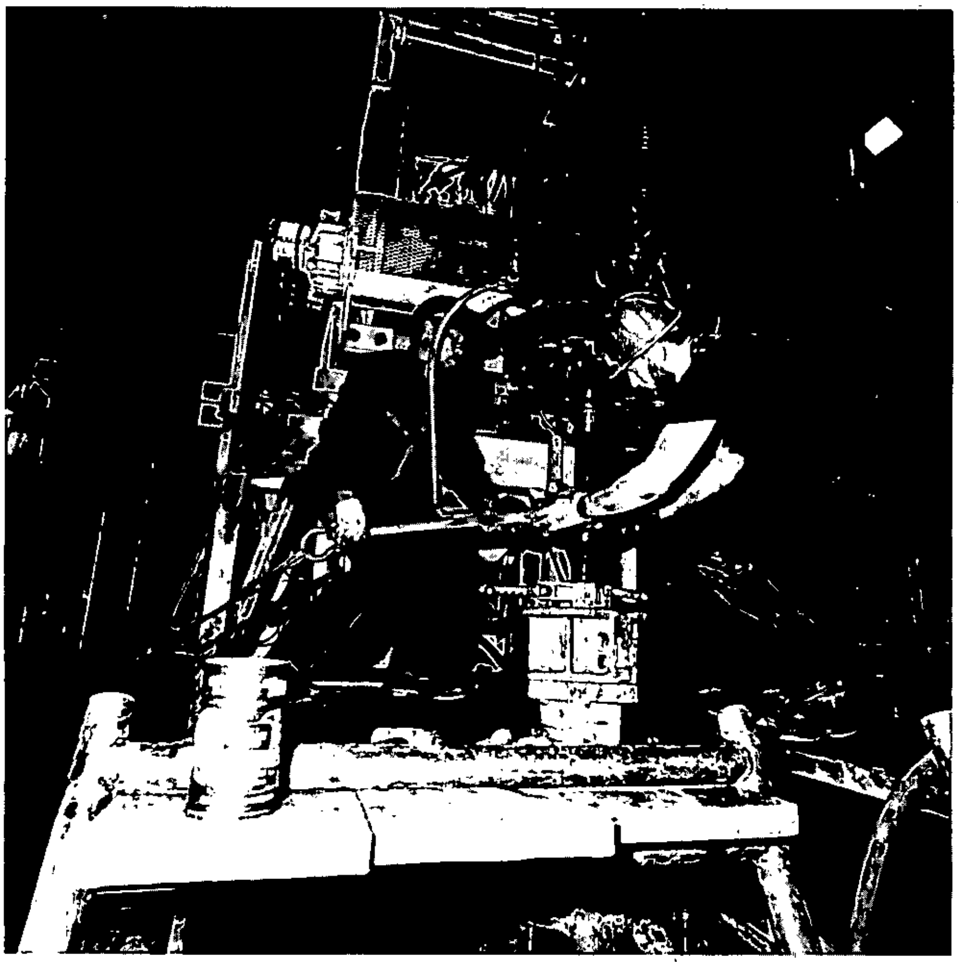
JOIDES Journal

VOL. XV, No. 2, June, 1989



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FOCUS

Three ODP issues have been receiving great attention and generating considerable debate over the past year or so. One has to do with publications resulting from drilling: delayed ODP volumes, restrictions on publication in the open literature, and the lack of thematic syntheses. JOIDES advice to PCOM and PCOM's proposal to EXCOM for policy changes are reported in this issue in the summary of the May PCOM meeting. A second issue is the preparation of the groundwork for a renewal of the Ocean Drilling Project. The scientific aspects will be based on a Long Range Planning Document, that was recently prepared and submitted by Nick Pisias, with the help of the JOIDES structure and the ODP contractors. We owe Nick a vote of thanks for a job well done!

Let me use this column to bring you up to date on the third issue, planning the general direction of the vessel about four years in advance of drilling, so that site-specific surveys and engineering developments can be scheduled. As you know, the advice that JOIDES gives ODP is driven by individual proposals that have been reviewed for their thematic content in light of the COSOD recommendations and thematic panel white papers, and then ranked in priority.

The JOIDES Resolution is now in the Western Pacific, having fallen behind its intended schedule as unexpected scientific opportunities arose and were pursued in the Indian Ocean and Western Pacific. It has before it proposed programs of high thematic value in the Central and Eastern Pacific, programs whose proponents have been waiting for more than 6 years for a renewal of drilling there. Yet some others have raised concerns about any delayed reappearance of the vessel in the Atlantic Ocean. Some proponents of drilling despair that the vessel will ever in their lifetimes get started on what they might have proposed!

Tentative allocation by PCOM to the panels of only about 18 months for scientific drilling in the central and eastern Pacific Ocean met with strong protest by each thematic panel, because they believed that the attack on many important themes requiring a Pacific venue would be delayed for an unknown period for what appeared to be non-scientific reasons.

At its most recent (May 1989) meeting, PCOM planned the direction of the drilling vessel through calendar 1991, somewhat less than three years in advance of the vessel. That was by naming specific legs for 1990 between Japan and Tonga, plus identifying in general the easternmost Pacific area to follow in 1991. The 1991 schedule would be selected from among the following list of programs given high priority by the thematic panels: Cascadia Accretionary Prism, Chile Triple Junction, Eastern Equatorial Pacific Neogene Transect, East Pacific Rise Bare-rock Drilling, Hydrothermal Processes at Sedimented Ridge Crests, and Lower Crust at Site 504B. Exactly how any of those candidate programs may actually develop into legs will depend in large part on technical developments and revised proposals.

EXCOM has asked PCOM to examine thematically reviewed proposals from any ocean, in order to plan the general direction of the vessel in the period after 1991, and JOIDES has widely announced the decision to the international scientific community by calling for proposals from any ocean. Between late 1989 and the end of calendar year 1991 there probably will have been about 14 months of scientific drilling in the region of the former CEPAC Panel. Between 1 January 1988 and EXCOM's September 1988 statement, proposals received by the JOIDES Office have mainly targeted objectives in the Pacific (22 Pacific, to 5 Atlantic and 2 Indian). From September 1988 to late May 1989, the totals remain in about the same ratio (14 Pacific to 4 Atlantic, one each of which may also be considered as "Arctic"). New proposals as well as refinements of existing ones are involved in each ocean. More Pacific than Atlantic proposals are mature or almost so, in terms of site surveys and clear definition of objectives within reach of the JOIDES Resolution. If advanced planning were to be based solely on the advice of the thematic panels and what proposals are in hand at the present time, the vessel would work mainly in the Pacific (with perhaps a modest trip into the Atlantic) for one or two years beyond 1991.

Having issued a call for proposals, PCOM is reluctant to plan the general position of the vessel beyond 1991 until there is reasonably sufficient opportunity for new and revised proposals to be submitted for thematic evaluation and competitive ranking without respect to ocean. Thematic panels will meet twice (early fall 1989; late winter 1990) before spring 1990, when PCOM will take their advice to determine the general direction of the vessel through spring 1994. If you are working on a drilling proposal, now is the time to finish it and send 10 copies to the JOIDES Office.

Ralph Moberly
Planning Committee Chairman

AN OPEN LETTER TO PROPONENTS OF OCEAN DRILLING FROM PCOM CHAIRMAN RALPH MOBERLY

1 June 1989

Dear Proponent of Ocean Drilling:

This letter is addressed to persons who submitted proposals for ocean drilling to the JOIDES Office between December 1982 and January 1988. You may wish to submit a revised or totally new proposal if you have new concepts or data. As you probably know, the advice that JOIDES gives to the Ocean Drilling Program is driven by individual proposals that have been reviewed for their thematic content in light of the COSOD recommendations and thematic panel white papers, and then ranked in priority. A recent policy change is that proponents will be informed of the results of panel reviews, which was not always the case in the past. Scheduling of drilling legs by the JOIDES Planning Committee (PCOM) is based on the highest ranked proposals that have sufficient site-survey information to justify drilling from the standpoints of science and safety, and that can be met with the drilling and logging technology available.

From now until the end of calendar year 1991 the *JOIDES Resolution* will be drilling in the Pacific. The Executive Committee of JOIDES has asked PCOM to examine thematically reviewed proposals from any ocean, in order to plan the general direction of the vessel in the period after 1991. PCOM has widely announced the decision to the international scientific community by calling for proposals from any ocean. **This letter is a further announcement.**

PCOM is obligated to plan the general direction of the vessel about four years in advance of drilling, so that there can be time for necessary additional site surveys, engineering developments, and other tasks. Having issued its call for proposals, however, PCOM is reluctant to plan the general position of the vessel beyond 1991 until there is reasonably sufficient opportunity for new and revised proposals to be submitted for thematic evaluation and competitive ranking without respect to ocean. New and revised proposals received in 1988 and 1989 are in review, as are several earlier ones that received high thematic evaluation.

Thematic panels will meet twice (early fall 1989, late winter 1990) before spring 1990, when PCOM will take their advice to determine the general direction of the vessel through spring 1994. **If you are working on a drilling proposal, <u>now</u> is the time to finish it and send 10 copies to the JOIDES Office.**

JOIDES RESOLUTION OPERATIONS SCHEDULE

LEGS 127 - 135

LEG	AREA	DEPARTURE LOCATION	DEPARTURE DATE	ARRIVAL LOCATION	ARRIVAL DATE	IN PORT	DAYS AT SEA*
127	Japan Sea I	Tokyo	06/24/89	Niigata	08/21/89	08/21 - 08/25	58
128	Japan Sea II	Niigata	08/26/89	?	10/08/89	?	43
	Dry Dock	?	10/08/89	?	10/25/89	?	18?
129	Old Pacific Crust	?	10/26/89	Guam	12/18/89	12/18 - 12/22	53
130	Ontong Java	Guam	12/23/89	Guam	02/21/90	02/21 - 02/25	60?
131	Nankai	Guam	02/26/90	Yokohama	04/29/90	04/29 - 05/03	62
132	Engineering II	Yokohama	05/04/90	Guam	06/29/90	06/29 - 07/02	56?
	Transit	Guam	07/03/90	Port Moresby	07/10/90	07/10 - 07/11	07
133	N.E. Australia	Port Moresby	07/12/90	Brisbane	09/06/90	09/06 - 09/10	56?
134	Vanuatu	Brisbane	09/11/90	Suva	11/06/90	11/06 - 11/10	56?
135	Lau Basin	Suva	11/11/90	?	01/06/91	?	56?

revised 05/12/89

*Schedule subject to change pending detailed planning for Legs 130 through 135.

Leg 124: Sulu Sea and Celebes Sea Preliminary Report

INTRODUCTION

The numerous western Pacific marginal basins have had a variety of origins and histories, including entrapment from a larger ocean basin, rifting from active volcanic arcs, rifting continental margins, or a composite of events.

They often separate collision zones and island arcs, and as such they represent small islands of undisturbed stratigraphic history within an otherwise very complex geological setting. The objectives of Leg 124 were to determine the age, stratigraphy, paleoceanography, and state of crustal stress within two of these marginal basins, the Celebes and Sulu seas.

Questions addressed concerning these basins are as follows:

1. Were the Celebes and Sulu seas once part of a larger ocean basin, or did they have different origins?

2. What was the age of formation of the basins and, if trapped from a larger basin, their time of separation?

3. What does the stratigraphic record tell us of: a) the history of volcanic activity surrounding the basins? b) the record of changing paleoceanography and sea level? c) the record of collisional events surrounding the basins? d) the timing of trench formation on the basin margins?

4. What are the directions and magnitudes of stresses acting within the basins? Specifically, do the stress patterns clearly discriminate between differing collision and subduction orientations that appear to be acting on both basins? Is there an effect of either or both of the broad collisions between Southeast Asia and the Philippine Sea plate from the east or the Australian continent on the south?

In order to address these questions, Leg 124 drilled five sites (Table 1; Fig. 1), two in the Celebes Sea (Sites 767 and 770) and three in the Sulu Sea (Sites 768, 769, 771). Site summaries for these sites were published in the February 1989 JOIDES Journal.

CELEBES SEA

Site 767 (proposed site CS-1) is located in the central Celebes Sea at 4°47.5'N, 123°30.2'E, in a water depth of 4905 m. The sediments record deposition within a deep basin below the calcite compensation depth (CCD), as shown by the low carbonate content and paucity of calcareous biogenic particles in the pelagic/hemipelagic sediment. Within that depositional framework are major changes in depositional processes and provenance of sediment. The major changes recognized in the sediment section recovered at Site 767 are:

1. An upward transition from pelagic clay deposition in Unit IV to deposition of volcanogenic hemipelagic mud in Units III to I;

2. An upward coarsening of hemipelagic muds from claystone in Unit III to clayey silt in Units II and I;

3. A major influx of quartz-bearing muddy to sandy turbidites with continental provenance in Unit III;

4. A variable influx of fine-grained carbonate turbidites in Units III and II;

5. Significant changes in frequency and composition of volcanic ash through the section.

Site 767 records several major events in the history of the Celebes Sea. The basement is basalt and is overlain by middle Eocene red clays. This age is consistent with the magnetic anomaly interpretation by Weissel (1980), but not with the hypothesis of Lee and McCabe (1986). The basal red clays show low rates of sedimentation and presence of manganese micronodules, fish teeth, and radiolarians, indicative of open ocean environments. This part of the section corresponds well with that observed at DSDP Site 291 (Ingle, Karig, et al., 1975) in the southern Philippine Sea just to the east of the Philippine Islands.

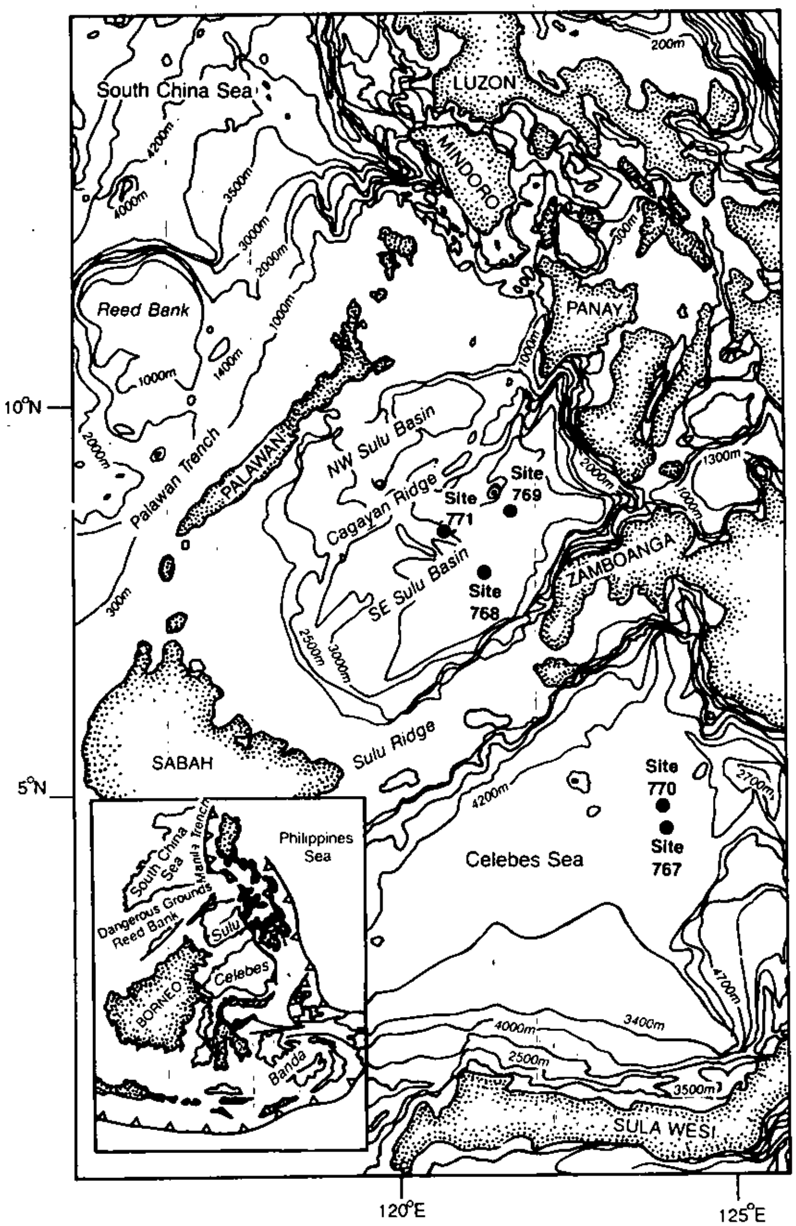

Figure 1. Simplified bathymetric map of the Celebes and Sulu seas showing the locations of sites drilled during ODP Leg 124 (modified from Hinz et al., 1988).

A puzzling increase with depth in both calcium and magnesium, measured in the interstitial waters of Subunit IIIC, shows no corresponding change in alkalinity, but does correspond to a decrease in pH. An increase in methane and ethane content with no corresponding increase in total organic carbon (TOC) was also noted.

Paleomagnetic studies of the oriented APC cores shows a very clear magnetic stratigraphy in the upper 100 m of the site. Changes in declination document the Brunhes/Matuyama boundary, both boundaries of the Jaramillo event within the Matuyama, and a short magnetic reversal below the Jaramillo subchron.

Site 770 (proposed site CS-1A) is located in the Celebes Sea, 45 km northeast of Site 767 (Fig. 1). The reasons for drilling this site were the same as for Site 767, and in particular to complete basement objectives left unfinished at Site 767. Basement objectives were to measure stress in the Celebes Sea crust, to obtain sufficient basement rocks to determine their origin, and to complete the program of downhole logging.

Stress orientation data were obtained with the borehole televiewer (BHTV) logs. Preliminary interpretation of hole ellipticity and breakout data indicate a maximum horizontal stress direction of 046°, or slightly more easterly than the results from Site 768 in the Sulu Sea. Ca and Mg values in the pore waters showed a correlated increase in the lower part of the hole, indicating a source in the alteration of the basalts.

The Celebes Sea originated in the middle Eocene in a setting like that of the southern Philippine Sea. From early Miocene onward the sea has been the site of high rates of volcanogenic turbidite deposition, but from early to late middle Miocene continental sources played a major role in providing sediments to the basin. By late Miocene time the continental sources were cut off, perhaps due to the initiation of the Cotabato and north Sulawesi trenches, which now act to trap sediment along the margins of the basin. In the late Pleistocene abundant volcanic ash, much of it air-fall in origin, dominated sedimentation in the Celebes Sea.

