 888-3294

Dr. Nikolai J. Beliy
(Alternate: Dr. O. O. Scheremet)
Ministry of Gas Industry
8UL Strolitelei
117939 Moscow, U. S. S. R.
Tel: 133 0130

Dr. Rustum Jean Byramjee
Compagnie Français des Pétroles
Tour Mirabeau
39-43, Quai André Citroën
75739 Paris Cedex 15, France
Tel: (01) 578 31 21

Dr. George Claypool
(Alternate: Dr. Keith Kvenvolden)
Branch of Oil and Gas Resources
U. S. Geological Survey
Denver Federal Center
Denver, CO 80225
Tel: (303) 234-3561
(U. S. Geological Survey
Menlo Park, CA 94025
Tel: (415) 856-7150)

Dr. Arthur E. Green
EXXON Production Research Laboratory
P. O. Box 2189
Houston, TX 77001
Tel: (713) 965-4172

Prof. A. J. Horn
34 Lloyden Drive
Atherton, CA 94025
Tel: (415) 323-7126

Dr. Ernst Hotz
c/o Deminex
Dorotheenstrasse 1
4300 Essen
Federal Republic of Germany
Tel: 0201-726350

Dr. David B. MacKenzie
(Alternate: Dr. John Harms)
Marathon Oil Company
One Park Central
1515 Arapahoe Street, Suite 1300
Denver, CO 80202
(P. O. Box 269
Littleton, CO 80160)
Tel: (303) 794-2601

Mr. Geoffrey D. Taylor
British Petroleum Company Ltd.
Britannic House/Moore Lane
London, EC2Y 9BU, England

• • •

Dr. Jose Honnorez (PCOM liaison designate)
Rosenstiel School of Marine
and Atmospheric Science
University of Miami
4600 Rickenbacker Causeway
Miami, FL 33149
Tel: (305) 350-7443

Dr. Edward L. Winterer (PCOM liaison)
Scripps Institution of Oceanography, A-012
La Jolla, CA 92093
Tel: (714) 452-2360

Dr. Yves Lancelot (DSDP liaison)
(Alternate: Dr. Matthew Salisbury)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3521, (452-3503)

Site Survey Panel (SSP)

Dr. E. John W. Jones, Chairman
Department of Geology
University College London
Gower Street
London WC1E 6BT, England
Tel: 01-387-7050

D. Dunnebier
Dr. ~~LeRoy M. Dorman~~
Scripps Institution of Oceanography, A-015
La Jolla, CA 92093
Tel: (714) 452-2406

Dr. Shozaburo Nagumo
(Alternate: Dr. Nadamori Murauchi)
Earthquake Research Institute
University of Tokyo
Bunkyo-ku, Tokyo 113, Japan
(Department of Earth Sciences
Chiba University
Yayoi-cho, Chiba, Japan 280)

Dr. Vincent Renard
Centre Oceanologique de Bretagne
B. P. 337
29273 Brest Cedex, France
Tel: (98) 45-80-55

Dr. Alexander A. Schreider
(Alternate: Dr. Irina P. Kosminskaya)
Shirshov Institute of Oceanology
23, Krasikova Street
Moscow, 109387, U. S. S. R.
(Institute of Earth's Physics
U. S. S. R. Academy of Sciences
10, B. Gruzinskaya
Moscow, U. S. S. R.)

Dr. Wilfried Weigel
Institute für Geophysik der Universitat Hamburg
Bundeskasse 55
D-2000 Hamburg 13
Federal Republic of Germany

• • •

Dr. Helmut Beiersdorf (PCOM liaison)
Bundesanstalt für Geowissenschaften
und Rohstoffe
3 Hannover 51, Postfach 510153
Federal Republic of Germany
Tel: 0511-6468-789

Dr. Dennis Hayes (PCOM liaison)
Lamont-Doherty Geological Observatory
Columbia University
Palisades, NY 10964
Tel: (914) 359-2900

Dr. Philip Rabinowitz
(IPOD Data Bank Liaison)
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-8883

Dr. Matthew Salisbury (DSDP liaison)
(Alternate: Dr. Keir Becker)
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3503, (452-3508)

JOIDES WORKING GROUPS

Hydrogeology Working Group
(Ocean Crust, Downhole Measurement and Inorganic Geochemistry Panels)

Dr. Roger N. Anderson, Chairman
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900

Dr. Lawrence Cathles
Department of Earth Sciences
Pennsylvania State University
University Park, PA 16802
Tel: (814) 865-1215

Dr. Jean-Paul Foucher
Centre Oceanologique de Bretagne
B. P. 337, 29273 Brest, France

Dr. Russell E. McDuff
Department of Oceanography, WB-10
University of Washington
Seattle, WA 98195
Tel: (206) 545-2961