SULU SEA

Site 768 (proposed site SS-2), is located in the southeastern part of the Sulu Sea, in water depth 4385 m (Fig. 1). Preliminary interpretation could indicate the Sulu Sea originated as a backarc basin in the early part of the middle Miocene, though its exact time must await basement dating. The major part of the volcanics deposited on that basement is represented by 250-m-thick pyroclastic flows, which probably accumulated during a short period of time after the oceanic crust of Site 768 was formed. Brown clay deposition continued above the tuffs, for about 30 m, after which the dominant lithology was greenish claystone. Sands and silts are abundant in the claystone, indicating abundant turbidity current deposition.

Quartz is abundant in Units II and III, and metamorphic grains are present, indicating a continental source. The clay mineralogy shows high illite and low smectite in these units, reversing in Unit I, again representing a dominant continental source in Units II and III. The sudden development of continentally derived turbidites in the middle Miocene (NN8) and a stratigraphic hiatus in Unit III, could be the response to the collision of the Cagayan Ridge with north Palawan. Increasing terrigenous influx from middle Miocene through the late Miocene may coincide with the development of this collision, magnified by the effects of the more recent collision of the Philippine mobile belt with the Cagayan, Palawan, and Sulu ridges.

Renewal of volcanism began during the late Miocene (NN11), but with a noticeable increase in the Pleistocene, associated with higher oceanic productivity. The onset of volcanism and decrease in terrigenous turbidites may have coincided with the development of the Sulu Trench.

Paleomagnetic results at Site 768 were outstanding. We recorded an excellent reversal stratigraphy from the Brunhes through the Gilbert (0-5 Ma), and possibly reversals 5D and 5E in the tuffs of Unit 4. We definitely recorded a rarely documented reversal at 1.1 Ma.

Site 769 (proposed site SS-5) was located on the southeast flank of the Cagayan Ridge, in 3644 m of water. The Cagayan Ridge is 120 km wide and is covered locally by reef carbonates (Meander Reefs, Cagayan Islands) and Quaternary volcanic rocks (Cagayan de Sulu Island). Discontinuous southeast-facing normal fault scarps apparently control its morphology. Individual scarps are over 500 m in relief, producing a cumulative relief of 500-1000 m above the deep (4000 m) southeast Sulu basin. Sediments filling this basin abut the base of the first scarps, preventing confident seismic stratigraphic correlations between ridge and basin.

The paleomagnetic results are good from the surface (Brunhes) to the Gilbert chron, and show an excellent and remarkably continuous record from the Gilbert chron through chron 11. Very precise correlations can be made between Holes 769A and 769B using the susceptibility record, and evidence of block faulting within the site is seen from the record of inclination in the cores, in excellent agreement with the seismic record.

Inorganic geochemical analysis of pore waters showed increasing Ca and Mg in the lower part of the site, suggesting a source of Mg in the underlying volcanic sequences.

Site 771 (proposed site SS-5A) on the Cagayan Ridge was drilled in 2859 m of water to a total depth of 304.1 mbsf (Fig. 1). The major increase in carbonate content of the cores in Sites 768, 769, and 771 near the end of the Pliocene indicates a rapid drop in the CCD. The low carbonate and high CCD in the late Miocene and early Pliocene can be the result of the closing off of the basin due to collisions. The drop of the CCD in the Pliocene-Pleistocene may indicate variations in depth of the sills present either between Mindoro and north Palawan, or along the Sulu archipelago where a recent volcanic arc was built. Additionally, this corresponds to a global deepening of the CCD recognized in all the major oceans at that time.

The eruption of tuffs and lapillistones corresponds closely in time with the opening of the Sulu Sea, as shown by formation of the crust at Site 768 in the early middle Miocene. The radiolarian assemblage overlying pyroclastics at Site 768 are about the same age as that found overlying the tuffs at Sites 769 and 771, but the gross compositions of this volcanic material is different (rhyolitic vs. andesitic), so we are not sure of the parentage of the Site 768 pyroclastics.

The tuffs on Cagayan Ridge may represent the last stage of arc volcanism for the ridge, or they may correspond to a short volcanic event resulting from passive margin rifting (analogous to that observed on the Vøring Plateau). On the basis of a roughly similar seismic reflection signature and visual description of drilled material, neither hypothesis can yet be disregarded. Compared with Site 768, the sediments overlying the brown clay are characterized by the lack of turbidites, illustrating that the present elevated position of the Cagayan Ridge was similarly elevated during all of the Neogene.

CONCLUSIONS

The Celebes Sea formed in open ocean conditions in the middle Eocene. The CCD lay between the ancient water depths of Sites 767 and 770. The basin approached close enough to a continental landmass, probably Sundaland, by late early Miocene time to be receiving significant amounts of land-derived detritus, and in the late middle Miocene the deeper Site 767 recorded high rates of turbidite deposition from a continental source. In contrast, the late Miocene to Pleistocene source terrain was volcanic and not continental, suggesting that the development of the north Sulawesi and Cotabato trenches has diverted the continental source material from the central part of the basin to its margins. The volcanism could also be related to increased subduction of the Molucca Sea plate beneath the Sangihe arc.

The Sulu Sea formed in the late early to early middle Miocene, nearly concurrently with the cessation of volcanism on the Cagayan Ridge. Early outpourings of rhyolitic to dacitic pyroclastic flows marked the early formation of the basin, sandwiched within the deposition of a brown, smectite-rich claystone. Andesitic tuffs of similar age underlie the pelagic sections at Sites 769 and 771, but any genetic relationship is as yet unclear. Thick, continentally derived turbidites in the late middle Miocene at Site 768 coincide with those seen in the Celebes Sea, and may indicate a common source, very likely Borneo, where an active mountain belt was shedding abundant debris at that time. Volcanogenic sedimentation dominates the non-biogenic components in the Pleistocene, probably indicating the initiation of the Sulu Trench and volcanoes on the Sulu Ridge.

Stress measurements at Sites 770 and 768 in the Celebes and Sulu basins show a northeast orientation of the maximum horizontal stress. This result shows that the dominant factor in the production of stress within these basins is the collision between the basins and associated ridges with the Philippine mobile belt. No indication of the impact of the Australian continent is seen, nor do the thrusts on either side of the Sulu Ridge play a role in generating stress within the basins. The Sulu Trench may be inactive or else it possesses very low shear resistance.

Maturity of the terrestrial type of organic matter at Site 768 reaches the stage of thermal hydrocarbon generation at a shallow subbottom depth, indicating a high thermal gradient above 100°C/km. Actual thermogenic gas generation was observed at this site.

Calcium and magnesium in interstitial waters show positively correlated increases with depth in the lower parts of the sedimentary sections of Sites 767, 768, and 769. Because normal alteration products of basalt scavenge magnesium, these observations suggest the presence of a chemical mechanism of crustal alteration previously unsuspected in the oceanic crust.

Leg 124 has been remarkably successful in all facets, achieving excellent results in each of the major objectives of the leg, and producing important new data in paleomagnetism and sedimentary geochemistry that were not expected prior to the drilling.

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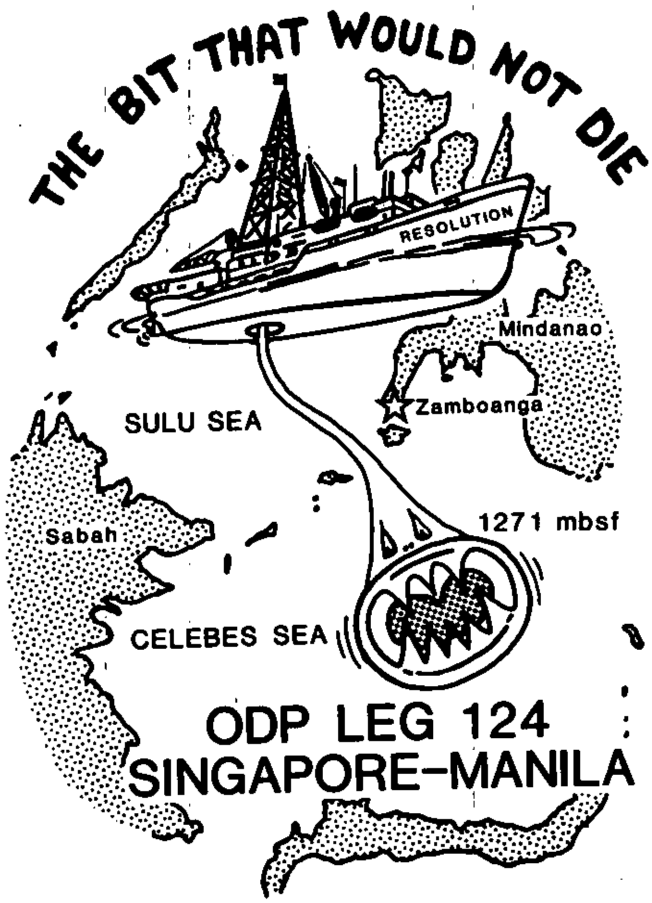
Table 1. Summary Site Information, Leg 124

Hole	Latitude (°N)	Longitude (°E)	Water Depth Meters*	Number of Cores	Meters Cored	Meters Recov'd	Percent Recov'd	Meters Total Penet.
767A	04°47.47'	123°30.21'	4905	1	4.2	4.1	98.6	104.0
767B	04°47.49'	123°30.20'	4905	78	739.0	585.1	79.2	739.0
767C	04°47.50'	123°30.21'	4905	13	114.1	44.7	39.2	794.1
768A	08°00.05'	121°13.16'	4385	1	9.5	8.8	92.6	101.5
768B	08°00.05'	121°13.19'	4385	40	364.1	293.8	80.7	364.1
768C	08°00.04'	121°13.18'	4385	100	915.3	525.5	57.4	1271.0
769A	08°47.14'	121°17.65'	3644	7	65.4	68.5	104.7	65.4
769B	08°47.12'	121°17.68'	3644	32	290.2	281.6	97.0	290.2
769C	08°47.12'	121°17.69'	3644	12	115.8	51.6	44.6	376.9
770A	05°08.70'	123°40.24'	4505	2	10.9	1.6	14.7	10.9
770B	05°08.69'	123°40.10'	4505	21	201.6	112.4	55.8	474.1
770C	05°08.69'	123°40.11'	4505	12	115.8	54.8	47.3	529.5
771A	08°40.69'	120°40.78'	2859	18	168.7	89.8	53.2	304.1

* Depths are drill-pipe measurements corrected to sea level.



LEG 124E: ENGINEERING LEG PRELIMINARY REPORT

INTRODUCTION

This special engineering leg was planned to satisfy the need for improved drilling technology in order to achieve scientific objectives for the Ocean Drilling Program. On Leg 124E, therefore, several developmental tools and operational techniques were tested at sea, including the diamond coring system (DCS), the modified navidrill core barrel (NCB) system, phase 1 of the pressure core sampler (PCS), the redesigned extended core barrel (XCB), coring techniques in deep-water chert sequences, and logging technology developed by the Borehole Research Group at Lamont-Doherty Geological Observatory.

The engineering and technology requirements of the JOIDES science community have been growing over the past several years. The complexity of tasks facing the ODP Engineering and Drilling Operations group is greater than ever. To achieve the desired result - the accomplishment of heretofore unattainable goals - requires a high level of cooperation between ODP and JOIDES. Key factors in the cooperative effort are improved communications between development engineers and JOIDES panels, more advanced planning (3- to 4-yr plans) including better definition of technical requirements and science goals, more thorough shore- and sea-based test programs, and, finally, adequate funding levels for critical development projects and equipment.

To conduct the necessary sea-based tests, the concept of dedicated engineering legs has been discussed for several years within the Ocean Drilling Program. The opportunity to utilize *JOIDES Resolution* for testing developmental tools and evaluating new operational techniques, independent of science objectives, is indeed timely. Such things as vessel motion (operational handling and deployment considerations), marine corrosive atmosphere (rust and corrosion effects on mechanical actuation and hydraulic sealing), and ambient downhole conditions of temperature and pressure can rarely be modeled effectively in a shore-based test. Proper testing at sea is critical to development of any efficient and reliable operational system.

Leg 124E, the first ODP cruise dedicated to engineering, has been an important step in improving ODP system sea-trials testing. It is hoped that the concept of dedicated ship time for engineering testing will continue as a pivotal element in future planning and will help ensure successful hardware development. As such, the complex scientific requirements of the future can be confidently planned for and accomplished.

ENGINEERING OBJECTIVES

Major engineering objectives of Leg 124E included the following:

1. Shallow-water concept evaluation of the new diamond coring system (DCS).
2. Continued operational evaluation of the developmental navidrill core barrel (NCB) system.
3. Prototype testing of the pressure core sampler (PCS), phase 1.
4. Performance testing of the newly redesigned extended core barrel (XCB).
5. Performance evaluation of ODP coring systems in deep-water chert sequences.
6. Testing and evaluation of Lamont-BRG logging technology.
7. Evaluation of deep-water operating capabilities of *JOIDES Resolution.*

SCIENTIFIC OBJECTIVES

Although the scientific objectives of Leg 124E were secondary to the engineering objectives, some were related including:

1. Describing and curating the cores recovered, especially the nature of the rock, the degree of drilling disturbance, and physical and magnetic properties.

2. Running a comprehensive logging program planned at the ENG-2 site (now Site 776), designed to augment previous results at DSDP Site 453, where core recovery averaged 39%.

3. Dedicating a number of the cores collected in the course of the engineering tests to a geriatric-core study. The study will systematically monitor changes in faunal assemblages, chemistry, and physical properties over an indefinite period of time, which began with initial core recovery aboard ship. Repeated subsampling and measuring the dedicated cores is scheduled after they have been stored in the ODP repository. An understanding of the scientific importance of the changes that occur in these cores during storage is vital to core analysis in general.

PRINCIPAL RESULTS OF SITE DRILLING AND ENGINEERING

In the following pages, an account is given on a site-by-site basis of the drilling and engineering activities, as well as the scientific results, that took place on Leg 124E (see Figure 1). The Operations Report that follows this report complements and expands the site reports.

Site 772 (proposed site ENG-1A; 16°39'N, 119°42'E; 1540 m water depth) was selected as an alternative to the Luzon Strait site (proposed site ENG-1) while en route to the latter. It was an attempt to find a suitable lithology for a DCS test in a more sheltered (sea state and current) environment than that anticipated at ENG-1. Site requirements included shallow water (1000-1600 m), limited sediment cover (100-200 m), and relatively shallow basement rock. Hole 772A was drilled to a total depth of 361 mbsf (1901 mbsl).

Engineering Results. The DCS was not evaluated at Site 772, since it was determined that basement was not reachable at a shallow enough depth. The total-depth capability of the DCS "test" system for Leg 124E was 2000 m. We wanted to core a minimum of 100 m of crystalline rock with the DCS. This was not possible, since basement had not yet been reached at 1901 mbsl. However, while coring the upper 351 m at the site, three other developmental systems were tested. Phase 1 of the newly completed PCS, the latest version of the XCB, and an expanded version of the pore water sampler "colleted" delivery system were all deployed.

The PCS was used twice, first inside the drill pipe near bottom (as a pressure test), and then a second run in sediment. A maximum hydrostatic pressure of 2200-2300 psi was recovered. Core was recovered on the second run but only at 500 psi retained pressure, well below calculated hydrostatic pressure. The reason for the low pressure was identified and corrected.

The XCB-124E system was deployed 10 times in several test configurations. The system held up well mechanically and was deemed successful from a handling/redressing perspective. Many more deployments in a variety of formations will be required to fully evaluate the system.

A "dummy" pore-water sampler (WSTP) package was deployed on the new "colleted" delivery system. That system decouples the water sampler from pipe motion through a 22-ft-long slip joint (increased from 11 ft in earlier models). The system was used only once and was evaluated primarily for ease of rig-floor handling.

In summary, the DCS testing was deferred to the original ENG-1 site. The limited PCS system tests were successful. Additional testing is essential for a complete evaluation of the system. The few XCB deployments were considered successful from a mechanical-integrity point of view but were deemed inadequate to draw any sweeping conclusions regarding overall system performance. Significantly more XCB testing is required. The mechanical handling and deployment testing of the new "22-ft, extended stroke" WSTP was completed successfully.

Scientific Results. Lithostratigraphic results revealed the expected

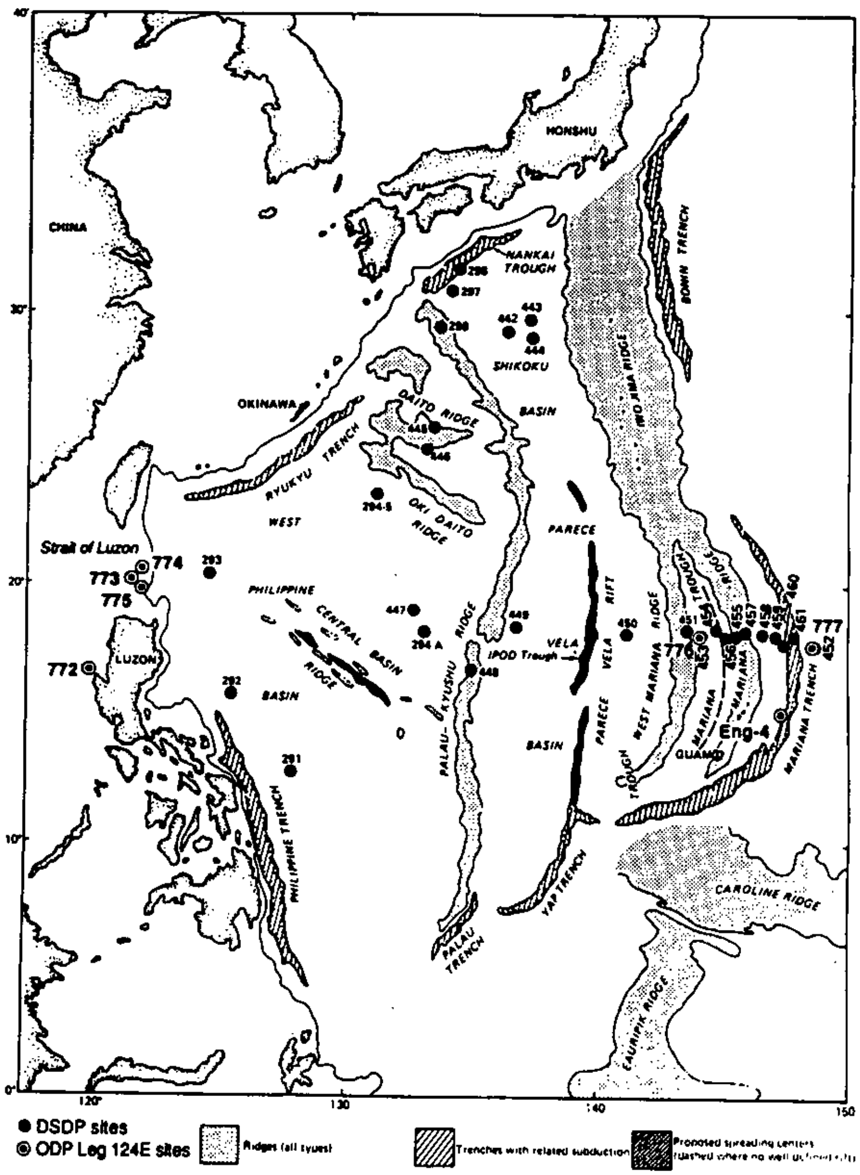


Figure 1. Map of western Pacific region showing DSDP sites and ODP Leg 124E sites. (Adapted from Hussong et al., 1982, Fig. 1).

hemipelagic clayey sediments at this site. Numerous core samples were collected for the geriatric-core study and will prove useful for long-term monitoring plans.