Dr. Richard P. von Herzen
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400

Dr. Mark Zoback
U. S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025

Long-Range-Plans Working Group
(Sedimentary Petrology and Physical Properties Panel)

Dr. George deVries Klein, Chairman
245 Natural History Building
1301 W. Green Street
Urbana, IL 61801
Tel: (217) 333-2076 (office), 333-3540 (message)

Dr. Michael A. Arthur
Department of Geology
University of South Carolina
Columbia, South Carolina 29208
Tel: (803) 777-2410

Dr. Richard Bennett
NORDA
Seafloor Division
Code 360
NSTL Station
Bay St. Louis, MS 39529
Tel: (601) 688-4657
FTS: 494-4657

Dr. I. Nick McCave
School of Environmental Sciences
University of East Anglia
Norwich NR4 7TJ, England
Tel: (0603) 56161

Dr. Peter Rothe
Geographisches Institut der
Universitat Mannheim
Abteilung für Geologie
6800 Mannheim 1
Schloss, Postfach 2428
Federal Republic of Germany

Mediterranean/Caribbean Sea Working Group
(Passive Margin Panel)

Mr. Lucien Montadert, Chairman
Institut Français du Petrole
Division Geologie
1 et 4, Avenue de Bois-Preau
B. P. 18
92 Rueil-Malmaison
France
Tel: 967-11-10, 967-17-66

Dr. Mahlon M. Ball
U. S. Geological Survey
Woods Hole, MA 02543
Tel: (617) 548-8700

Dr. Albert W. Bally
Department of Geology
Rice University
P. O. Box 1892
Houston, TX 77001
Tel: (713) 527-4881)

Dr. Vladimir Chehovich
Institute of the Lithosphere
U. S. S. R. Academy of Sciences
22 Straromontny Pereylok
Moscow 109180, U. S. S. R.
Tel: 231-48-36

Dr. Kenneth Hsü
Geologisches Institut der E. T. H.
Sonneggstrasse 5
Zurich 6, Switzerland
Tel: (01) 32-62-11, Ext. 3669

Dr. William Ludwig
Gulf Science and Technology Co.
P. O. Box 36506
Houston, TX 77036
Tel: (713) [illegible]

Dr. Isabella Premoli-Silva
Instituto di Paleontologia
Piazzale Gorini 15
20133 Milano, Italy
Tel: (02) 29 28 13

Dr. W. Schreyer
Institut für Mineralogie
Rugh-Universitat Bochum
D 463, Bochum-Querenburg
Universitatstrasse 150
Postfach 2148
Federal Republic of Germany

Dr. Joel Watkins
Exploration & Production Division
Gulf Science & Technology Company
P. O. Box 2038
Pittsburgh, PA 15230

Mesozoic Working Group
(Ocean Paleoenvironment Panel)

Dr. Seymour O. Schlanger, Chairman
Department of Geological Sciences
Locy Hall
Northwestern University
Evanston, IL 60201
Tel: (312) 492-5097

Dr. Robert G. Douglas
Dept. of Geological Sciences
University of Southern California
University Park
Los Angeles, CA 90007
Tel: (213) 743-7676

Dr. Hugh C. Jenkyns
Dept. of Geology and Mineralogy
University of Oxford
Parks Road
Oxford OX1 3PR, England
Tel: 0865-54511

Dr. Yves Lancelot
Deep Sea Drilling Project, A-031
Scripps Institution of Oceanography
La Jolla, CA 92093
Tel: (714) 452-3521

Dr. Roger Larson
Graduate School of Oceanography
University of Rhode Island
Kingston, RI 02881
Tel: (401) 792-6165

Dr. William V. Sliter
U. S. Geological Survey
Branch of Paleontology and
Stratigraphy, MS 970
12201 Sunrise Valley Drive
Reston, VA 22092
Tel: (703) 860-6051 (703) 860-6051

Dr. Hans Thierstein
Scripps Institution of Oceanography, A-015
La Jolla, CA 92093
Tel: (714) 452-4646

Middle America Working Group
(Active Margin Panel)

Dr. Roland von Huene, Chairman
U. S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
Tel: (415) 856-7105

Dr. R. Couch
School of Oceanography
Oregon State University
Corvallis, OR 97331

Dr. Keith Kvenvolden
U. S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
Tel: (415) 856-7150

Dr. J. Casey Moore
Department of Earth Sciences
University of California
Santa Cruz, CA 95060
Tel: (408) 429-2504

Dr. D. Seely
EXXON Production Research Company
P. O. Box 2189
Houston, TX 77001
Tel: (713) 965-4222

Dr. Lyn Sykes
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900

North Atlantic (Western) Working Group
(Passive Margin Panel)[1]

Mr. John I. Ewing
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext. 265

Dr. John A. Grow
U. S. Geological Survey
Woods Hole, MA 02543
Tel: (617) 548-8700

Dr. James P. Kennett
University of Rhode Island
Graduate School of Oceanography
Narragansett Bay Campus
Kingston, RI 02881
Tel: (401) 792-6216

Dr. Robert E. Sheridan
Department of Geology
University of Delaware
Newark, DE 19711
Tel: (302) 738-1271

Dr. Gerta Keller
Paleontology and Stratigraphic Branch
MS 95
U. S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
Tel: (415) 323-8111

Dr. Robert B. Kidd
Institute of Oceanographic Sciences
Brook Road
Wormley, Godalming
GU8 5UB, England
Tel: 04 2879 4141

North Pacific Cenozoic Working Group
(Ocean Paleoenvironment Panel)

Dr. Fritz Theyer, Chairman
Hawaii Institute of Geophysics
University of Hawaii
2525 Correa Road
Honolulu, HI 96822
Tel: (808) 948-7006 (office)
948-6605 (lab)

Dr. Lloyd Burckle
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900

Dr. James D. Hays
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900, Ext. 403, 404

Dr. James Ingle
Department of Geology
Stanford University
Stanford, CA 94305
Tel: (415) 497-2531

Northwest Pacific Working Group
(Active Margin Panel)

Dr. Roland von Huene, Chairman
U. S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
Tel: (415) 856-7105

Dr. James Ingle
Department of Geology
Stanford University
Stanford, CA 94305
Tel: (415) 497-2531

Dr. LaVerne D. Kulm
School of Oceanography
Oregon State University
Corvallis, OR 97331
Tel: (503) 754-2296

Dr. Seymour O. Schlanger
Department of Geological Sciences
Locy Hall
Northwestern University
Evanston, IL 60201

Dr. David W. Scholl
U. S. Geological Survey
MS 99
345 Middlefield Road
Menlo Park, CA 94025
(415) 856-7089

Dr. Alexi Susimov
P. P. Shirshov Institute of Oceanology
U. S. S. R. Academy of Sciences
Moscow, U. S. S. R.

Dr. Seiya Uyeda
University of Tokyo
Earthquake Research Institute
Bunkyo-ku, Tokyo 164, Japan

[1]Passive Margin Panel menber to be determined.
Chairman to be determined.

Dr. Tracy Vallier
U. S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
Tel: (415) 856-7048

Southern Ocean Working Group
(Ocean Paleoenvironment Panel)

Dr. James D. Hays, Chairman
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Tel: (914) 359-2900, Ext. 403, 404

Dr. David A. Johnson
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
Tel: (617) 548-1400, Ext. 2463

Dr. James P. Kennett
University of Rhode Island
Graduate School of Oceanography
Narragansett Bay Campus
Kingston, RI 02881
Tel: (401) 792-6216

Dr. Roland Schlich
Directeur de Recherche
Universite Louis Pasteur
Institut de Physique du Globe
5 Rue Rene Descartes
67084 Strasbourg, France

Dr. John Sclater
Department of Earth and
Planetary Sciences
Massachusetts Institute of Technology
Cambridge, MA 02139
Tel: (617) 253-1980

Dr. Tjeerd J. van Andel
Department of Geology
Stanford University
Stanford, CA 94305
Tel: (415) 497-0765

Dr. Sherwood Wise
Department of Oceanography
Florida State University
Tallahassee, FL 32306