Paleomagnetics results indicated that the upper part of the cored interval is correlative with the Brunhes, and the base of Core 124E-772A-11X probably is slightly older than the Jaramillo.

Physical-property studies showed that the siliciclastic clay in the upper 5 m of the cored section was highly over-consolidated. Sediment in the 5-45-mbsf interval was normally consolidated. Sediment below this level was highly underconsolidated, apparently as a result of the XCB coring process; these cores were all highly disturbed. Four major geotechnical zones were delineated on the basis of physical-property determinations. The boundaries of these zones correlate with major seismic horizons on a high-resolution profile of the site vicinity.

Site 773 Two holes were drilled at Site 773 (proposed site ENG-1; 20°12.3'N, 121°39.2'E; 1604 m water depth). Hole 773A was terminated at a total depth of 137.4 mbsf (1741.4 mbsl). An apparent rubble zone was encountered between 119 and 134 mbsf. Several ledges were identified also in that zone. The formation was composed primarily of interbedded clay and rubble. Gabbro was recovered in the core catcher of the last XCB core, indicating that basement may have been close. Unfortunately, formation instability in the rubble zone made the hole inappropriate for deployment and testing of the DCS.

Engineering Results. The XCB-124E system was deployed twice as spot cores between washed intervals. Again, just as in Hole 772A, no conclusions could be reached concerning overall system performance. There were no mechanical failures.

Hole 773B was drilled to a depth of 98.7 mbsf so as to position the drill pipe above the unstable rubble zone encountered while drilling Hole 773A.

Plans were to keep the 5 1/2-in. drill pipe above the unstable rubble zone so that it would not become stuck during subsequent DCS coring operations. Drilling through the rubble and underlying basement would have been a good demonstration of the DCS potential.

The first deployment of the DCS occurred at Hole 773B under less than ideal wind and sea conditions. A thorough evaluation of the DCS took place despite the ship's heave amplitude and period exceeding the design parameters of the DCS (Table 1).

Although some aspects of the DCS were not tested, many positive highlights of the system were identified as well as some improvements to be implemented prior to future shipboard testing. Highlights of the DCS testing at Site 773 include the following:

1. Established the feasibility of handling and deploying a slim-hole DCS through ODP 5 1/2-in. drill pipe suspended from a floating vessel.
2. Demonstrated the concept of cutting core with a DCS in 1600 m of water under severe operating conditions.
3. Demonstrated successful secondary "active" heave compensation under environmental conditions exceeding the design parameters of the system.
4. Successfully tested the deployment, operation, and recovery of the DCS tubing string (3 1/2-in. working drill rod), including wedge-thread connections, without adverse effects.
5. Confirmed satisfactory performance of the DCS top drive, power pack, and mud-pump equipment.
6. Confirmed satisfactory performance of the DCS platform, mast, and feed-cylinder hardware.
7. Established the feasibility of spudding a sedimentary hole with an APC/XCB BHA and then deepening the hole to total depth with the DCS.

Necessary changes and improvements to any prototype system are always identified, based on the initial test deployment. That was also true of the DCS development.

Based on the Leg 124E sea trials, the following areas were singled out for improvement prior to the next DCS test:

1. All mining-industry wireline tools and coring components need to be strengthened to hold up better when deployed in the more rugged offshore, deep-water environment.

2. The core winch, installed on the platform, and used to recover the DCS core barrels, must be upgraded or replaced with a more standard "oilfield"-type winch equipped with mechanical braking, and level wind systems.

3. Handling/deployment time, although reduced significantly by the end of Leg 124E, must be improved still further. A variety of improvements can be made which will lead to significantly more efficient DCS rig-floor and platform operations.

4. Future deployments must solve the problem of hole instability leading to the sticking of the API 5 1/2-in. drill string. Use of a reentry cone and casing modified for DCS compatibility will aid in solving the problem.

Some aspects of the DCS were not tested on Leg 124E. The ability to penetrate and recover crystalline rock was not demonstrated. An evaluation of the wider kerf diamond core bits (4.0-in. OD by 1.87-in. ID) was not conducted. The dynamic effect of rotating a long tubing string inside API drill pipe, although evaluated at 120 rpm, was not investigated at the higher, 500- to 600-rpm speeds likely to be used in coring crystalline rock. Finally, the use of rig triplex mud pumps dressed with 5-in. liners was not evaluated for use in the DCS coring operation. In spite of the shortcomings, DCS testing on Leg 124E generated a large amount of data which is essential to the further development of the DCS for ODP operational use.

Scientific Results. The volcaniclastic claystone obtained at the site is characteristic of an island-arc environment. Additional core samples were collected and curated for the geriatric-core study.

Site 774 Two holes were drilled at Site 774 (proposed site ENG-1B; 20°12.3'N, 121°44.08'E; 1098 m water depth) in attempting to find basement and stable hole conditions for testing the DCS. The water depth of 1089 m would have been ideal for DCS testing owing to minimal wireline, drill-pipe, and drill-rod (tubing) round-trip times.

Hole 774A was drilled with an XCB bit and center bit to a total depth of 37.8 mbsf (1132.3 mbsl). The hole was terminated owing to extreme hole instability likely caused by the loose volcaniclastic sand penetrated at the mud line. When an overpull of 160,000 lb was required to free the drill string, the decision was made to terminate the hole.

Hole 774B was also drilled with an XCB bit and cutting shoe to a total depth of 255.9 mbsf (1344.9 mbsl). Basement rock was not reached, and hole stability deteriorated until eventually the drill pipe became irretrievably stuck. After 12 hr, and a maximum overpull of 510,000 lb failed to free the pipe, a drill-string severing charge was deployed and the hole was abandoned. It is suspected that the same accumulation of volcaniclastic sand encountered in Hole 774A was responsible for the sticking of the drill pipe in this hole.

Weather conditions at the site were extremely rough and contributed to the difficulty in maintaining adequate hole stability. No developmental tools were deployed or evaluated at the site.

The main scientific result achieved at the site was a satisfactory water-gun profile obtained during underway-geophysics surveys.

Site 775 Three shallow holes were spudded at Site 775 (proposed site ENG-1C; 19°51'N, 121°42.98'E; 506 m water depth) again in attempting to find suitable conditions to test the DCS. The site was located on a seamount in Luzon Strait. The shallow water depth, as mentioned earlier, made trip times much less costly. Basement was virtually assured, but adequate sediment cover for spudding was questionable.

After an intense search for a sediment pond, using the underwater television system (VIT), Hole 775A was spudded. After 6.0 m of penetration had been made in well-cemented volcaniclastic sand, drilling was halted, and the VIT system was deployed for confirmation of spud-in. The bit had indeed penetrated sub-bottom, and the site appeared drillable. The pipe was pulled clear of the mud line, since drilling could not proceed with the VIT system deployed around the drill string.

Hole 775B was spudded "blind" and was drilled to a total depth of 20.5 mbsf (526.5 mbsl). The hole was abandoned owing to unstable hole conditions (surface volcaniclastic sand) complicated by severe sea conditions.

Hole 775C was successfully spudded and drilled to a total depth of 11.2 mbsf (517.2 mbsl). However, this hole also proved unstable owing to abundant volcaniclastic sand. Extremely bad sea conditions causing large-amplitude, short-period heave conditions, coupled with untenable hole stability, ultimately forced the abandonment of all the holes at this site.

All holes were drilled using an XCB bit with a wash barrel in place. No developmental tools were deployed or evaluated at this site.

Upon completion of Site 775 a transit was made to Luzon Island, where the lee of the island afforded protection for offloading the DCS hardware and personnel. During the offloading process, five stands of 5-in. drill pipe were run, and the latching system for the Japanese "ONDO" temperature-measurement system was tested. That system is scheduled for operational deployment on the Nankai Trough leg. The latch system was deployed seven times without success until enough additional weight (heavy-weight sinker bars) was added to the tool. The latch system was then successfully deployed twice with a total weight of 1073 lb (487 kg) below the tool. Although it was identified that more weight was required for the deployment than estimated, the weight of the ONDO tool itself should be more than enough to allow a successful operational deployment.

Site 776 Site 776 (proposed site ENG-2; 17°54.4'N, 143°40.95'E.; 4713.4 m water depth), in the western part of the Mariana Trough, coincides with the location of DSDP Site 453. Site 453 was cored to a total depth of 455.5 mbsf, with an average core recovery of 39%. The rocks near the bottom of Hole 453 were identified as altered polymict igneous breccias overlying intensely sheared gabbro cataclastites and were not considered to constitute "true" basement (Shipboard Scientific Party, 1981).

Hole 776A was drilled to a total depth of 532.5 mbsf, or an estimated penetration into "basement" rocks of about 100 m. Unfortunately the hole fell in around the drill string and was lost, along with the bottom-hole assembly and part of the drill pipe. Time constraints did not allow drilling a second hole.

Loss of the hole made it impossible to obtain logging data from the two new Schlumberger combination tools - the "quad combo" and the geochemical tool with its high-temperature litho-density module. It was possible to make minimal tests of the qualitative performance of the new hardware and software in the drill pipe after the pipe was severed and pulled above the seafloor. These tests indicated that the new configurations worked successfully without any apparent interference between the nuclear modules. Hole cooling-by-pumping tests were not possible without having a hole in hot rock. The wireline heave-compensator tests were made successfully in the pipe from 90 to 2000 meters below the rig floor (mbrf), and these measurements probably were just about as useful as measurements in an open hole would have been. Data obtained included heave-induced acceleration of the ship measured by an accelerometer in the hull, acceleration of the Schlumberger geochemical tool measured by the GPIT module near the top of the tool, and line tension measured at the logging winch.

Site 777 (proposed site ENG-3; 17°42.2'N, 148°41.8'E; 5810.5 m water depth) coincides with the location of DSDP Site 452. Site 777 was chosen to evaluate the possibilities of achieving scientifically acceptable core recovery in interbedded chert and softer-sediment lithologies. Five shallow holes were drilled, with sub-bottom penetrations ranging from 39 to ~60 mbsf.

Engineering Results. No soft sediment was recovered in any of the XCB or NCB cores below the first occurrence of chert. The drilling records can be interpreted to suggest that the chert is not uniform but contains clay layers or is at least fractured. In any case, the chert/porcellanite did not present itself as a stable, hard formation to be smoothly cut by the diamond coring shoes of the XCB or NCB tools.

Attempts to core the chert beds with the XCB system were unsuccessful. A few pieces of chert were recovered with partially trimmed surfaces matching the cutting shoe inner diameter, but the trimming operation was never completed because the chert apparently fractured before a full cylinder could be produced and "fed" into the core liner past the core catchers.

The NCB showed more promise than the XCB in coring interbedded chert and clay but will not be worthy of scientific commitment to such interbedded lithology until certain improvements can be made to the overall NCB system. Additional land testing of both XCB and NCB systems is scheduled later in 1989.

A positive aspect of drilling at this site was that five holes were spudded into 38-41 m of pelagic clay and deepened into the chert layers without damage to the BHA. The possibility of such damage was considered a significant potential problem before the site was drilled. The improvements in heave compensation used on *JOIDES Resolution,* as compared to the bumper subs used on Glomar Challenger, make the spudding operation relatively routine, albeit slow, with as little as 38 m of extremely soft and unsupportive sediment over the hard chert/porcellanite unit.

OPERATIONAL STRATEGIES FOR OBTAINING SCIENTIFIC OBJECTIVES

Drilling at Site 777 demonstrated that XCB and NCB techniques as they presently exist are not capable of efficient drilling and recovering core in formations dominated by chert and porcellanite. The XCB cutting shoe is not sufficiently robust to withstand quick abrasion in these formations, and when penetration is achieved, XCB recovery is no better than with standard rotary drilling (RCB). NCB recovery is occasionally more encouraging, but the cores cut at this site, because of their fractured nature, usually jammed in the core catcher after only a small amount of recovery.

No soft sediment was recovered below the uppermost layer of chert/porcellanite in any of the Site 777 holes, although some fine-grained chert material was recovered that had been pulverized by the drilling process. Because of ambiguity in interpreting the drilling records, it is difficult to draw conclusions about the coring systems' capabilities to recover original soft sediment interbedded with cherts. Testing on land is needed to document the recovery capabilities of both of the systems in alternating hard and soft formations under ideal conditions. The Upper Cretaceous chert and chalk sequences of the southern English or French Normandy coasts should be an excellent physical analogue of many deep-sea formations.

SUMMARY AND CONCLUSIONS

Many positive results were achieved on this first drilling leg dedicated to testing new tools and technology under operational conditions. The diamond coring system firmly established the feasibility of handling and deploying a slim-hole diamond coring system through ODP 5 1/2-in. drill pipe suspended from a floating vessel and cutting a core in 1600 m of water under severe operating conditions. Necessary improvements were identified, which could only have shown up on sea trials. These include developing more rugged core-barrel systems and the need to solve the problem of hole instability. The improved XCB system generally worked well and proved to be decidedly better than the previous model. The NCB had two or three failures unrelated to drilling and performed better than the XCB in the chert sequences.

Other tools performed well, including the latching system for the Japanese "ONDO" temperature-measurement system, the PCS, and the pore water sampler "colleted" delivery system.

Finally, one of the most important benefits of the engineering leg was observing first-hand the various coring and drilling systems and how they operated (in what were mostly adverse conditions of high winds and seas), and above all, learning what and how improvements to these systems need to be made to bring about more effective implementation on future ODP legs.

AFTER LEG 124E

Following the DCS deployment on Leg 124E, the system was shipped back to the United States for modifications while ODP's engineers began to study the feasibility of extending the DCS to a 3500-4500-m system. The overall DCS results on Leg 124E were encouraging to the point that no major component design or concept errors were encountered operating the 2000-m system. The 2000-m system was used only as a low-cost Phase I attempt at a deeper water system.

Table 1 lists the Leg 124E/DCS highlights and areas for further study. Since their return from Leg 124E, ODP's engineers have been looking at how extending the DCS system to a 3500-4500-m system affects: 1) drill rod integrity, 2) secondary heave compensation, 3) platform safety, 4) electric vs. hydraulic top drive, and 5) improved DCS wireline winch. There are also numerous small improvements that must be made to the handling, rig-up, and deployment of the DCS to enhance both speed and safety on the rig floor.

The concept of utilizing a "piggy-back" DCS system from a floating vessel was realized successfully during Leg 124E. The next deployment of the DCS system from *JOIDES Resolution* will be on the next engineering leg in May-June 1990. Prior to that occurrence, ODP plans to conduct two land tests, one in the western United States and one in the United Kingdom on interbedded chert/chalk formations near the English Channel. The constraints to conducting the U.K. testing may be either fiscal or regulatory in nature, and ODP is working currently with BGS to take care of potential regulatory problems well in advance.

REFERENCES

Hussong, D. M., Uyeda, S., Knapp, R., Ellis, H., Kling, S., and Natland, J., 1982. Deep-Sea Drilling Project Leg 60: cruise objectives, principal results, and explanatory notes. *In* Hussong, D. M., Uyeda, S., et al., Init. Repts. DSDP, 60: Washington (U. S. Govt. Printing Office), 3-30.

Shipboard Scientific Party, 1981. Site 453: west side of the Mariana Trough. *In* Hussong, D. M., Uyeda, S., et al., Init. Repts. DSDP, 60: Washington (U.S. Govt. Printing Office), 101-167.

TABLE 1: TEST RESULTS OF THE 2000-M DIAMOND CORING SYSTEM ON LEG 124E

Test results of the Diamond Coring system accomplished the following:

*Established feasibility of handling/deploying DCS at sea

*Demonstrated concept of cutting DCS core from floating vessel

  *In 1600 m water depth

  *Under severe environmental conditions

*Proved secondary compensation functioned successfully under environmental conditions exceeding design parameters

  *Design: WOB ± 500 lb, 4-6 ft heave, 8-second period

  *Actual: WOB ± 500 lb, 4-6 ft heave, 4-second period

*Drill rod string with wedge thread connections performed well

*Top drive, hydraulic power pack, mud pumps, platform, mast, and feed cylinder all performed satisfactorily

The tests indicated the following improvements:

*Strengthen wireline tools for rugged deep-water environment

*Upgrade core winch - add brake and levelwind features

*Improve umbilical design

*Reduce handling/deployment time and upgrade depth capability

*Develop means to control upper hole stability

ODP SITE SURVEY DATA BANK REPORT

The JOIDES/ODP Data Bank received the following data between January 1, 1989 and April 30, 1989. For additional information on the ODP Data Bank, please contact Carl Brenner at Lamont-Doherty Geological Observatory, Columbia University, Palisades, NY 10964.

- From G. Moore, HIG: Additional multichannel seismic profiles from the 1987 FRED MOORE survey of the Bonin Arc (lines II-1, I-16, I-17 and I-3); MCS profiles from 2-ship survey of the Nankai Trough (lines NT-62-4, 62-5, 62-6, 62-7 and 62-8).

- From P. Fryer, HIG: R/V SONNE seabeam bathymetry from the Conical Seamount area.

- From R. Hyndman, PGC,Canada: Selected MCS and SCS lines, with SeaMARC II bathymetry, gravity contour map, magnetic contour map and geothermal heat probe data, all in the Cascadia subduction zone area.

- From R. Hyndman, PGC, Canada: Digital single-channel seismic lines; gravity, bathymetry and magnetic contour maps; SeaMARC II mosaic, and geothermal heat probe data in the Cascadia margin area.

LEG 125: BONMAR SITE REPORTS

INTRODUCTION

The Bonin-Mariana region is made up of a complex series of arcs and basins formed since the start of westward subduction of Pacific lithosphere in the Eocene. ODP Legs 125 and 126 have been designed to study three important and poorly understood aspects of this system, namely:

1. The origin and evolution of the forearc terranes, to be investigated by drilling a series of holes through the sediments and into the basement of the Bonin forearc basin (proposed sites BON3 through BON6) and into three serpentinite seamounts from the Mariana outer-arc high (proposed sites MAR3A and MAR3B) and Bonin lower slope terrace (proposed site BON7).
2. The process and products of arc rifting, to be investigated by drilling two holes (proposed sites BON1 and BON2) into the center and eastern wall of the Sumiso rift within the active Bonin arc.
3. Dewatering of the subducted lithosphere, to be investigated indirectly from the composition of the forearc basin and rifted arc volcanic rocks recovered from proposed sites BON1-BON6, and directly from the analyses of fluids, chemical precipitates, and metamorphic rocks from the serpentinite seamounts at proposed sites MAR3A, MAR3B, and BON7.