ALPHABETIC TELEPHONE DIRECTORY

NAME	PANEL AFFILIATION	TELEPHONE	COUNTRY
Adams, R. L.	ILP	(203) 359-3500	USA
Anderson, R.	OCP, Hydrogeol. WG	(914) 359-2900	USA
Appleman, D.	IHP	(202) 381-6331	USA
Artemiev, M.	PMP		USSR
Arthur, M.	OPP, Long-Range Plans WG	(803) 777-2410	USA
Aubouin, J.	PCOM	336-25-25, Ext. 5247	France
Baker, D.	EXCOM	(206) 543-7160	USA
Ball, M.	Med/Carib WG	(617) 548-8700	USA
Bally, A.	PPSP, Med/Carib WG	(713) 220-5975	USA
Baltuck, M.	IGP, OGP, OPP	(714) 452-4172	USA
Barker, P.	AMP	021-472-1301, Ext. 2081	UK
Basov, I.	SCP	231-48-36	USSR
Becker, I.	DMP, OCP, SSP	(714) 452-3508	USA
Beiersdorf, H.	PCOM, OPP, SSP	0511-6468-789	FRG
Beliy, N.	PPSP	1330130	USSR
Bender, F.	EXCOM	0511-64681	FRG
Bennett, R.	SP^4, Long-Range-Plans WG	(601) 688-4657	USA
Biju-Duval, B.	PMP	967-11-10	France
Bogdanov, N.	EXCOM	238-85-88	USSR
Bois, C.	PPSP		France
Bougault, H.	OCP		France
Bouma, A.	PMP	(412) 665-6507	USA
Brenner, C.	(IPOD Data Bank)	(914) 359-8883	USA
Boyce, E.	DMP, SP^4	(714) 452-2778	USA
Brassel, S.	OGP	0272-24161	UK
Brett, R.	(NSF)	(202) 632-4274	USA
Bryant, W.	PCOM, PMP, DMP	(713) 845-2153	USA
Budnikov, N.	ILP		USSR
Burckle, L.	SCP, No. Pac. Cenozoic WG	(914) 359-2900,Ext. 406	USA
Byramjee, R.	PPSP	772-2013	France
Cadet, J-P	AMP	38 66-07-25	France
Calvert, S.	IGP		Canada
Cann, J.	PCOM, IGP	3-0632-328511, Ext. 3090	UK
Carlson, R.	Sp^4	(713) 845-1371	USA
Cathles, L.	Hydrogeol. WG	(814) 865-1215	USA
Chamley, H.	OPP	(20) 91-92-22, Ext. 2130	France
Chehovich, V.	Med/Carib WG		USSR
Christensen, N.	DMP	(206) 543-7143	USA
Claypool, G.	PPSP	(303) 234-3561	USA
Clotworthy, J.	(JOI, Inc.)	(202) 333-8276	USA
Couch, R.	Mid. Am. WG		USA
Coulbourn, W.	AMP, SCP	(714) 452-3503	USA
Cowan, D.	AMP	(206) 543-4033	USA
Creager, J.	EXCOM, PCOM, AMP, IHP	(206) 543-9944	USA
Dean, W.	SP^4	(303) 234-2310	
Debyser, J.	EXCOM	723-5528, Ext. 420	France
Degens, E.	OGP		FRG
Delany, J.	OCP	(206) 543-4830	USA
Dmitriev, Y.	AMP		USSR
Dorman, L.	SSP	(714) 452-2406	
Douglas, R.	OPP, PPSP, SSP Mesoz. WG	(213) 743-7676	USA
Durbaum, H.	EXCOM	0511-64681	FRG

NAME	PANEL AFFILIATION	TELEPHONE	COUNTRY
Elderfield, H.	IGP		UK
Elthon, D.	OCP	(713) 749-4414	USA
Emmerman, R.	OCP	(0721) 608 3323	FRG
Erdman, G.	OGP	(918) 336-6600	USA
Ewing, J.	PCOM, W. No. Atl. WG	(617) 548-1400, Ext. 265	USA
Foucher, J.-P.	Hydrogeology WG		France
Francis, T.	DMP	042-879-4141	UK
Futterer, D.	OPP		FRG
Galimov, E.	OGP		USSR
Garrison, L.	PPSP	(512) 888-3294	USA
Garrison, R.	OPP	(408) 429-2114	USA
Gartner, S.	(NSF)	(202) 653-9148	USA
Green, A.	PPSP	(713) 965-4172	USA
Grow, J.	W. No. Atl. WG	(617) 548-8700	USA
Harms, J.	PPSP	(303) 794-2601	USA
Harrison, C.	EXCOM	(305) 350-7400	USA
Hathaway, J.	IHP	(617) 548-8700	USA
Hay, W.	(JOI, Inc.)	(202) 333-8276	USA
Hayes, D.	EXCOM, PCOM, SSP, AMP So. Ocean WG	(914) 359-2900, Ext. 470, 471	USA
Hays, J.	OPP, N. Pac. Cenozoic WG	(914) 359-2900, Ext. 403	USA
Heath, R.	EXCOM	(503) 754-4763	USA
Helsley, C.	EXCOM, PCOM	(808) 948-8760	USA
Hill, M.	ILP		USA
Hinz, K.	PMP	0511-646 8330	FRG
Hoffert, M.	IGP	(98) 03-16-94	France
Honnorez, J.	PCOM, PPSP	(305) 350-7443	USA
Horn, A.	PPSP	(415) 323-7126	USA
Hotz, E.	PPSP	0201-726350	FRG
Hsü, K.	Med/Carib WG	(01) 32-62-11	Switz.
Hunt, J.	OGP	(617) 548-1400, Ext. 2562	USA
Hussong, D.	AMP	(808) 948-8711	USA
Hyndman, R.	DMP	(604) 656-8269	Canada
Inderbitzen, A.	(NSF)	(202) 653-9148	USA
Ingle, J.	N. Pac. Cenozoic WG, NW Pac. WG	(415) 497-2531	USA
IPOD Data Bank		(914) 359-2900, Ext. 502	USA
Jageler, A.	DMP		USA
Jenkins, G.	SCP	(0908) 63116	UK
Jenkyns, H.	Mesozoic WG	0865-54511	UK
Jenkyns, H.	Mesozoic WG	0865-54511	UK
Johnson, D.	So. Ocean WG	(617) 548-1400, Ext. 2463	USA
JOI, Inc.		(202) 333-8276 FTS: (202) 282-7022 (202) 282-7066	USA
JOIDES Office (S.I.O.)[1]		(714) 452-2360	USA
Jones, E.	SSP	01-387-7050	UK
Jung, R	DMP		FRG

[1]The JOIDES office will move to the University of Miami 1 July 1982.

NAME	PANEL AFFILIATION	TELEPHONE	COUNTRY
Kagami, H.	PMP	03-376-1251	Japan
Karig, D.	AMP	(607) 256-3679	USA
Kastner, M.	IGP	(714) 452-2065	USA
Keene, C.	PMP	(902) 426-3413	Canada
Keller, George	EXCOM	(503) 754-3504	USA
Keller, Gerta	N. Pac. Cenozoic WG	(415) 323-8111	USA
Kennett, J.	PCOM, OPP, SCP, W. No. Atl. WG, So. Ocean WG	(401) 792-6216	USA
Kent, P.	EXCOM	0793 40101, Ext. 314	UK
Kidd, R.	OPP, N. Pac. Cenozoic WG	042879-4141	UK
Kinoshita, H.	DMP		Japan
Klein, G.	SP⁴, Long-Range-Plans WG	(217) 333-2076	USA
Knauss, J.	EXCOM	(401) 792-6222	USA
Kobayashi, K.	EXCOM, PCOM	03-376-1251	Japan
Kosminskaya, I.	SSP		USSR
Kraft, L.	SP⁴	(713) 772-3701	USA
Kulm, L.	NW Pac. WG	(503) 754-2296	USA
Kushiro, I.	OCP		Japan
Kvenvolden, K.	OGP	(415) 856-7150	USA
Ladd, J.	AMP	(914) 359-2900	USA
Lancelot, Y.	EXCOM, PCOM, PMP, PPSP Mesoz. WG	(714) 452-3521	USA
Langseth, M.	PCOM	(914) 359-2900	USA
Larson, R.	Mesoz. WG	(401) 792-6165	USA
Laughton, T.	EXCOM	042879-4141	UK
Ledbetter, M.	SP⁴	(404) 542-7756	USA
Leinen, M.	IGP	(401) 792-6268	USA
Loeblich, A., Jr.	IHP	(213) 825-1475	USA
Loughridge, M.	IHP	(303) 499-1000, Ext. 6487	USA
Ludwig, W.	Med/Carib WG	(713) 754-2000	USA
MacGregor, I.	(NSF)	(202) 653-9148	USA
MacDonald, K.	OCP	(805) 961-4005	USA
Mackenzie, D.	PPSP	(303) 794-2601, Ext. 410	USA
Martini, E.	SCP	(0611) 79821-06/07	
Mathews, M.	DMP	(505) 667-2884	USA
McCave, I.	SP⁴, Long-RangePlans WG	(0603) 56161	UK
McDuff, R.	Hydrogeology WG	(206) 545-2961	USA
McManus, D.	PCOM	(206) 543-5099	USA
Melguen, M.	IHP	98-45-80-55	France
Melieres, F.	SP⁴	336-2525, Ext. 5157	France
Merrell, W.	EXCOM	(713) 845-7211	USA
Merrill, R.	IHP	(714) 452-3529	USA
Meyers, P.	OGP	(313) 764-0597	USA
Moberly, R.	EXCOM, PCOM, OCP, SP⁴	(808) 948-8765	USA
Montadert, L.	PMP, Med/Carib. WG	749-02-14	France
Moore, J.	Mid. Am. WG	(408) 429-2504	USA
Moore, T.	OPP	(713) 940-4946	USA
Mountain, G.	SP⁴	(914) 359-2900	USA
Murauchi, N.	SSP		Japan
Murdmaa, I.	OPP		USSR
Nagumo, S.	SSP		Japan
Nakamura, K.	AMP		Japan
Nasu, N.	EXCOM	(03) 376-1251	Japan
Natland, J.	OCP, IGP	(714) 452-3538	USA
Neprochnov	DMP		USSR