The following site summaries were received from Leg 125 Co-Chief Scientists Patty Fryer and Julian Pearce immediately after operations at each site were finished.

<u>Site Summary, Site 778</u>
Latitude: 19°29.93' N
Longitude: 146°39.94' E
Water Depth: 3913.7 m

Site 778 (proposed site MAR-3B) is situated about halfway up the southern flank of Conical Seamount, a 1500-m high cone-shaped serpentinite diapiric seamount located on the outer-arc high of the Mariana forearc basin, about 100 km west of the trench axis. Site selection was based on a SeaMARC II side-scan sonar image of the seamount which indicated recent serpentinite flows as areas of high sonar backscatter. The site was located in the center of a major flow. The principal objectives were to penetrate the serpentinite flows on the seamount flank, the underlying sediments, and, if possible, reach the forearc basement. Drilling would provide information on the construction of this kind of serpentinite seamount, the internal mineralogy, petrology and geochemistry of serpentinite flows and their entrained clasts, the chronology of serpentinite extrusion, and the nature and metamorphic history of the forearc lithosphere.

Hole 778A was spudded at 1445Z on 22 February 1989, and was RCB-cored to 107.6 mbsf. Episodes of hole instability required repeated washing-out of the hole, and finally, at 0700Z on 24 Feb., prevented further drilling. The lack of stability was attributed to the friable and heterogeneous nature of the serpentinite flows (hard clasts of variable size in a soft matrix). Recovery of the cored intervals was low, averaging 13.7%.

Two lithostratigraphic units are recognized at Site 778: a serpentinite-rich clay-marl-breccia (Unit I); and a phacoidal sheared serpentinite (Unit II).

➡Unit I: (Subunit IA; 0-7.2 mbsf) middle/upper Pleistocene-Recent serpentine-rich sediment. The uppermost portion has two pebbles (one limestone and one serpentinite) overlying 15 cm of pale blue-gray serpentine clay. Below this is 15 cm of gray-green serpentine clay, 10 cm of red-orange serpentine clay and 1.5 m of pale blue-gray, clay-sized serpentine (containing 80% serpentine, 10% opaques, 5% epidote, 5% zoisite, and trace amounts of chlorite, thulite, glass and micrite). The bottom of this unit is a breccia which extends to the base of Core 125-778A-1R (an interval of 357 cm) and through the upper 50 cm of Core 125-778A-2R. The upper 0.9 m of the breccia is composed of serpentine and shows extensive drilling disturbance; the remainder has a light reddish-brown matrix of sandy silt-sized serpentine occasionally mottled by mixing with a light gray and light olive serpentine-chlorite-rich marl. It is suspected that the admixture of detrital and serpentine material within this subunit may indicate either drilling disturbance or incorporation of sediment into a remobilized serpentine flow.

➡Unit I: (Subunit IB; 7.2-29.8 mbsf) lower-upper Pleistocene sediment giving poor recovery. It contains a sandy marl and a collection of cobbles and pebbles including serpentinite, vesicular volcanic rocks and a foraminifera-bearing serpentinite sandstone.

➡Unit II: (29.8-107.6 mbsf) This entire unit is made up of phacoidal, sheared serpentinite. Its matrix is composed of: 50-80% serpentinite, 5-20% opaques, 0-25% thulite, 0-20% epidote, 0-15% chlorite, 0-10% zoisite, 0-5% talc, 0-5% olivine and traces of albite and micrite. A variety of clasts are present: variably serpentinized, tectonized harzburgite (80%); metabasalts (15%); and other fragments including metagabbros, serpentinized dunites and vein materials such as talc, carbonates and quartz (5%).

The 1.5 m of clay-sized serpentine in Unit IA is interpreted as a serpentine flow because of lack of pelagic or detrital components, the atypical color, and the absence of biological or sedimentological structures. The mottled interval below this flow may also be a flow, but contains both detrital and serpentinite materials.

Dating is based on limited magnetostratigraphy and sparse biological components. In the interval 0.5-1.5 mbsf a reversed component of magnetization gives a minimum age of 0.73 Ma, the age of the last reversal. Biostratigraphic data indicate a middle or late Pleistocene age in Subunit IA at 7 mbsf and an early Pleistocene age in Subunit IB (approx. 1.7 Ma) at 29.5 mbsf. The youngest serpentinite flows can thus be dated as Pleistocene. There has been very little sediment accumulation since the youngest flow was deposited.

The ultramafic clasts in the cores are of two types: serpentinized, tectonized harzburgite (70-85% olivine, 15-25% orthopyroxene, with minor quantities of clinopyroxene, mainly as exsolution lamellae in orthopyroxene, and a Cr-rich spinel); and serpentinized dunite. There are several types of variably metamorphosed mafic clasts in the cores. These include metamorphosed volcanics which contain plagioclase-clinopyroxene and/or orthopyroxene phenocrysts or orthopyroxene-olivine-Cr spinel phenocrysts in a glassy ground mass. One metagabbro was observed. A few metabasalts show medium grade metamorphism (one contains blue amphibole).

The serpentinite flow sequence in Unit II exhibits a number of structural features, including microbrecciation, ductile shearing of clasts, shear zones on all scales (mm, cm and dm), a variably developed foliation parallel to shear-plane orientations, and open-to-isoclinal folding of bedding and foliation planes. These features can be interpreted in terms of a combination of primary mantle tectonism, stresses related to intrusion and protrusion (flow emplacement) of the serpentinite diapir materials, and stresses resulting from post-protrusion remobilization.

Analyses of interstitial pore water samples show a 10% decrease in chlorinity downhole (over 107 m). This observation is consistent with the decreased Cl content of fluids seeping from chimneys at the summit of the seamount (collected by Alvin). The seep fluids are thought to have formed in part as a product of deserpentinization of the subducting Pacific plate. The decrease in chlorinity with depth in the hole is interpreted as a relative decrease in admixture of seawater with similarly chlorine-poor fluids entrained in the serpentine flow material (compaction effect?).

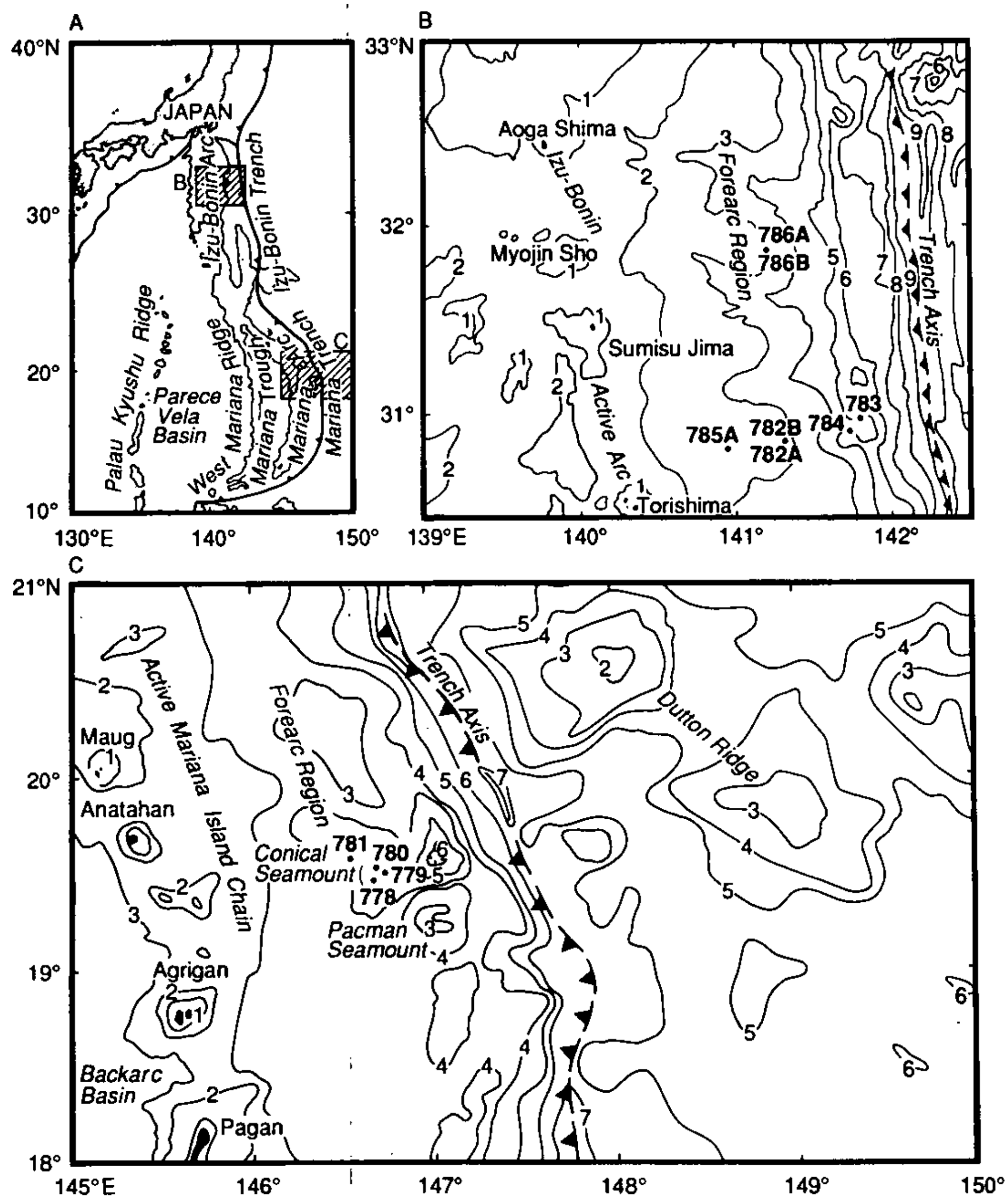


Figure 1. **A**. General location map for sites drilled on Leg 125 in the Bonin and Mariana arc systems. **B**. Sites drilled in the Bonin forearc. **C**. Sites drilled in the Mariana forearc.

The principal results can be summarized as: 1) The confirmation that forearc seamounts can be constructed from serpentinite flows emanating from a central diapir; 2) the evidence from clasts that low to medium-grade metamorphism characterizes the source region of the serpentinite diapirs; and 3) the evidence from water chemistry that dehydration of the subducted lithosphere may have played an important role in the serpentinization of the source region of the serpentinite diapirs.

Site Summary, Site 779
Latitude: 19°30.75' N
Longitude: 146°41.75' E
Water Depth: 3947.2 m

Site 779 is situated about 3.5 km northeast of Site 778 about halfway up the southeastern flank of Conical Seamount. Whereas site 778 was located on a recent serpentinite flow, site 779 was located to the east of this flow where backscatter was lower. In this way, we hoped for a greater sediment cover and better hole stability. Site 779 was a further attempt to achieve the objectives of proposed site MAR-3B. Basement was not reached at Site 778. Drilling Site 779 would permit another attempt to penetrate basement and would provide further information on the construction of this kind of serpentinite seamount, the internal mineralogy, petrology, and geochemistry of serpentinite flows and their entrained fluids and igneous and metamorphic rock clasts, the chronology and mechanism of serpentine extrusion, and the nature and metamorphic history of the forearc lithosphere. Hole 779B is a hydraulic piston core taken adjacent to Hole 779A to obtain a second section of the mudline sediment for analysis of authigenic minerals, of interstitial waters and of gases.

Hole 779A was spudded at 1700Z on 24 February 1989 and was rotary-cored to 317.2 mbsf. A free fall funnel was dropped at 170 mbsf (51 hr rotating time) and drilling continued until the bit was on deck at 1700Z on 3 March. Because of hole stability problems, Hole 779A was considered unsafe to log. Recovery averaged 22.9%. Hole 779A was cored into sediment just before re-entering Hole 779A.

Three major lithostratigraphic units were recovered at Site 779:

➡Unit I: (0-10.6 mbsf in Hole 779A and 0-9 mbsf in Hole 779B) Early Pleistocene-Recent unconsolidated sediments and unconsolidated serpentine flows comprising clay, clay-sized serpentine, and lithic fragments in a matrix of sand-, silt- and clay-sized serpentine.

➡Unit II: Subunit IIA (10.6-216.2 mbsf) Early Pleistocene-early Pliocene sheared serpentinite containing clasts of variably serpentinized harzburgite and subordinate variably serpentinized dunite and metabasalt in a serpentinite matrix.

➡Unit II: Subunit IIB (216.2-303.0 mbsf) Early Pliocene sheared serpentinite containing clasts of serpentinized harzburgite with subordinate serpentinized dunite, gabbro and metabasalt in a serpentinite matrix with intercalations of detrital serpentine sediments.

➡Unit III: Serpentinite breccia with convolute layering (303.0-317.2 mbsf).

Dating of Hole 779A is based on biostratigraphic data which give Pleistocene ages for Unit I (early Pleistocene at its base), and late Miocene/early Pliocene ages for the top of Subunit IIB (this section also contained reworked Oligocene nannofossils). Dating of Hole 779B is based on combined biostratigraphic and magnetostratigraphic evidence; the former gives Pleistocene ages; the latter indicates that the upper part of the hole is a record of the middle part of the Matuyama Chron (just below the Pliocene/Pleistocene boundary).

The serpentine-rich material in Subunit IIB contains recrystallized carbonate, kerogen and lithified filamentous bacteria which are coated with opaque minerals. The presence of kerogen indicates a primary sedimentary origin for this material, an interpretation supported by the presence of horizontal bedding within the same unit.

Hard rock lithologies are mostly of two types: serpentinized, tectonized ultramafics and subordinate metabasic rocks. The ultramafics are mostly harzburgite and subordinate dunite with similar primary mineralogies to Hole 778A. The degree of serpentinization is variable, but shows an overall decrease downhole; serpentinite veins are common showing a polystage filling history. Mafic clasts are predominantly metabasalt and metagabbro of primary mineralogy dominated by plagioclase and clinopyroxene and (in basalts) glass; one microgabbro is about 3 m thick in cored section. Common metamorphic minerals are clay minerals, chlorite, pumpellyite and rare albite and sphene.

Structures in the serpentinite indicate a complex history of deformation comparable to that described in Hole 778A. Detailed studies of Subunit IIA have shown that there is no regular arrangement between ultramafic clasts, suggesting that this unit represents a chaotic formation; the presence and orientations of brittle-ductile conjugate faults in the clasts of Subunit IIB indicate expansion about a vertical axis; the deformation of the matrix is consistent with gentle flowage under an applied load.

Studies of physical properties give average densities of 2010 $kg.m^{-3}$ for the serpentinite matrix and 2550 $kg.m^{-3}$ for the ultramafic clasts; the latter range from 1950 to 3090 $kg.m^{-3}$ according to the degree of serpentinization. Seismic velocities range from 3.0 to 6.9 $km.s^{-1}$, averaging 4.6 and 5.1 $km.s^{-1}$ for the hard rock clasts in the A and B directions, respectively. Thermal conductivities for hard rock samples range from 1.397 to 3.223 $Wm.K^{-1}$, averaging 2.148.

Analyses of interstitial pore water samples at Site 779 show quite different results from those of waters at Site 778. This indicates considerable lateral variation in interstitial water composition within the flank materials of the seamount. The pH of the waters from Site 779 rise rapidly with depth and reach a maximum of 11.9 at 100 mbsf. Alkalinity of the waters increases five-fold over the same interval. Ammonia and sodium content also increase. However, Ca decreases by 80% over this interval, in contrast to the waters from Site 778, which doubled in Ca content over a similar interval. At both sites 778 and 779 the salinity and chlorinity of the waters decreases by 10% over the first 100 mbsf. Potassium and sulfate also decrease. Dissolved magnesium is totally depleted below 80 mbsf at both sites. A striking difference between the sites was noted in the hydrocarbon contents of the fluids. Hydrocarbons increase dramatically with depth in Hole 779A, showing species through C3, and reach a maximum of 30% methane in one gas pocket sampled through the core liner in Core 125-779A-28R (225 mbsf). Some of the characteristics of the interstitial water composition can be explained by seawater-rock interaction at shallow levels, probably accompanied by bacterial sulfate reduction. However, to explain the complexities of the water data, particularly the large decrease in salinity and chlorinity, a different, presumably deeper source of fluids may be required. The fluid compositions are consistent with derivation as a consequence of deserpentinization of the subducting Pacific plate.

The principal results of Site 799 can be summarized as follows: 1) The site provides further evidence for the depleted nature of the mantle wedge beneath Conical Seamount; 2) Flowage of unconsolidated serpentine coupled with sedimentary processes are important in the construction of Conical Seamount; 3) Medium-grade metamorphism of the serpentinite source region has occurred; and 4) Water from the subducted slab appears to be an important source of fluids involved in the serpentinization of Mariana forearc materials.

Site Summary, Site 780

Hole 780A
Latitude: 19°32.15' N
Longitude: 146°39.27' E
Depth: 3086.8 m

Hole 780B
Latitude: 19°32.47' N
Longitude: 146°39.22' E
Water Depth: 3094.0 m

Hole 780C
Latitude: 19°32.53' N
Longitude: 146°39.21' E
Water Depth: 3083.4 m

Hole 780D
Latitude: 19°32.55' N
Longitude: 146°39.20' E
Water Depth: 3088.9 m

Site 780 (proposed site MAR-3A) is situated on the west-southwest side of the summit of Conical Seamount. Site selection was based on Alvin submersible dives, which showed this area to be sediment covered and marked by active venting of fluids and precipitation of material from solution. The principal objectives of this site were to investigate the mechanical properties of the center of the diapir, the composition and source of fluids associated with the venting, and the potential for ore deposition within serpentinite diapirs. In addition, this site was expected to provide further information on some of the objectives of proposed site MAR-3B (Site 779), in particular: the nature, composition and metamorphism of the forearc lithosphere; and the construction of the seamount.

Hole 780A was spudded with an APC at 0845Z on 4 March. The core barrel was bent on impact and only one partial core was recovered at 1830Z, 4 March. Hole 780B was spudded with an RCB at 0530Z (and respudded at 0645Z) on 5 March. Drilling ended when the sinker bar assembly failed to latch onto the core barrel during retrieval of the third core and both sinker bar assembly and core barrel were lost. Hole 780B officially ended at 1900Z, 5 March, when the BHA was back on deck, having recovered 10.34 m of core with a recovery rate of 57%. Hole 780C was spudded with an RCB at 1900Z, 5 March, recovering 1t cores with a recovery rate of 9% before high torque caused drilling to be abandoned. An attempt to log the hole was also abandoned when the hole closed in, although one temperature profile was obtained. Hole 780C officially ended at 1830Z, 8 March. Hole 780D was spudded using the new XCB at 0100Z (and respudded at 0700Z) on March 9, coring 30.9 m with a recovery rate of 28.1%. The hole was abandoned at 1345Z on 10 March at the request of the Co-Chief Scientists after the third deployment of the Water Sampler Temperature Probe (the principal objective for this hole). Overall success in drilling at this site was constrained by the interbedding of hard serpentinized peridotite and very soft serpentinite mud.