NAME	PANEL AFFILIATION	TELEPHONE	COUNTRY
Nierenberg, W.	EXCOM	(714) 452-2826	USA
Nigrini, C.	SCP	(213) 697-8842	USA
Nikitin, L.	PCOM, DMP		USSR
Nowak, J.	IHP	0511-6468-655	FRG
Ozima, M.	OCP		Japan
Peterson, G.	ILP		FRG
Peterson, M.	EXCOM	(714) 452-3500	USA
Pokryshkin, A.	DMP		USSR
Poore, R.	SCP	(703) 860-7403	USA
Premoli-Silva, I.	Med/Carib. WG	(02) 29 28 13	Italy
Rabinowitz, P.	(IPOD Data Bank)	(914) 359-8883	USA
Raleigh, B.	EXCOM	(914) 359-2900, Ext. 470	USA
Reid, R.	EXCOM	(713) 845-7211	USA
Renard, V.	DMP, SSP	80-46-50	France
Riedel, W.	PCOM	(714) 452-4386	USA
Roberts, D.	PMP	441-920-8474	UK
Roberts, W.	ILP	(918) 333-8833	USA
Robinson, P.	OCP	(902) 424-2358	Canada
Romankevich, E.	OGP		USSR
Rothe, P.	SP^4, Long-Range-Plans WG	0621-292-5458	FRG
Rucker, D.	(JOI, Inc.)	(202) 333-8276	USA
Rullkotter, J.	OGP		FRG
Rutman, G.	ILP		France
Ryabchikov, I.	IGP		USSR
Ryan, W.	PMP	(914) 359-2900	USA
Salisbury, M.	PCOM, SP^4, PPSP, SSP	(714) 452-3503	
Saunders, J.	IHP	061-25-82-82	Switz
Savin, S.	IGP	(216) 368-3690	USA
Sayles, F.	IGP	(617) 548-1400, Ext. 2561	USA
Scherbakov, V.	IHP		USSR
Schermet, O.	PPSP	133-01-30	USSR
Schilling, J.-G.	EXCOM	(401) 792-6102	USA
Schlager, W.	PCOM	(305) 672-1840	USA
Schlanger, S.	OPP, Mesozoic WG, NW Pac. WG		USA
Schlich, R.	SSP, So. Ocean WG		France
Scholl, D.	NW Pac. WG		USA
Schouten, H.	OCP	(617) 548-1400, Ext. 2574	USA
Schrader, H.	PCOM	(503) 754-2296	USA
Schreider, A.	SSP		USSR
Schreyer, W.	Med/Carib. WG		FRG
Sclater, J.	So. Ocean WG	(617) 253-1980	USA
Seely, D.	Mid. Amer. WG	(713) 965-4222	USA
Sharaskin, A.	IGP	137-00-11, Ext. 83	USSR
Sheridan, R.	No. Atl. WG	(302) 738-1272	USA
Shinn, A.	(NSF)	(202) 653-9146	USA
Sidorenko, A.	EXCOM	234-29-68	USSR
Simoneit, B.	OGP	(503) 754-2895	USA
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Snelson, S.	PMP	(713) 663-2601	USA
Staudigal, H.	IGP	(914) 359-2900	USA
Steele, J.	EXCOM	(617) 548-1400, Ext. 2500	USA
Stephen, R.	OCP	(617) 548-1400, Ext. 2583	USA
Summerhayes, C.	OGP	(713) 965-4337	USA
Susimov, A.	NW Pac. WG		USSR
Sykes, L.	Mid. Amer. WG	(914) 359-2900	USA