Two major lithostratigraphic units were recovered at Site 780:

- Unit I (0-3.5 mbsf in hole 780A; 0-18.2 mbsf in Hole 799B; 0-14.0 mbsf in Hole 780C; and 0-15.4 mbsf in Hole 780D) comprises middle Pleistocene-Holocene sand-, silt- and clay-sized serpentine with rare intervals of foraminifera-rich serpentine clay and serpentine-rich silty-clay.

- Unit II (14.0-163.5 mbsf in Hole 780C and 15.4-32.4 mbsf in Hole 780D) comprises intervals of serpentinized ultramafic rocks in a matrix of sandy silt- and silty clay-sized serpentine sediment.

The sediments in Unit I contain 65-75% serpentine with minor amounts of opaque minerals, aragonite and foraminifera, with trace amounts of zoisite, chlorite, nannofossils, spicules, silicoflagellates, diatoms and radiolarians. Dating at Site 780 is based on calcareous nannofossil and planktonic foraminiferal ages of middle to late Pleistocene in the upper portions of Holes 780A-D. The presence of delicate aragonite needles implies *in situ* authigenic growth after the serpentine with minor to trace amounts of opaque minerals, clay, zoisite, chlorite, micrite and garnet.

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Hard rock lithologies comprise serpentinized, tectonized ultramafics and subordinate serpentinized dunites with primary mineralogies similar to that of ultramafic rocks from Sites 778 and 779. Serpentinite veins are common, showing a polystage filling history. The muddy matrix recovered from Site 780 typically lacks the foliation and shear fabric of the matrix from the flank sites. The matrix may therefore be interpreted as the primary fabric of the upwelling serpentinite, upon which foliation and shear fabric are imposed by compaction, extension and pure shear during the downhill creep of serpentinite debris flows.

Logging in Hole 780C showed temperatures increasing steadily from seawater values (1.5°C) near the surface to 13.5°C at 60 mbsf; the Water Sampler Temperature Probe in Hole 780D gave a lower value, 3.5°C at 41 mbsf. It is possible that the higher temperatures in Hole 780C resulted from seepage of water into the hole from overpressured serpentine at about 130 mbsf. Studies of physical properties give a density range of 1750-2000 kg.m^{-3} and compressional wave velocities of 1.5 to 2 km.s^{-1} for the serpentinite matrix in Unit II. Rheological measurements indicate that this matrix is a weak, highly non-ideal, plastic material capable of supporting blocks up to 20 m across and compatible with models for diapiric injection of serpentinite.

Analyses of interstitial pore water samples at Site 780 revealed marked downhole chemical changes. In Holes 780A and 780D, for example, salinity decreases by 25%, chlorinity by 20%, Ca by >90%, Mg is totally depleted, sulfate nearly doubles, alkalinity increases from 2.5 to 34, pH increases from about 8 to 12.4, potassium increases significantly and ammonium increases from 0 to 210. In Holes 780A and 780D, these changes take place within a few meters of the seafloor, showing that the fluid entrained within the serpentinite may only mix with seawater at very shallow levels. The magnitude and direction of these changes also differs in significant ways compare to the flank sites.

The principal results of Site 780 can be summarized as follows: 1) High pH, high alkalinity, very low Mg fluids can exist within a few meters of the seafloor at the summit of Conical Seamount, indicating that mixing between entrained fluids and seawater need not take place at depth; 2) Rheological studies support a model for the origin of the seamount by diapiric intrusion of variably serpentinized clasts supported by a low-density, plastic matrix; and 3) Absence of deformation in the serpentinite matrix at the summit contrasts with the strongly sheared matrix at the flanks and suggests that much of the deformation of the serpentinite matrix at the flank sites was the result of surface or near-surface flow following diapiric intrusion.

<u>Site Summary, Site 781</u>
Latitude: 19°37.91' N
Longitude: 146°32.56' E
Water Depth: 4420.6 m

Site 781 (proposed site MAR-3C) is situated about 7 nautical miles northwest of the summit of Conical Seamount on the outer-arc high of the Mariana forearc basin, about midway between the active Mariana arc and the trench axis. The principal objectives of this site were to fulfil the unachieved aims of seamount flank Sites 778 and 779, namely to study the sediments and basement beneath the serpentinite seamount and hence to determine the age range of serpentinite diapirism and to characterize the type of crust into which the serpentinite was intruded. It was hoped that a site at the base of the seamount free of serpentinite flows would achieve these objectives. Precise site selection was based on six-channel seismic records which showed a strong reflector, possibly basement, at about 100 mbsf, a feature which was confirmed by a short underway geophysical survey.

Hole 781A was spudded with an RCB at 0315Z on 11 March, penetrating 250 m and recovering 39.6 m of core for a recovery rate of 15%. Most of the poor core recovery was in sediments below a basalt unit that was encountered between 72.3 and 91.8 mbsf. It was thought that very fine, unconsolidated sediment was being washed away ahead of the bit. Various attempts to improve recovery, including low pump-pressure drilling and the use of core-catcher socks, had no significant effect. Hole 781A was abandoned on reaching the 250 m limit set by the JOIDES Safety Panel, and officially ended at 0900Z on 13 March.

One lithostratigraphic unit and three subunits have been defined at Site 781:

➡Subunit IA (0-72.32 mbsf) comprises upper Pliocene-?Holocene diatom-radiolarian silty clay grading downwards into vitric silty clay and vitric clayey silt.

➡Subunit IB (72.32-91.80 mbsf) is vesicular, porphyritic basalt.

➡Subunit IC (91.80-250.0 mbsf) comprises middle-upper Pliocene to (?)lower Pliocene vitric silty clay and vitric clayey silt.

Structures within the sediments in Subunit IA indicate deposition from gravity-driven mass flows. At least nineteen turbidite sequences have been identified in Subunit IA, with thicknesses ranging from 1 to 180 cm, averaging 3-12 cm. Subunit IC contains lithologies similar to those in the lower part of Subunit IA, though poor recovery precludes detailed interpretation. Ages are based on calcareous nannofossil and foraminifera assemblages in both Subunits IA and IC, although the reworking, especially in Subunit IC, is a cause of ambiguity in the ages.

Subunit IB, which corresponds to the reflector on the seismic records, is massive basalt 13-25 m thick containing up to 30% phenocrysts and glomerocrysts of plagioclase, olivine and clinopyroxene in a fine-grained groundmass. The basalt also contains 2-10% vesicles which increase in abundance and size towards the center of the subunit. The top of the basalt has a 8-mm-thick chilled margin that is comprised of vesicle-free, fresh glass. There are no internal flow boundaries in the core recovered. The basalt may be a near-surface sill or a lava flow; the fact that its reverse magnetic polarity contrasts with the normal polarity of the overlying sediments is consistent with both possibilities.

Studies of physical properties revealed high densities and magnetic susceptibilities in the sediments recovered in the final core. However, closer inspection showed that these could be explained by the presence of metal filings introduced during drilling. The last core was drilled without pumping water in an attempt to improve core recovery.

Interstitial fluids from Site 781 show only very small chemical deviations from seawater composition downhole, more typical of a normal pelagic sequence. These results are in marked contrast to those of interstitial water studies at the previous three sites on Conical Seamount.

A principal point of interest from Site 781 is the presence of the thick massive basalt of Pliocene or later age, the first evidence for such recent magmatism in any extant intraoceanic forearc terrane. The origin, provenance, and precise age of this basalt, when determined, will necessitate some revision of forearc models.

<u>Site Summary, Site 782</u>
Latitude: 30°51.60' N
Longitude: 141°18.60' E
Water Depth: 2958.6 m

Site 782 (BON-6B) is located on the eastern margin of the Izu-Bonin forearc basin, about halfway between the active volcanic arc and the trench.

The principal objectives of this site were to determine 1) the stratigraphy of the forearc basin and hence the temporal variations in sedimentation, depositional environment, paleoenvironment and arc volcanism; 2) the uplift/subsidence history of the outer part of the forearc and hence to provide information on forearc flexure and basin development; 3) the nature of the igneous basement of the forearc basin; and 4) the micro-structural deformation and large-scale rotation and translation of the forearc terrane since the Eocene. Site selection was based on multi-channel seismic records and a short shipboard seismic survey; the site chosen lies just south of Fred Moore 3505, line 14, 1940Z, the proposed site for BON-6B. Site 782 was occupied from 1300Z, 16 March, to 1345Z, 23 March 1989.

Hole 782A was spudded with an APC at 2200Z on 16 March 1989, coring 85.5 m with 105% recovery. Drilling was continued with an XCB, coring an additional 391 m with 48% recovery, just penetrating basement before the pipe stuck and eventually had to be severed with explosives at the second joint above the 7-1/4-in. drill collar. The hole officially ended with the severed joint back on deck at 2230Z on 20 March 1989. Hole 782B was offset 100 m south of Hole 782A and "washed down" to basement at 459.3 mbsf with an RCB. However, only one 9.6-m core was cut, with 1% recovery, before drilling again had to be curtailed. The failure to drill basement is thought to have been caused by the bit plugging with very fine-grained to glassy andesitic gravel. Two successful logging runs were carried out in the hole; a third run (the magnetic susceptibility tool) was aborted because of equipment failure. Operations in Hole 782B ended at 1345Z on 23 March.

Two lithostratigraphic units, the first sedimentary and made up of three subunits, the second comprising volcanic basement, have been defined at Site 782:

➡Unit I: (Subunit IA 0-153.6 mbsf in Hole 782A) is Pleistocene to lower Pliocene gray to yellow-greenish, homogeneous nannofossil marl interrupted below 100 mbsf by volcanic ash layers;

➡Unit I: (Subunit IB 153.6-337.0 mbsf in Hole 782A) is upper to lower Miocene light to dark gray nannofossil marl containing abundant scattered sand-sized volcanic debris;

➡Unit I: (Subunit IC 337.0-409.2 mbsf in Hole 782A) is upper Oligocene to upper Eocene vitric nannofossil chalks intercalated with tuffaceous sediment and also (near the base) pebble-rich sands, gravelly conglomerates and numerous ash layers;

➡Unit II (409.2-476.8 mbsf in Hole 782A and 459.3-468.9 mbsf in Hole 782B) comprises angular to subrounded clasts of andesitic and dacitic lava.

Sedimentation rates increased from the late Oligocene (~3 m/m.y) through middle Miocene (~10 m/m.y.) and late Miocene (~20 m/m.y.), to the Pliocene (~40 m/m.y.), before falling again in the Pleistocene (~20 m/m.y.). Three possible short unconformities have been identified in the succession: one between the middle and late Miocene; one (the longest at 3-5 m.y.) between the late Oligocene and early Miocene; and one in the late Eocene.

The andesites and dacites of Unit II are typically slightly vesicular and contain phenocrysts of plagioclase, orthopyroxene and clinopyroxene in a glassy groundmass. Some may be pillow fragments. Analyses suggest that they are members of the island arc tholeiite series.

Studies of physical properties in Hole 782A reveal thermal conductivities within Unit I of about 1 $Wm.K^{-1}$ and bulk densities that increase downhole within Unit I from 1600 to 1950 $kg.m^{-3}$. Porosities of the sediments decrease downhole from 70% to 60% with a discontinuity at about 280 mbsf (middle Miocene). Magnetic susceptibilities increase downhole in response to the amount of induration of the sediment. Magnetic inclination data from Hole 782A cluster around +50° and -50°, indicating little or no translation of the site since the upper Eocene; however, declinations are scattered because of core disturbance so no data on the extent of rotation could be obtained.

Of the two logging runs, the first used the temperature logging, phasor induction, lithodensity and sonic tools, the second the natural gamma spectrometry, aluminum clay, general purpose instrumentation and gamma spectrometry tools. Preliminary results show a significant increase in silica at 373 mbsf accompanied by an increase in resistivity, an increase in density and in density variation and peaks in uranium, thorium and potassium.

The principal results of this site are: 1) identification of Eocene basement in this part of the forearc basin; 2) characterization of the uppermost basement as intermediate-acid submarine volcanic rocks of island arc tholeiite affinities; 3) paleomagnetic evidence that there has been no major translation of the site since the Eocene; 4) recognition that the greatest sedimentation rate is seen in the Pliocene and the greatest vitric ash input in the upper Eocene and Oligocene.

Site Summary, Site 783
Latitude: 30°57.86' N
Longitude: 141°47.27' E
Water Depth: 4646.8 m

Site 783 (proposed site BON-7) is located on the northern, mid-flank portion of a seamount that forms part of a >500 km-long ridge running along the lowermost, inner wall of the Izu-Bonin Trench. The seamount at this site has a thin sedimentary cover, perhaps in part because it lies at the distal end of a prominent submarine canyon system. The objectives of drilling at this site were to: 1) determine the nature of sediments in the outermost forearc region; 2) investigate the regional tectonic history of the ridge upon which the seamount is located; 3) investigate the age and mode of emplacement of the seamount; 4) study the structure and composition of the basement of the seamount; and 5) determine the interstitial waters in the sediments. The nature and origin of the seamount could then be compared with that of Conical Seamount, drilled at Sites 778-781. Site selection was based on multichannel seismic records and a short shipboard seismic survey; the site chosen lay just north of the intersection of Fred Moore 3505, lines 14 (0339Z) and 16 (2145:30Z), the proposed site for BON-7.

Hole 783A was spudded with an APC at 2200Z on 23 March 1989, drilling 168.2 m with 27.9% recovery. Heat flow measurements were taken at 42.7 mbsf and 90 mbsf. Hole 783A was abandoned when the torque and pressure of the drill string suddenly increased. The hole officially ended at 0215Z on 26 March 1989.

Two lithostratigraphic units have been defined: Unit I (0-120.0 mbsf) is middle or lower Pleistocene to lower Pliocene or older, glass-rich, silty clay to claystone; and Unit II (120.0-158.6 mbsf) is phacoidal sheared serpentine with clasts of serpentinized harzburgite.

Dating is based on calcareous nannofossil and diatom biostratigraphy. Microfossil studies also indicate that the upper 100 m were deposited at or near the carbonate compensation depth and that reworking may have been important in places lower in the sequence. Lithologic Unit I as a whole has a small biogenic component, with greater siliceous than calcareous contribution. Unit I also has varying volcanic input, primarily as glass with lesser amounts of feldspar, pyroxene and amphibole.

The harzburgites of Unit II consist of olivine (80-90 modal%), orthopyroxene (10-15%) with minor clinopyroxene (as exsolution lamellae in orthopyroxene) and spinel. Other rock types are very rare, although one piece of harzburgite contains a clinopyroxene-rich vein (5-15 mm wide) and the sediments contain several metabasaltic clasts.

Deformation observed in the sediments at Site 783 begins with the first partially lithified sediment at 62.1 mbsf and includes shear fabrics and convolute plastic folding within the claystones of Unit I and the phacoidal serpentine muds of Unit II. High-temperature pre-serpentinization and lower-temperature, post-serpentinization fabrics similar to those described for Conical Seamount are found in the ultramafic clasts of Unit II.

Studies of physical properties show that the bulk densities increase from 1470 to

1590 kg.m^{-3} in the sediments of Unit I and cluster around 2100 kg.m^{-3} in the serpentine of Unit II. Porosities average 70% in the sediments and 35% in the serpentine. The average compressional wave velocity in the sediments is 1.9 km.s^{-1} and the serpentine is 2.15 km.s^{-1}. Thermal conductivities average about 1 Wm.K^{-1} in sediments and 1.9 1 Wm.K^{-1} in the serpentine.

The principal results of this site are:
1) the confirmation that this seamount is made up, at least in part, of serpentinite; 2) the biostratigraphic evidence that the serpentinite is at least early Pliocene in age and hence older than Conical Seamount in the Mariana forearc; 3) the structural evidence for deformation within the overlying sediments as well as within the serpentinite.

Site Summary, Site 784
Latitude: 30°54.49' N
Longitude: 141°44.27' E
Water Depth: 4900.8 m

Site 784 (proposed site BON-7) is located about 4 nautical miles away from Site 783 on the lowermost, western flank of the same seamount, on the inner wall of the Izu-Bonin Trench. As at Site 783, the objectives of drilling at this site were: 1) to determine the nature of sediments in the outermost forearc region; 2) to investigate the regional tectonic history of the ridge upon which the seamount is located; 3) to investigate the age and mode of emplacement of the seamount; 4) to study the structure and composition of the basement of the seamount; and 5) to determine the interstitial waters in the sediments. Site selection was based on multi-channel seismic records and a short shipboard seismic survey. The site chosen lay just south of line 15 (1520Z) from the Fred Moore 3505 survey.

Hole 784A was spudded with an APC at 0830Z on 26 March 1989, drilling 425.3 m with 51.3% recovery before the period assigned to drilling at BON-7 expired. Logging the hole unfortunately proved impossible when the bit apparently failed to release and five joints of drill pipe were subsequently found to have bent. Site 784 officially ended at 0900Z on 31 March 1989.

The stratigraphic section recovered at Site 784 is divided into Lithologic Unit I with three subunits, and Lithologic Unit II:

➡Unit I: (Subunit IA 0-126.4 mbsf) comprises vitric clayey silt, glass-rich silty clay/claystone of upper Pleistocene to upper (or middle) Miocene age;

➡Unit I: (Subunit IB 126.4-302.7 mbsf) is a vitric claystone of upper (or middle) Miocene to middle Miocene or older age;

➡Unit I: (Subunit IC 302.7-321.1 mbsf) comprises claystone and silt-sized serpentine of unknown age;

➡Unit II (321.1-425.3 mbsf) comprises phacoidal sheared serpentine microbreccia.

Dating is based on calcareous nannofossil and diatom biostratigraphy. Lithologic Subunit IB may correlate with Subunit IB at Site 782 in the forearc basin on the basis of age and ash content, although there is a depleted carbonate/microfossil component at Site 784 because of sediment deposition at or below the carbonate compensation depth. Subunit IC shows clear interfingering of background pelagic sediments derived from the volcanic areas to the west and silt-sized serpentine from the topographic high to the east.

The ultramafic clasts from Unit II are of two types: variably serpentinized tectonized harzburgite consisting of olivine (70-90 modal%), orthopyroxene (10-30%) with minor clinopyroxene (as exsolution lamellae in orthopyroxene) and spinel; and subordinate dunites containing olivine (90-99%), orthopyroxene (1-10%) and spinel (0.5-2%). About 30 very small metabasalt clasts were also identified.

Deformation in Unit I claystones at Site 784 includes sets of en echelon tension veinlets, and sets of microfaults, some clearly associated with water escape pipes. Most structures are extensional, and can be shown to have formed in a non-hydrostatic stress regime. Within the serpentinites of Unit II, we observed pebbly serpentinite muds with convolute lamination, sheared and relatively unsheared pebbly clay-sized serpentinites without convolute lamination, and serpentinite breccias. Many of these layers bear larger blocks, mostly of serpentinite; irregular-size grading was observed in some layers.

Studies of physical properties show that the average bulk densities are 1572 $kg.m^{-3}$ in the sediments of Unit I and 2188 $kg.m^{-3}$ in the serpentine of Unit II. The average compressional wave velocities in the sediments and serpentinites are 1.66 and 3.08 $km.s^{-1}$, respectively. Thermal conductivities average about 0.9 $Wm.K^{-1}$ in the sediments and 1.74 $Wm.K^{-1}$ in the serpentine.

Preliminary interpretation of paleomagnetic data from sediments between 0 and 160 mbsf show magnetic inclination peaks around +50° and -50° indicating little translation since the Pliocene. In the interval between 160 and 240 mbsf there is no good bimodal distribution and a significant number of data points lie between +15° and -15° suggesting that there may have been significant translation between the middle Miocene and the Pliocene. No inclination data were obtained below 240 mbsf, but magnetic susceptibilities did increase markedly at the sediment/serpentinite boundary, perhaps because the serpentinite contained a high proportion of magnetite which was released during serpentinization.

The principal results of this site are: 1) confirmation that the lower western flank of the seamount also contains deposits of serpentinite; 2) further biostratigraphic evidence that the serpentinite is at least middle Miocene and hence that the seamount is considerably older than Conical Seamount in the Mariana forearc; 3) structural evidence for extensional deformation within the more compacted sediments overlying the serpentinite; and 4) possible paleomagnetic evidence for significant translation of the site between the middle Miocene and the Pliocene.

Site Summary, Site 785
Latitude: 30°49.47' N
Longitude: 140°55.17' E
Water Depth: 2660.8 m

Site 785 (proposed site BON-6A) is located in the center of the Izu-Bonin forearc basin about 40 nautical miles east-northeast of the active volcano, Tori Shima. The objectives of this site were to study: 1) the uplift and subsidence history of the forearc basin at this locality; 2) the temporal record of sedimentation, depositional environment, paleoceanography, and intensity and nature of arc volcanism; 3) the nature and age of the igneous basement of the forearc basin; and 4) the microstructural deformation and the large-scale rotation and translation of the forearc. Site selection was based on multichannel seismic records and a short shipboard seismic survey; the site chosen is just south of the intersection of lines 12 (0412Z) and 14 (1530Z) of the Fred Moore 3505 survey.

Hole 785A was spudded with an APC at 1800Z on 31 March 1989, drilling 19 m with 93% recovery before changing to an XCB and drilling a further 95.7 m with 0.08% recovery (total = 104.7 m with 17.6% recovery). Continuing hole stability problems caused by a thick, near-surface layer of pumice and ash prevented not only further drilling but also the setting of a reentry cone; the hole was therefore abandoned. Since pumice/ash layers were considered a regional feature, no attempt was made to drill a further hole within beacon range and the site officially ended at 1030Z on 1 April 1989.

The stratigraphic section recovered at Site 785 is assigned to a single lithostratigraphic unit, Unit I (0-104.7 mbsf), which comprises two meters of light brown pumice-bearing nannofossil ooze overlying a pumice bed and is of late-early Pleistocene age.

Dating is based on calcareous nannofossil, foraminifera, and diatom biostratigraphy. The ooze has normal magnetic polarity, where sampled, and can be placed within the Brunhes Normal Polarity Chron.
The ooze is made up of calcareous nannofossils (50-80%), foraminifera (5-8%), micrite (3-10%), radiolarians (2-3%), diatoms (3%), sponge spicules (1%), clay (20-25%), quartz (2-3%), and vitric fragments (2-3%). The pumice bed contains light gray to gray pumice fragments of 1 mm to 6 cm diameter in a poorly sorted matrix that includes black granules and coarse sand-sized vitric particles.

The pumice and vitric fragments themselves comprise highly vesicular dacitic-rhyolitic glass with phenocrysts of plagioclase feldspar, clinopyroxene, and orthopyroxene.

Studies of physical properties show that the average bulk densities are 1600 kg.m-3 in the sediments and 1300 kg.m-3 in the pumice; grain densities are 2500 kg.m-3 in the sediments and 2000 kg.m-3 in the pumice.

The principal result from this site is the evidence for a major Pleistocene pumice bed in this part of the Izu-Bonin forearc basin. The difficulty in drilling stable holes in such material has clear implications for site selection near active volcanic arcs.

<u>Site Summary, Site 786</u>

Hole 786A
Latitude: 31°52.48' N
Longitude: 141°13.58' E
Water Depth: 3058.1 m

Hole 786B
Latitude: 31°52.45' N
Longitude: 141°13.59' E
Water Depth: 3071.0 m

Site 786 (BON-6C) is located in the center of the Izu-Bonin forearc basin about 120 nautical miles east of the active volcano, Myojin Sho. The objectives of this site were to study: 1) the uplift and subsidence history of the forearc basin at this locality; 2) the temporal record of sedimentation, depositional environment, paleoceanography, and intensity and nature of arc volcanism; 3) the nature and age of the igneous basement to the forearc basin; and 4) the regional stress field of the forearc, the microstructural deformation, and the large-scale rotation and translation of the forearc. Site selection was based on multichannel seismic records and a short shipboard seismic survey; the site chosen was 5 nautical miles east of the intersection of line 5 (0510Z) of the Fred Moore 3505 survey and Conrad line 38 (1125Z). Occupation of the site began at 1 April, 2015Z and ended at 0800Z on 16 April 1989.

Hole 786A was spudded with an APC at 0815Z on 2 April 1989, drilling 28.7 m with 103% recovery before changing to an XCB and drilling a further 137.8 m with 40.1% recovery (total = 166.5 m with 51.0% recovery). Hole 786B was washed through 162.5 m of the sedimentary column and commenced recovery of igneous basement at 162.5 mbsf. Drilling continued to a maximum depth of 828.6 mbsf using a bit (M84F) that was still showing no signs of failure after 118.4 hr of use when drilling was stopped in order to begin logging.

Four suites of logging tools were run in Hole 786B. The first suite, consisting of the dual induction tool (DIT), the digital sonic tool (SDT), and the natural spectrometry tool (NGT), was run from 3520.0 mbsl up to the end of the drill string. The second suite, consisting of the lithodensity tool (LDT), the compensated neutron tool (CNT), and the NGT, was run from a depth of 3458.1 mbsl up to the end of the drill string. The third logging suite, consisting of the DIT, LDT, CNT, and SDT, was used to log the hole from 3892 up to 3535.2 mbsl. The fourth suite, consisting of the induced gamma-ray spectrometry tool (GST), the aluminum clay tool (ACT), and the NGT, was run from a depth of 3892.0 mbsl to the mudline. The borehole televiewer (BHTV) was deployed for the fifth logging run and logged 80 m of the hole after one failure, before the logging time expired.

The stratigraphic section recovered at Site 786 is assigned to four lithostratigraphic units. Units I through III are defined only in Hole 786A which recovered the sedimentary sequence at the site. Unit IV is defined in both.

➡Unit I: (0-83.46 mbsf) comprises 83.46 m of lower Pleistocene to middle Miocene nannofossil marl and clay. It is made up predominantly of nannofossils (up to 70%), with lesser amounts of micrite (tr-40%), foraminifera (tr-30%), clay (5-7%), sponge spicules (tr-5%), radiolarians (tr-4%), diatoms (tr -3%), and quartz (tr-2%).

➡Unit II: (83.46-103.25 mbsf) is upper Oligocene to middle Eocene nannofossil marl and nannofossil-rich clay. The unit consists of calcareous nannofossils (2-60%), with lesser amounts of foraminifera (2-10%), micrite (1-35%) and radiolarians (tr-2%), Unit II also contains clays (10-50%), opaques (3-15%), chlorite (tr), and serpentine (tr). A volcanogenic component of vitric ash, and mineral fragments are also present.

Unit III (103.25 to 124.90 mbsf) is a middle Eocene sequence of volcaniclastic breccia. The sedimentary components of the breccia matrix are nannofossils (up to 65%), clay (10-50%), micrite (1-35%), foraminifera (1-10%), radiolarians (tr-2%), and opaque minerals (3-15%).

Unit IV (124.9-166.5 mbsf in 786A and 162.5-828.6 mbsf in 786B) comprises volcaniclastic and sedimentary breccias, vitric siltstones and sandstones, lavas, dikes, and pyroclastic flows. Volcaniclastics, glass (20-100%), pyroxene (1-30%), feldspar (1-15%), lithic fragments (tr-10%), and amphibole (tr-5%) dominate the detrital component of the sediments; clays (10-53%) are also present.

Dating is based on calcareous nannofossil, foraminifera and diatom biostratigraphy. The rocks from the bottom of Hole 786A and the top of Hole 786B are considered to be the same material. Sedimentation rates were highest in the Pliocene (8.9 m/m.y.) and dropped (to 4.2 m/m.y.) between the latest Miocene and middle Miocene. A hiatus exists between middle Miocene and the upper Oligocene sediments, below which the rate was very low (0.95 m/m.y.).

The igneous basement comprises mainly massive and brecciated flows, ash flows, and intercalated sediment in its upper part, and pillow lavas and dikes or sills in its lower part. Rock types include high-magnesian basalts, boninites, basalts, andesites, dacites, and rhyolites. There are several prominent shear zones and hydrothermal breccias within the sequence.

Studies of physical properties show that the average bulk densities are 1.65 g/cc in the sediments and 1.8-2.1 g/cc in the volcanic sequences; grain densities of 2.65 g/cc vary little between the sediments and the volcanic rocks.

Preliminary interpretation of the paleomagnetic data shows many intervals of normal and reversed polarity. The interval 0-50 mbsf shows good bimodal distributions with peaks around +45° and -45°, indicating little translation since the late Miocene. Between 160-240 mbsf there is no bimodal distribution; however, there are many more data points between +15° and -15° suggesting translation from a lower latitude.

The principal achievement at this site is the deep penetration of an Eocene volcanic edifice, which will: 1) provide a record of the construction and structure of the forearc volcanic basement and 2) provide the basis for understanding early arc magmatism in general and boninite petrogenesis in particular.

Table 1. Summary Site Information, Leg 125

Hole	Latitude (°N)	Longitude (°E)	Water Depth Meters*	Number of Cores	Meters Cored	Meters Recov'd	Percent Recov'd	Meters Total Penet.
778A	19°29.93'	146°39.93'	3914	13	107.6	22.8	21.2	107.6
779A	19°30.75'	146°41.75'	3947	37	317.2	73.2	23.1	317.2
779B	19°30.75'	146°41.75'	3947	1	9.0	8.7	96.7	9.0
780A	19°32.51'	146°39.27'	3087	1	3.5	3.5	100.0	3.5
780B	19°32.47'	146°39.22'	3094	2	18.2	10.3	56.6	27.7
780C	19°32.53'	146°39.21'	3083	18	163.5	14.4	8.8	163.5
780D	19°32.55'	146°39.20'	3089	6	30.9	9.1	29.4	41.8
781A	19°37.91'	146°32.56'	4421	27	250.0	39.6	15.8	250.0
782A	30°51.66'	141°18.85'	2959	50	476.8	278.3	58.4	476.8
782B	30°51.60'	141°18.84'	2966	1	9.6	0.1	1.0	468.9
783A	30°57.86'	141°47.27'	4649	18	168.2	47.0	27.9	168.2
784A	30°54.49'	141°44.27'	4901	45	425.3	218.3	51.3	425.3
785A	30°49.47'	140°55.17'	2661	11	104.7	18.4	17.6	104.7
786A	31°52.48'	141°13.58'	3058	19	166.5	85.0	51.1	166.5
786B	31°52.45'	141°13.59'	3071	72	666.0	190.1	28.5	828.5

* Depths are drill-pipe measurements corrected to sea level.

Tokyo Port Call

More than 1,000 people visited the JOIDES Resolution during its first port of call in Tokyo, April 18-23, 1989. On Tuesday, April 18, a press conference was held shortly after the ship's arrival at Harumi wharf. Participants in the press conference included Dr. Philip D. Rabinowitz, representing ODP; Dr. Patricia Fryer and Dr. Julian Pearce, co-chief scientists for Leg 125; and Dr. Laura Stokking, staff scientist for Leg 125. The two ship's captains were also on hand to answer technical questions.

Participants in the press conference discussed the results of Leg 125, the mission of ODP and the important role that Japan has played in the program since its inception. The press conference was well attended by representatives from both print and electronic media. Members of the press toured the ship after the press conference.

Thursday, April 20, was the main day for tours with more than 1,000 people coming on board. Lending invaluable assistance were Dr. Asahiko Taira, Dr. Kazuo Kobayashi and their students from the Oceanographic Research Institute. One ORI student and one marine technician accompanied each group. Technicians were also stationed at critical labs to explain the equipment in and purpose of the labs. A buffet luncheon was held on board for Japanese scientists, industry representatives, government officials and members of Japan's national committee for the ODP. Thursday evening a reception, dinner in the galley and a special tour of the ship was conducted for special guests of ODP including His Excellency, Toro Asou, parliamentary vice minister of Education, Science and Culture; Dr. Takahisa Nemoto, director of the Ocean Research Institute, Dr. Akito Arima, president of the University of Tokyo and other ministry and university officials. Dr. John H. Moore, deputy director of the National Science Foundation, Dr. James Briden, United Kingdom JOIDES Executive Committee member and Dr. Chuck Helsley, chairman of the JOIDES Executive Committee as well as representatives from ODP, JOI and NSF were also guests.

LEGS 127 AND 128: JAPAN SEA I & II PROSPECTUS

1. INTRODUCTION AND GOALS

The Japan Sea is one of the most intensively studied marginal seas in the western Pacific region (Tamaki, 1988). The sea consists of several deep basins (water depths in excess of 3000 m) which appear to be floored by oceanic-type crust and separated by ridges underpinned by continental material (Fig. 1). This general picture has been developed from an extensive marine geophysical data base but suffers from a lack of hard geological data on the acoustic basement aside from that gained from dredging operations. In 1973, four sites were drilled in the Japan Sea during DSDP Leg 31 to determine the nature and composition of acoustic basement and to characterize the sedimentary history. Unfortunately, the presence of ethane in recovered cores and a medical emergency cut the drilling short, leaving the deeper objectives unrealized.

Tectonic scenarios for the development of the Japan Sea have been deduced from the wealth of marine geophysical and geological data and from onshore work in Japan, particularly geologic mapping and paleomagnetic studies. Most models consider the sea to represent a backarc basin initiated by multiple rifting probably during the late Oligocene-early Miocene. The spreading ultimately relates to the complex plate interactions during the last 30 m.y. In all cases, better data on the age and nature of the basement in the Japan Sea are necessary to constrain the style, timing and kinematics of these interactions and to investigate more topical and local problems such as the nature and age of anomalously thick oceanic crust, the style and history of multiple rifting and obduction, and rates and character of basin subsidence and sedimentation.

The overall goals of the drilling program for ODP Legs 127 and 128 include documentation of the tectonic, depositional, and paleoceanographic development of the Japan Sea in terms of the following objectives (Fig. 2):

1.1 Nature and age of basement of the basins (Site J1b, J1d, J1e). Drilling to basement will help date a newly mapped set of magnetic anomaly lineations that suggest frequent ridge propagation during basin spreading in the Japan Sea Basin. Basement drilling will also provide hard evidence of the anomalous oceanic crust documented by recent ocean bottom seismometer (OBS) data in the Yamato Basin, and allow evaluation of a proposed fast spreading history for the Japan Sea suggested by paleomagnetic data from southwestern Japan.

1.2 Style of multiple rifting (Sites J2a, J1b, J1d, J1e). The influence of complex multiple rifting events associated with continental crustal extension, a complex pseudo-fault pattern, and an anomalously thick oceanic crustal structure, will be examined to constrain backarc extension tectonics of the continental arc and to compare backarc-type to Atlantic-type extension tectonics. The influence of arc crust and mantle upon the generation of backarc volcanism will also be examined.

1.3 Obduction of oceanic crust (Site J3). Cumulative evidence indicates that the Eurasian-North American (EURA-NOAM) plate boundary shifted to the western margin of the Japan Sea from the central Hokkaido suture line during Quaternary time, effectively transferring northeast Japan to NOAM. Seismic reflection profiles in the eastern Yamato Basin illustrate that incipient obduction as well as subduction of oceanic crust is ongoing along this new plate boundary which shifted from the central Hokkaido suture line. Drilling at proposed site J3b is aimed at constraining the timing of initiation of this convergence and yielding data regarding the origin of ophiolites and obduction of oceanic crust.