NAME	PANEL AFFILIATION	TELEPHONE	COUNTRY
Takayanagi, Y.	OPP	0542-37-1111	Japan
Tarney, J.	OCP	021-472-1301	UK
Taylor, G.	PPSP		UK
Theyer, F.	OPP, N. Pac. Cenozoic WG	(808) 948-7006	USA
Thiede, J.	PMP,	46-6800, Ext. 969	Norway
Thierstein, H.	Mesoz. WG	(714) 452-4646	USA
Thomas, E.	OPP, SCP	(714) 452-4193	USA
Timofeev, P.	OPP, EXCOM, SP[4]	233-06-20	USSR
Treadwell, T.	EXCOM	(713) 845-7211	USA
Tsvetkov, A.	OCP		USSR
Tucholke, B.	PMP	(617) 548-1400, Ext. 2494	USA
Uyeda, S.	NW Pac. WG		Japan
Vail, P.	PMP	(713) 965-4884	USA
Vallier, T.	NW Pac. WG	(415) 856-7048	USA
Van Andel, Tj.	So. Ocean WG	(415) 497-0765	USA
Van Hinte, J.	PMP	548-3511	Netherlands
Von Herzen, R.	DMP, Hydrogeol. WG	(617) 548-1406	USA
Von Huene, R.	AMP, Mid. Amer. WG, NW Pac. WG	(415) 856-7105	USA
Von Rad, U.	PCOM	0-511-6468-788	FRG
Walter, H.	AMP	0511-64681	FRG
Watkins, J.	Med. Carib. WG		USA
Wedepohl, K.	IGP		FRG
Weigel, W.	SSP		FRG
Williams, G.	ILP	01-235-0762	UK
Winterer, E.	EXCOM, PCOM, PMP, PPSP	(714) 452-2360	USA
Wisby, W.	EXCOM	(305) 350-7519	USA
Wise, S.	So. Ocean WG		USA
Woodbury, P.	IHP	(714) 452-3526	USA
Wright, A.	OGP	(714) 452-3508	USA
Zdorovenin, V.	IHP		USSR
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VOL. 4	038-000-00080	____	11.50
VOL. 5	038-000-00081	____	9.75
VOL. 6	038-000-00082	____	15.50
VOL. 7	038-000-00083	____	22.00
VOL. 8	038-000-00084	____	12.75
VOL. 9	038-000-00085	____	11.40
VOL. 10	038-000-00138	____	13.50
VOL. 11	038-000-00119	____	13.25
VOL. 12	038-000-00121	____	26.50
VOL. 13	038-000-00132	____	28.00
VOL. 14	038-000-00125	____	11.50
VOL. 15	038-000-00156	____	17.65
VOL. 16	038-000-00139	____	14.00
VOL. 17	038-000-00148	____	13.00
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VOL. 19	038-000-00141	____	12.75
VOL. 20	038-000-00153	____	16.50
VOL. 21	038-000-00150	____	15.45
VOL. 22	038-000-00165	____	13.55
VOL. 23	038-000-00170	____	19.30
VOL. 24	038-000-00184	____	19.20

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VOL. 25	038-000-00169	____	14.15
VOL. 26	038-000-00187	____	20.15
VOL. 27	038-000-00183	____	15.55
VOL. 28	038-000-00227	____	18.65
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VOL. 30	038-000-00246-5	____	15.75
VOL. 31	038-000-00214	____	17.40
VOL. 32	038-000-00241-4	____	16.90
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VOL. 41	038-000-00347-0	____	19.25
Supplement to Volumes 38-39-40-41	038-000-00381-0	____	14.25
VOL. 42 (PART I & PART II)	038-000-00358-0	____	35.00 for 2 part set
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Part 2	038-000-00417-4	____	20.00
VOL. 48	038-000-00413-1	____	24.00
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VOL. 50	038-000-00438-7	____	26.00
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Vol. No.	Cruise Location	Cruise Date	Drilling Sites	Number Pages
1	Orange, Texas to Hoboken, New Jersey	August-September 1968	1-7	Out of Print
2	Hoboken, New Jersey to Dakar, Senegal	October-November 1968	8-12	Out of Print
3	Dakar, Senegal to Rio de Janeiro, Brazil	December 1968-January 1969	13-22	Out of Print
4	Rio de Janeiro, Brazil to San Cristobal, Panama	February-March 1969	23-31	754
5	San Diego, California to Honolulu, Hawaii	April-June 1969	32-43	828
6	Honolulu, Hawaii to Apra, Guam	June-August 1969	44-60	1,330
7	Apra, Guam to Honolulu, Hawaii	August-September 1969	61-67	1,758
8	Honolulu, Hawaii to Papeete, Tahiti	October-December 1969	68-75	1,038
9	Papeete, Tahiti to Balboa, Panama	December 1969-January 1970	76-84	1,206
10	Galveston, Texas to Miami, Florida	February-April 1970	85-97	774
11	Miami, Florida to Hoboken, New Jersey	April-June 1970	98-108	1,078
12	Boston, Massachusetts to Lisbon, Portugal	June-August 1970	109-119	1,266
13	Lisbon, Portugal to Lisbon, Portugal	August-October 1970	120-134	1,448
14	Lisbon, Portugal to San Juan, Puerto Rico	October-December 1970	135-144	998
15	San Juan, Puerto Rico to Cristobal, Panama	December 1970-February 1971	146-154	1,200
16	Cristobal, Panama to Honolulu, Hawaii	February-March 1971	155-163	950
17	Honolulu, Hawaii to Honolulu, Hawaii	April-May 1971	164-171	930
18	Honolulu, Hawaii to Kodiak, Alaska	May-July 1971	172-182	1,078
19	Kodiak, Alaska to Yokohama, Japan	July-September 1971	183-193	914
20	Yokohama, Japan to Suva, Fiji	September-October 1971	194-202	958
21	Suva, Fiji to Darwin, Australia	November 1971-January 1972	203-210	931
22	Darwin, Australia to Colombo, Ceylon	January-March 1972	211-218	922
23	Colombo, Ceylon to Djibouti, F.T.A.I.	March-May 1972	219-230	1,180
24	Djibouti, F.T.A.I. to Port Louis, Mauritius	May-June 1972	231-238	1,184
25	Port Mauritius to Durban, South Africa	June-August 1972	239-249	884
26	Durban, South Africa to Fremantle, Australia	September-October 1972	250-258	1,130
27	Fremantle, Australia to Fremantle, Australia	November-December 1972	259-263	1,060
28	Fremantle, Australia to Lyttleton, New Zealand	January-February 1973	264-274	1,018
29	Lyttleton, New Zealand to Wellington, New Zealand	March-April 1973	275-284	1,198
30	Wellington, New Zealand to Apra, Guam	April-June 1973	285-289	753
31	Apra, Guam to Hakodate, Japan	June-August 1973	290-302	982
32	Hakodate, Japan to Honolulu, Hawaii	August-October 1973	303-313	980
33	Honolulu, Hawaii to Papeete, Tahiti	November-December 1973	314-318	973
34	Papeete, Tahiti to Callao, Peru	December 1973-February 1974	319-321	814
35	Callao, Peru to Ushuaia, Argentina	February-March 1974	322-325	929
36	Ushuaia, Argentina to Rio de Janeiro, Brazil	April-May 1974	326-331	1,079
37	Rio de Janeiro, Brazil to Dublin, Ireland	May-July 1974	332-335	1,008
38	Dublin, Ireland to Amsterdam, The Netherlands	August-September 1974	336-352	1,256
39	Amsterdam, The Netherlands to Cape Town, South Africa	October-December 1974	353-359	1,164
40	Cape Town, South Africa to Abidjan, Ivory Coast	December 1974-February 1975	360-365	1,104
41	Abidjan, Ivory Coast to Malaga, Spain	February-April 1975	366-370	1,285
	SUPPLEMENT TO VOLUMES 38-39-40-41		336-370	1,022
42	PART I: Malaga, Spain to Istanbul, Turkey	April-May 1975	371-378	1,276
	PART II: Istanbul, Turkey to Istanbul, Turkey	May-June 1975	379-381	1,270
43	Istanbul, Turkey to Norfolk, Virginia	June-August 1975	382-387	1,140
44	Norfolk, Virginia to Norfolk, Virginia	August-September 1975	388-394	1,030
45	San Juan, Puerto Rico to San Juan, Puerto Rico	November 1975-January 1976	395-396	742
46	San Juan, Puerto Rico to Las Palmas, Canary Islands	January-March 1975	396A-396B	460
47	PART I: Los Palmas, Canary Islands to Vigo, Spain	March-April 1976	397	860
	PART II: Vigo, Spain to Brest, France	April-May 1976	398	812
48	Brest, France to Aberdeen, Scotland	May-July 1976	399-406	1,208
49	Aberdeen, Scotland to Funchal, Madeira	July-September 1976	407-414	1,044
50	Funchal, Madeira Islands to Funchal, Madeira Islands	September-November 1976	415-416	892
51, 52, 53				
	PART I: San Juan, Puerto Rico to San Juan, Puerto Rico	November 1976-April 1977	417-418	742
	PART II: San Juan, Puerto Rico to San Juan, Puerto Rico	November 1976-April 1977	417-418	1,622
54	Cristobal, Panama Canal Zone to Long Beach, California	May-June 1977	419-429	982
55	Honolulu, Hawaii to Yokohama, Japan	July-September 1977	430-433	892
56, 57				
	PART I: Yokohama, Japan to Yokohama, Japan	September-December 1977	434-441	654
	PART II: Yokohama, Japan to Yokohama, Japan	September-December 1977	434-441	772
58	Yokohama, Japan to Okinawa, Japan	December 1977-January 1978	442-446	1,046
59	Naha, Okinawa to Apra, Guam	February-March 1978	447-451	844
60	Apra, Guam to Apra Guam	March-May 1978	452-461	954
61	Apra, Guam to Majuro Atoll, Marshall Islands	May-July 1978	462	900
62	Majuro Atoll to Honolulu, Hawaii	July-September 1978	463-466	1,124
63	Long Beach, California to Mazatlan, Mexico	October-November 1978	467-473	992
66	Mazatlan, Mexico to Manzanillo, Mexico	March-May 1979	486-493	888

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Direct comments and suggestions concerning this issue to the JOIDES Journal publication staff: Paula J. Worstell, editor; Michiko Hitchcox, production coordinator; JOIDES Office (A-012), Scripps Institution of Oceanography, La Jolla, CA 92093.

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