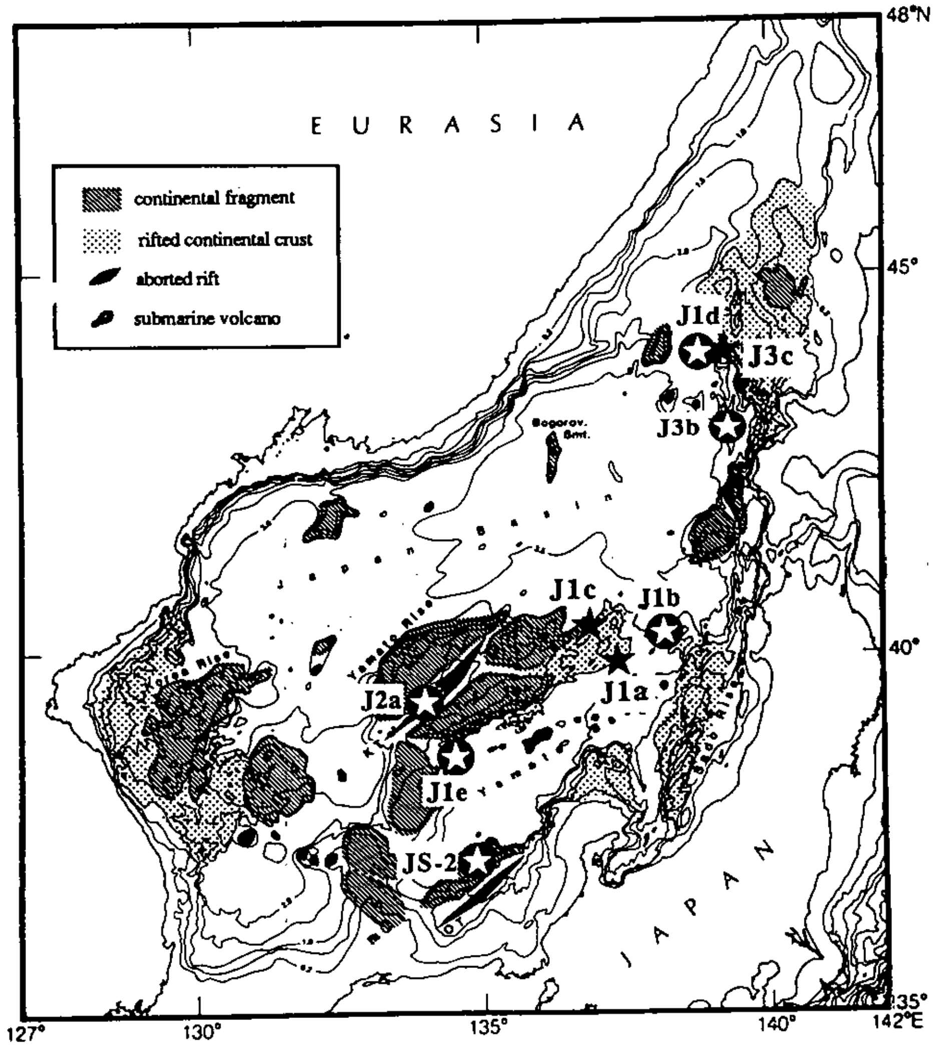

Figure 1. Location map of the Japan Sea showing the proposed sites for drilling during Legs 127 and 128 and the DSDP Leg 31 Sites 299-302. First priority sites are marked with open star symbols (Leg 127: J1b-1, J1d-1, J3b-1, J1e-1; Leg 128: JS2, J2a-1). Alternate sites are shown by closed star symbols. DSDP sites are shown as closed circles.

1.4 Paleoceanography. Stratigraphic columns to be sampled at all six proposed sites will yield important new faunal, isotopic, and lithologic data regarding the water mass and sediment history of the Japan Sea. ODP results should allow effects of local tectonic control on basin sills to be separated from effects of global eustatic and climatic events. Quantitative faunal and floral analyses at all sites are expected to yield data on variations in rates of productivity, intensity of oxygen minima, origin of deep intermediate and surface water masses within the sea, and rates and mode of basin subsidence. In particular, proposed site JS-2, located on a local high above the basin CCD, is aimed at yielding a detailed faunal and isotopic record of paleoclimatic-paleoceanographic events within the sea during the critical late Miocene period of globally intensified vertical circulation and lowered sea levels.

1.5 Metallogeny in a failed backarc rift (Site J2a). The Kitayamato Trough is thought to represent an ideal setting for massive sulfide mineralization within a failed backarc basin similar to the depositional and tectonic environments of ancient massive sulfide deposits now being mined within continental margin, arc, and backarc settings. Drilling proposed site J2a to basement will further our understanding of potentially metalliferous backarc environments and permit detailed comparison with similar environments now exposed on land. The thick sediment sequence at site J2a also has the potential to provide detailed paleoceanographic data including possible evidence of low-oxygen water masses during initial formation of the backarc rift.

1.6 Downhole measurements. All sites will be logged with the standard Schlumberger suite of tools and with the formation microscanner (FMS). In addition, borehole televiewer (to estimate stress) and magnetometer-susceptibility data are planned for proposed sites J1e, J3b, and J1b. Heat flow measurements and temperature logging at several of the sites will address the controversial problem of heat generation within the sedimentary column of the basin. Crustal permeability will be measured with a

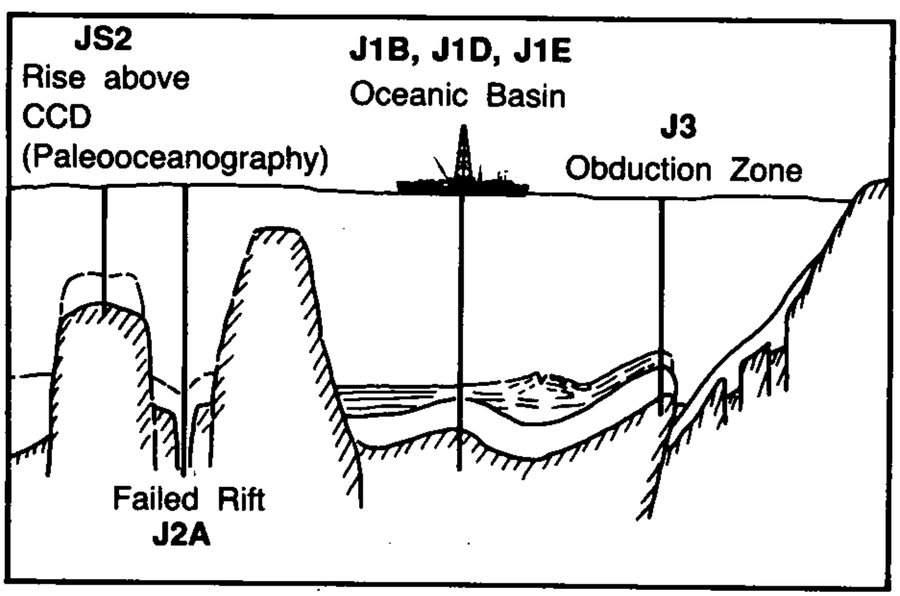

Figure 2. Schematic diagram showing the specific objectives for drilling at each site.

packer at sites J1b, J3b, and J2a. During Leg 128, site J1b will be revisited for an oblique seismic experiment, borehole seismometer deployment, and a geoelectrical experiment. The oblique seismic and geoelectrical experiments will present critical data for understanding the anomalously thick oceanic crust of the Yamato Basin. Emplacement of the borehole seismometer will permit long-term monitoring of seismicity off western Japan.

2. GEOLOGIC FRAMEWORK

2.1 Tectonics and structure. The Japan Sea is one of several marginal seas and backarc basins which lie between two of the most dynamic regions of the Earth's lithosphere: the subduction zones of the western Pacific and the Himalayan convergence. At least four major plates and several microplates converge in this area. The Japan Sea lies principally on the Eurasian plate (or Amurian microplate) and is separated from the North American plate (or Okhotsk microplate) on the east-northeast by a young plate boundary characterized by active thrust faulting and large (M>7), compressional earthquakes (Fukao and Furumoto, 1975; Kimura and Tamaki, 1986).

Patterns of faulting and the shallow structure of the Japan Sea have been known for some time from seismic reflection data (Tamaki, 1988). At least three structural provinces exist: 1) basinal areas, such as the Japan and Yamato basins, containing mostly flat-lying sediments over a moderately irregular acoustic basement surface; 2) block-faulted ridges having rough surface and acoustic basement topography underpinned by continental and rifted continental rocks typified by the Yamato Rise, Korea Plateau, Ullung Rise, and Oki Bank; and 3) a north-eastern margin displaying complex folding and uplifted tectonic ridges bounded by young thrust faults. Based on DSDP drilling, upper Miocene hemipelagic sediments drape the block-faulted acoustic basement of the Yamato Rise, indicating that the initial extension is probably no younger than about 10 Ma. In contrast, the thrust faults and folds occurring along the eastern margin of the Japan Sea are very young. Seismic stratigraphic data indicate that much of the folding probably occurred in the late Pliocene-Pleistocene, and modern seismicity demonstrates that thrust and strike-slip faults are still active (Seno and Eguchi, 1983; Kimura and Tamaki, 1986; Yamazaki et al., 1985).

The deeper crustal structure of the Japan Sea is constrained by seismic refraction data obtained using two ships, sonobuoys, and ocean bottom seismometers (OBS) (Ludwig et al., 1975). Velocities and thicknesses fairly typical of oceanic crust prevail beneath the Japan Sea Basin. In contrast, Layer 2 in the Yamato Basin is thickened by a 3.5 km/s unit that could represent consolidated sediment or volcanics, possibly Miocene "Green Tuff" equivalents. In addition, Layer 3 beneath the Yamato Basin is thicker than would be expected for a typical oceanic column. This somewhat anomalous crustal structure may continue beneath the Yamato Rise. The shallower portion of the rise appears to be a complex of rifted Mesozoic continental fragments and Upper Cretaceous to Lower Tertiary volcanic rocks (Tamaki, 1988).

Quaternary volcanism is largely confined to the Japanese Islands and eastern Japan Sea margin and is a consequence of continued westward underthrusting by the Pacific and Philippine plates (Tamaki, 1988). Seaward of this broad arc lie several chains of andesitic seamounts, mostly of Miocene age (Fig. 1). Heat flow in the Japan Sea ranges from 1.25 to 3.25 HFU (53-138 mW/m^2) with the bulk of values lying between 1.75 and 2.55 HFU (74-115 mW/m^2) (Yoshii and Yamano, 1983; Tamaki, 1986, 1988). By comparison with data from other marginal seas, the range in heat flow values for the Japan Sea suggests an age of initial rifting of about 10-30 Ma (Tamaki, 1988).

The various tectonic scenarios proposed for the development of the Japan Sea generally consider the sea to have formed by multiaxial backarc spreading and rifting of a former continental arc (Tamaki, 1985), ultimately reflecting the complex interactions of the lithospheric plates during the past 30 m.y., perhaps longer. In detail, the specific models for how this was effected differ considerably. The proposed mechanisms include:

1. A double scissor-shaped opening during the late Oligocene-early Miocene based on land paleomagnetic data, accommodating clockwise rotation of southwestern Japan and counter-clockwise rotation of northeastern Japan (Otofuji and Matsuda, 1983; Otofuji et al., 1985; Celaya and McCabe, 1987; Tosha and Hamano, 1988).

2. Regional trench roll back resulting in the concurrent opening of the Kuril Basin, Japan Sea, and Shikoku-Parece Vela Basin (Seno and Maruyama, 1984).

3. A pull-apart origin caused by right lateral shear over a broad zone (Lallemand and Jolivet, 1985; Jolivet, 1986; Jolivet et al., 1987).

4. Extension caused by the eastward retreat of the Amurian plate during Cenozoic time, ultimately related to the collision between India and Eurasia (Savostin et al., 1983; Zonenshain and Savostin, 1981; Kimura and Tamaki, 1986; Tamaki, 1988).

In addition, the zone of convergence marked by thrust faults along the northeastern margin of the Japan Sea has suggested to some that a new subduction zone is currently forming there (Kobayashi, 1985; Nakamura, 1983; Seno and Eguchi, 1983; Tamaki and Honza, 1985). This zone may mark the boundary between the Eurasian and North American plates.

2.2 Sedimentary and paleoceanographic summary. Neogene and Quaternary sediments present in basinal areas of the Japan Sea locally reach thicknesses of 1500-2000 m (Ludwig et al., 1975; Gnibidenko, 1979; Tamaki, 1988) with Pleistocene and Holocene patterns reflecting topographic control of sediment dispersal systems. Seismic data together with limited stratigraphic data from DSDP Leg 31 sites (Karig, Ingle, et al., 1975) illustrate that a similar stratigraphic sequence characterizes most basinal areas despite significant differences in sediment thickness (Ishiwada et al., 1984; Kobayashi, 1985) with a typical basinal sequence consisting of: 1) an upper well-stratified and highly reflective unit composed of Pliocene-to-Holocene siliciclastic sands, silts, and/or clays, which overlies 2) a seismically transparent unit of lower Pliocene to Miocene hemipelagic diatomaceous silts and clays. In contrast, the well-stratified Pliocene-to-Holocene unit is thin or absent over many topographic highs with a typical ridge sequence consisting of a thin transparent layer of Pliocene-Quaternary diatomaceous clay overlying a more stratified and reflective unit of Miocene clays, diatomaceous clays, and volcaniclastic sediments. With some exceptions, this persistent vertical sequence represents a major change from wide-spread deposition of Miocene-lowermost Pliocene hemipelagic sediments to a basin-filling facies involving rapidly deposited Pliocene-to-Holocene siliciclastic turbidites (Ingle, 1975a).

The oldest sediment recovered from DSDP Leg 31 sites consists of upper Miocene diatomaceous clays. However, Leg 31 drilling did not penetrate the entire sedimentary sequence in the Japan Sea. Unsampled lower portions of the stratigraphic column likely include middle Miocene and older diatomaceous, siliciclastic, carbonate, and volcaniclastic sediments that represent early phases in the evolution of the sea. Some support for this interpretation is provided by Barash (1986), who reports recovery of middle and upper Miocene diatomaceous and phosphatic mudrocks from the flank of the Yamato Rise. Additional insights regarding the possible nature of older sedimentary units come from studies of onshore Neogene sequences present around the rim of the Japan Sea.

Filled and uplifted Neogene sub-basins are arrayed along the eastern and southern margins of the Japan Sea from Sakhalin to the Korean Peninsula (Ingle, 1975a). They reflect late Pliocene and Pleistocene deformation in the Japan Sea region. All of the onshore Neogene deposits display a similar sequence of lithofacies, and so provide a broad outline of the Oligocene to Pleistocene depositional, paleoceanographic, and paleogeographic evolution of this region. The Oga Peninsula surface section in northwestern Honshu represents one of the best studied of the various onshore Neogene sequences (Takayasu and Matoba, 1976) and when combined with subsurface data from the adjacent Akita Basin (Tsuchi et al., 1981) forms a reference section of special significance for ODP Leg 127 and Leg 128 drilling.

Biostratigraphic, paleomagnetic, and radiometric age data from the Oga section and other sequences along the western margin of Japan provide a well-constrained chronology for the Japan Sea region as a whole (Asano et al., 1975; Tsuchi, 1981). In particular, diatom zonations offer an unusually reliable means of dating and correlation within the widespread diatomaceous sediments and genetically related porcellanites which characterize Miocene deposition in the Japan Sea as well as other margin basins around the rim of the North Pacific (Burckle and Opdyke, 1977; Koizumi, 1978, 1985; Barron, 1981).

The repetitive lithofacies patterns present within the onshore sequences together with biofacies evidence of variations in paleobathymetry and paleoceanography (Asano et al., 1969; Ingle, 1975a, 1981; Koizumi, 1983, 1988; Matoba, 1984), recent advances in dating of these sequences (Tsuchi, 1981), and offshore evidence from the Japan Sea proper (e.g., DSDP Leg 31 sites and isolated dredges and cores) collectively point to six stages or phases in the Neogene sedimentary history of this region as outlined below:

1. <u>Late Oligocene-early Miocene</u>. Initial extension and rifting in the Japan Sea region marked by widespread volcanism and deposition of volcaniclastic, nonmarine, and lacustrine sediments representing the so-called early "Green Tuff" unit (Takayasu and Matoba, 1976; Koizumi, 1988).

2. <u>Early middle Miocene</u>. Tectonic production of a widespread unconformity possibly associated with clockwise rotation of southwestern Japan as backarc extension continued (Hayashida and Ito, 1984). Deposition of the later "Green Tuff" unit, composed of volcaniclastic and nonmarine sediments commonly assigned to the Daijima Group, followed by the initial deposition of marine deposits in sub-tropical littoral and neritic environments under the influence of the proto-Kuroshio Current system (IGCP-114 National Working Group of Japan, 1981).

3. <u>Late middle and late Miocene</u>. Accelerating rates of basin subsidence accompanied by widespread deposition of diatomaceous and organic-rich muds (Onnagawa and lower Funakawa formations) at bathyal depths under oxic and suboxic water masses, reflecting increasing rates of primary productivity as the Neogene climate cooled and episodic reductions in the flux of terrigenous sediments occurred; deposition of phosphatic sediments.

4. <u>Latest Miocene and earliest Pliocene</u>. Accelerating flux of redeposited siliciclastic sediments resulting in dilution of diatomaceous hemipelagic sediments (middle Funakawa Formation) enhanced by abruptly lowered sea levels in latest Miocene time with the possibility of the creation of a lago mare owing to silling (Burckle and Akiba, 1978).

5. <u>Early Pliocene to Early Pleistocene</u>. Major deposition and progradation of submarine fan systems into sub-basins and initiation of rapid basin-filling by coarse terrigenous clastics (Kitaura and Wakimoto formations) modulated by eustatic low and high stands of sea level; episodic exclusion of Pacific Deep Water and basin silling (Matoba, 1984).

6. <u>Mid-Pleistocene to Holocene</u>. Mid-Pleistocene tectonic reorganization of

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the Japan Sea marked by a widespread unconformity in both onshore and offshore sequences with continued rapid deposition of coarse- and fine-grained turbidites in basinal areas and hemipelagic deposition of diatomaceous muds on newly created highs; deformation and uplift of numerous filled sub-basins along the eastern and southern margins of the sea.

In addition to the events noted above, late Pliocene and Pleistocene eustatic lowstands and synchronous paleoclimatic and paleoceanographic changes apparently created unusual oceanographic conditions in the Japan Sea during periods when the sea was essentially isolated from the open Pacific. The limited evidence available suggests that these latter events created anoxic deep water and geochemically distinct sediments (Miyake et al., 1968; Ujiie and Ichikawa, 1973; Ingle, 1975b; Matoba, 1984), which stand in contrast to the unusually well-mixed and oxic deep, intermediate, and shallow water masses in the Holocene Japan Sea (Hidaka, 1966). Clearly, the tectonic evolution of the Japan Sea backarc basin played a major role in governing the paleoceanographic evolution of the sea through control of paleobathymetry and gateways to the open Pacific (Matoba, 1984; Chiji et al., 1988) with each depositional phase reflecting a complex interplay among tectonic, eustatic, paleoclimatic, and paleoceanographic events.

Finally, sediments and organic matter in the Japan Sea have been affected extensively by diagenesis. DSDP drilling demonstrated that biogenic methane, generated by the decomposition of organic matter, and associated ethane, are widespread in the Japan Sea (Karig, Ingle, et al., 1975; Erdman et al., 1975; Rice and Claypool, 1981; Claypool and Kvenvolden, 1983). The recovery of porcellanite at DSDP Site 302 (Garrison et al., 1975) and the common occurrence of cherts and porcellanites in siliceous strata in Neogene basins of Honshu and Hokkaido (Iijima and Tada, 1981; Tada and Iijima, 1983) suggest that the alteration of diatomaceous sediments ; through burial diagenesis may be widespread in the Japan Sea. ıl Zeolitization of volcaniclastic units is als likely to be quite common, as this type o alteration affects many of the Tertiary volcanic units on the Japanese islands (Tada et al., in press; Iijima, in press). The diagenetic alterations add a special complexity to interpretation of the Neogene record (e.g., Kano, 1979; Lee and Devries Klein, 1986).

3. DRILLING SITE-SPECIFIC OBJECTIVES

3.1 Sites J1b-1/J1b-2/J1b-3/J1a/J1c (Yamato Basin). Site J1b-1, located in the northern Yamato Basin, is a reentry hole designed to penetrate 620 m of sediment and continue at least 100 m into acoustic basement (Figs. 1 and 2). Reentry is planned to ensure maximum basement penetration and to provide an open hole for later downhole experiments during Leg 128. The principal objective of this site is to determine the nature and age of the basement rocks. Recent OBS refraction data indicate an anomalously thick oceanic crust throughout much of the Yamato Basin, and a detailed magnetic survey suggests a complex pseudofault pattern indicative of frequent ridge propagation during spreading of the basin. Basement sampling at proposed site J1b-1 will permit a determination of the age and nature of the anomalous crust and improve our understanding of the style and mechanisms of backarc extension in this area. These data will also provide constraints on the timing of regional plate interactions in East Asia.

In addition to the basement sampling at this site, continuous coring of the sedimentary section will complement the findings at DSDP Site 299 where the lower part of the sedimentary section was not penetrated. These data will provide facies and paleoceanographic information at a basinal site in the Japan Sea and, through regional seismic correlations, will be useful in understanding the style and evolution of sedimentation in this backarc setting.

Alternate sites J1b-2 and J1b-3 are located just north of J1b-1. Site J1a is located in the Yamato Basin just northwest of DSDP Site 299 (Fig. 1). This site serves as an alternate should successive attempts at the other two J1b sites fail. The sediment thickness at J1a, about 580 m, is comparable to that at J1b-1, about 620 m.

Site J1c is a twin of DSDP Site 302, and is an alternate to the J1b and J1a sites. It lies southeast of and slightly updip of Site 302, which was stopped just before reaching acoustic basement by a medical emergency. Also, Site 302 was not cored continuously. Thus J1c will provide a more complete sedimentary history than previously acquired and will penetrate and sample more of the acoustic basement. Further, because no ethane was encountered during Site 302 drilling, no safety concerns are anticipated at site J1c.

3.1.a. Borehole seismometer. Emplacement of a newly developed wide frequency range/wide dynamic range three-component downhole seismometer will take place at site J1b-1. The instrument is to be installed in a fully cased hole. A real-time, controlled-source seismic experiment will be performed first to obtain the local crustal structure. For this purpose, air guns and ocean bottom seismometers will be deployed by a supporting vessel. The long-term measurements at the site will be made with off-line digital recording at the ocean floor. Accumulation of data from natural earthquakes will be used to establish the crust/mantle 3D seismic structure beneath the backarc basin. Furthermore, the combination of seismic data obtained from the basin with data from land stations will be valuable for our understanding of the dynamics of the trench-arc system. At present, very little seismic data have been obtained at ocean-based stations.

3.1.b. Electrical experiments. Electrical resistivity is a sensitive indicator of temperature changes, and the presence of fluids or partial melts. Measurements of natural electromagnetic disturbances allow determination of resistivity down to about 300 km in depth. However, the presence of a deep water column restricts resistivity determinations at shallow depths. This lack of information also limits resolution at greater depths.

The electromagnetic structure in and around the Japanese Islands has been obtained by observing the variation of the electric and magnetic fields. Beneath the Japan Sea, comparatively resistive structure is found, as low as 0.001 S/m down to about 100 km depth. This seems inconsistent with the high heat flow and young crustal age, as well as with the thin lithosphere inferred from seismic studies (Abe and Kanamori, 1970; Evans et al., 1978). Data from a controlled source experiment designed to reveal the resistivity structure of the top 10 km will aid in explaining these observations.

At site J1b-1, an uncased, dedicated hole will be drilled to perform large scale and oblique resistivity experiments. The large-scale electrical resistivity experiment is designed to establish a high-resolution resistivity structure for the hole. Similar experiments have been performed in DSDP holes (Francis, 1982; Von Herzen et al., 1983; Becker, 1985). The oblique electrical resistivity experiment is aimed at establishing the resistivity structure for a 10-km depth section. This is a novel approach in which the vertical current source will be supplied by a supporting vessel, and the vertical electric field in the hole will be measured by downhole tools deployed from *JOIDES Resolution*.

3.2 Site J1e-1 (Yamato Basin). Site J1e-1 is located in the west central Yamato basin just east of the Yamato Rise (Fig. 1). The "double scissor-shaped" opening model suggests that this site is related to clockwise rotation of southwestern Japan. The objectives at this site are the same as at Site J1b-1, namely (1) determination of the age and nature of basement, (2) style of multiple rifting, and (3) characterization of the sedimentary history. Drilling is proposed to a total depth of 720 m, which includes

50 m of basement penetration. This is not a reentry site.

3.3 Sites J1d-1/J1d-2 (Japan Basin). Site J1d-1 is located at the northern end of the Japan Basin just off the flank of what appears to be a buried remnant spreading ridge (Figs. 1, 2). We expect to penetrate 630 m of sediment and 50 m of acoustic basement. As at the previous sites, the objectives are to determine the nature and age of the basement in this area for tectonic interpretations and to characterize the sedimentation history. This site represents the first deep sea drilling site in this part of the Japan Sea and as such will complement the results from the southern sites.

Site J1d-2 is an alternate site located just east of the primary site in an area of similar structure and sediment thickness.

3.4 Sites J3b-1/J3b-2/J3b-3/J3c (Okushiri Ridge). Site J3b-1 is located on the Okushiri Ridge, a complex, thrust-faulted structure along the northeastern flank of the Japan Basin. It is possible that this ridge represents an obducted block formed by compression associated with backarc spreading (Tamaki, 1988). Based on nearby dredge hauls and seismic correlations, faulting and uplift occurred after the Pliocene. The principal goals of the drilling at this site are: 1) to constrain the timing of uplift and compressional tectonics in this area; 2) to provide data on the nature and age of the uplifted basement; and 3) to characterize the sedimentary history for paleoceanographic reconstructions. This site differs considerably from the previous three prime sites in that it is the only site to address the origin of compressional tectonic features which are prevalent along the eastern margin of the Japan Sea (Tamaki, 1988).

Sites J3b-2 and J3b-3 are alternate sites located slightly north and west of the primary site. Site J3c is the third alternate site. It lies on the western flank of the northern extension of Okushiri Ridge well north of and on a different ridge segment from the J3b sites. Only a thin sedimentary cover is present at this site and basement penetration of 100 m is planned.

3.5 Sites J2a-1/J2a-2 (Kita-Yamato Trough). Site J2a-1 is a primary site on Leg 128 and aimed at drilling a failed-rift sequence thought to represent an ideal setting for mineralization of massive sulfide deposits of the Kuroko or shale-hosted type. The thick sediment column at this site will also provide valuable biofacies and lithofacies evidence of depositional and paleoceanographic events during early rifting phases in the evolution of the Japan Sea, including possible evidence of suboxic water masses accompanying middle Miocene subsidence and silling.

3.6 Site JS2 (Oki Ridge). This site is aimed specifically at recovery of a Miocene to Holocene paleoceanographic reference section in sediments thought to have been deposited above the local calcite compensation depth (CCD). It is anticipated that this sequence will yield both quantitative microfossil data and a stable isotope record of late Neogene paleoceanographic and paleoclimatic events.

Alternate sites are J1a and J1c, which are also lower priority alternates on Leg 127 as discussed above.

4. OPERATIONS PLAN

Leg 127

Leg 127 is scheduled to depart Tokyo on 24 June 1989 and return to Niigata on 21 August 1989, after 59 operational days (Table 1a). The proposed sites will be drilled in the order: J1b, J1d, J3b, and J1e. Basement penetration of >50 m is anticipated at all sites. The largest penetration into the basement (~100 m) is planned at Site J1b. A standard reentry cone will be set at Site J1b in preparation for the seismic instruments that will be installed in the basement rock section during Leg 128. The casing at the site will be through the whole sediment column.

Proposed site J1b-1 is located in the northern Yamato Basin on Tansei-maru KT-88-9 line 108 at shotpoint 1262.

Alternate sites are J1b-2, J1b-3, J1a and J1c. The drilling plan for Leg 127 consists of three holes: Hole A will be cored with a combination of advanced piston coring (APC) and extended core barrel coring (XCB) to approximately 300 meters below seafloor (mbsf). A comprehensive heat flow measurement and in situ water sampling program will be performed during the APC-cored interval. For this purpose, the ODP water sampler, temperature and pressure tool (WSTP) will be deployed after each piston core. Hole B, an exploratory hole, will be drilled with the rotary core barrel (RCB) to 300 mbsf, and cored to approximately 20 m into basement. The sediment section will then be logged. For the basement objectives, a third hole (Hole C) will be RCB drilled to basement. A minimum of 100 m of basement will be cored after casing the sediment section. This hole will be used for logging basement.

A comprehensive logging program is planned for this site. The standard Schlumberger logging (two strings), formation microscanner (FMS), borehole televiewer (BHTV), magnetometer-susceptibility, packer/hydrofracture, and vertical seismic profile (VSP) measurements will be performed.

Proposed site J1d-1 is located at the northern end of the Japan basin on Tansei-maru KT-87-6 line MC1 at shotpoint 543. We anticipate penetrating 630 mbsf using APC/XCB coring. Temperature and fluid samples will be taken with the WSTP after each APC core. Drilling to basement will then be accomplished using the RCB on a second hole for a total penetration of 680 mbsf (including 50 m of basement). This will be followed by standard Schlumberger logging (two strings), FMS, BHTV and magnetometer-susceptibility runs. The alternate site is J1d-2.

Proposed site J3b-1 is located on the Okushiri Ridge on Hakuho-maru KH-86-2 line 5, at shotpoint 821. The drilling strategy will be a combination of APC and XCB coring to XCB refusal (estimated at 560 mbsf), followed by a second hole which will be RCB cored to a total penetration of 610 mbsf (includes 50 m of basement). At the conclusion of drilling, standard Schlumberger logs, BHTV, FMS and packer/hydrofracture experiments will be run. J3b-2, J3b-3 and J3c are alternate sites.

Proposed site J1e-1 is located in the west central Yamato Basin on the Geological Survey of Japan line J1e, at time 08:53. We anticipate penetration to XCB refusal (at approximately 600 mbsf) using APC/XCB coring. The WSTP tool will be deployed after every APC core. This will be followed by RCB coring for a total penetration of 720 mbsf (including 50 m of basement). The logging plan includes the standard Schlumberger suite, FMS, BHTV and magnetometer-susceptibility runs.

Proposed site J3b-3 may be APC-cored if time is available, to detect the age of initiation of uplift of the Okushiri Ridge from facies changes in the upper sedimentary section.

Leg 128

Leg 128 is scheduled to leave Niigata on 26 August 1989 and return to an as yet undetermined port on 7 October 1989, after 42 operational days (Table 1b). The proposed sites will be drilled in the order: JS2, J2a, followed by downhole experiments at J1b.

Proposed site JS2 is located on the Oki Ridge on the Geological Survey of Japan line JS2, shot 20480. The first 80 mbsf at this site will be triple APC cored to allow whole-round samples to be dedicated to the analysis of bacterial biomass and activity. The first hole will be 80 mbsf, the second hole will penetrate to 120 mbsf, and the third hole will be continued using the APC/XCB combination to refusal. Temperature and fluid samples will be taken with the WSTP after every other APC core in one of the holes. At the conclusion of drilling, standard Schlumberger logs and the FMS will be run.

Proposed site J2a-1 is located in the Kita-Yamato Trough, on JNOC line 13-4 at shotpoint 7120. We anticipate penetrating 600 mbsf (or until XCB refusal) using APC/XCB coring. Temperature and fluid samples will be taken with the WSTP after each other APC core. Drilling to basement will then be accomplished using the RCB on a second hole for a total penetration of 1610 mbsf (including 50 m of basement). A standard reentry cone will be set. This will be followed by standard Schlumberger logging (two strings), FMS, and VSP runs. The alternate site is J2a-2.

After completing these two sites, we will return to site J1b-1, which will have been drilled during Leg 127, to conduct a series of downhole experiments. Seismic instruments will be installed in the basement rock section of the reentry hole that will have been cased through the sediment column. A new RCB hole will then be drilled to perform electrical conductivity measurements that require an uncased hole.

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Table 1a. Summary Site Information, Leg 127

Site	Latitude	Longitude	Water Depth (m)	Penetration (m) Sed.	Bsmt.	Drill days	Log days	Total days	Cum. days
Leg 127 departs Tokyo on 24 June 1989									
J1b-1	40°11'N	138°15'E	2825	620	100	13.5	5.4	18.9	18.9
J1d-1	44°00'N	138°52.7'E	3374	630	50	9.0	2.1	11.1	30.0
J3b-1	42°50'N	139°25'E	2223	560	50	6.8	3.2	10.0	40.0
J1e-1	38°36.7'N	134°32.6'E	2945	670	50	9.3	2.3	11.6	51.6
Transit time								6.4	58.0
Alternate Sites:									
J1b-2	40°13'N	138°14'E	2800	610	100	12.6	5.9	18.5	
J1b-3	40°17.6'N	138°16.0'E	2892	490	100	11.7	5.8	17.5	
J3b-2	43°00'N	139°22.2'E	2312	920	50	10.9	5.0	15.9	
J3b-3	42°50'N	139°18'E	2700	250	0	2.5	0	2.5	
J3c	44°00'N	139°15'E	1168	246	100	4.9	5.0	9.9	
J1d-2	44°00'N	138°57.5'E	3406	760	50	10.4	2.0	12.4	
J1a	39°50'N	137°25'E	2530	580	100	9.0	5.6	14.6	
J1c	40°19'N	136°54'E	2400	720	50	9.3	1.7	11.0	

Table 1b. Summary Site Information, Leg 128

Site	Latitude	Longitude	Water Depth (m)	Penetration (m) Sed.	Bsmt.	Drill days	Log days	Total days	Cum. days
Leg 128 departs Niigata on 26 August 1989									
JS2	37°02.2'N	134°48.6'E	880	710	20	5.2[a]	1.4	6.6	6.6
J2a-1	39°13'N	133°52'E	2085	1379	50	17.9	3.0	20.9	27.5
J1b-1	40°11.4'N	138°14.2'E	2861	620	100	1.0	6.0[b]	7.0	34.5
Transit time								5.5	40.0
Contingency time								3.0	43.0
Alternate Sites:									
J2a-2	39°07.6'N	133°58.6'E	1860	880	100	13.2	4.5	17.4	
J1a	39°50'N	137°25'E	2530	580	100	9.0	5.6	14.6	
J1c	40°19'N	136°54'E	2400	720	50	9.3	1.7	11.0	

[a] Includes triple APC coring (first 80 mbsf) for bacterial biomass/activity experiment.

[b] Borehole seismometer and oblique electric resistivity experiments.

PLANNING COMMITTEE REPORT

The Spring Meeting of the Planning Committee was held 2-4 May, 1989 at the Voksenåsen Hotel in Oslo, Norway and hosted by the ESF. The focus of discussion for this meeting centered around rescheduling the Nankai Leg and consequent changes within the FY90 drilling schedule, scheduling drilling for the next three years, policies for future engineering development legs, ODP publications policy, and adoption of the Long Range Planning Document. Highlights of the Oslo meeting appear below. At PCOM's next meeting (22-24 August 1989 in Seattle) the agenda will focus on preparation for the Annual Meeting, review of programs led by watchdogs and panel liaisons, and specific assignments for panels and DPGs.

ODP Engineering Developments

Mike Storms reported on the engineering tests performed on Leg 124E. The Diamond Coring System was successfully deployed under severe operating conditions with sucessful "active" heave compensation under environmental conditions in excess of design parameters for the system. Design improvements and increasing the drilling depth capability of the DCS from its present 2000 m depth limit to 3500-4500 m is estimated to cost $700K to $800K. Test of the Navi-drill core barrel showed that the new Mach 1P, "drainhole" mud motor, is a significant improvement over previous designs. Motor failures and other design problems, however, indicate more work is needed before the Navi-drill can be deployed routinely as required for use of the Geoprops probe.

Mike Storms presented the ODP-TAMU Engineering estimates of the relative costs to achieve compatibility between the 4-inch diameter borehole made by the DCS and the minimum 5-inch borehole required to use the present suite of logging tools. It is estimated that reaming an preexisting 4-inch diameter, 500-m borehole made with the DCS, to a 7.5-inch borehole compatible with the present suite of logging tools, requires 17.5 days of drilling time and would cost $76K for the drilling hardware needed for just the reaming. The estimated cost for increasing the size of the borehole drilled by the DCS to 5 inches is $2.72M and requires 2-3 weeks in dry dock for modifications to the JOIDES Resolution. Drilling a hole greater than 6.5 inches in diameter with the DCS requires even more extensive modifications to the JOIDES Resolution.

Rich Jarrard for WLS provided an estimate of $60K per leg to rent a basic logging tool assembly for a 4-inch diameter hole, but this sacrifices a considerable amount of information that is obtained with the logging tool suite currently in use. Modifying the present tools for use in a 4-inch hole would be prohibitively expensive and in some cases difficult to impossible to achieve. With the current budgets a choice between renting tools for high temperature logging and logging 4-inch holes would also have to be made. An increase in funding appears to be necessary to achieve compatibility between hole size and logging if the DCS is used.

Engineering Development Legs

Because of the importance of Engineering Developments for the future success of ODP, PCOM affirms the use of the ship's time for testing of engineering developments in joint science-engineering legs or within a scientific leg, as opportunities and the stage of developments allow. PCOM in consultation with ODP-TAMU Engineering and with the advice of JOIDES Panels, will establish priorities for these legs, check that preparations for tests are adequate, and determine if the necessary site surveys are available for proper site selection. There will be both an engineer and a science co-chief on the engineering development legs. Staffing of these legs should include JOIDES panel members or other scientists concerned with the long-term engineering development goals, and proponents of the particular engineering development undergoing tests.

Engineering operations will have priority on these legs. Engineering legs will no longer be given an "E" designation, but will be sequentially numbered along with scientific legs.

Drilling Plans for FY90

Nankai Trough

Because of the uncertain status of several of the geotechnical instruments scheduled to be deployed during the Nankai Trough drilling leg (Navi-drill, Geoprops probe, TAM wireline packer), the weather, and one-leg versus two-leg drilling strategies, there was extensive discussion about this leg. Even though an initial drilling leg would benefit from the use of the geotechnical instruments under current development, it was agreed that the scientific objectives of the Nankai Leg can stand on their own without the Geoprops probe; therefore the program was left in the FY90 drilling program.

Old Pacific Leg Replaces Geochemical Reference Leg

Because of their high thematic ranking, Old Pacific and Atolls and Guyots were proposed for insertion into the programs scheduled for FY90, to reduce transit times under weather constraints. Past thematic rankings and stage of maturity of these programs were carefully considered. Specifically, Old Pacific had greater thematic support than Geochemical Reference, and was more mature than Atolls and Guyots. PCOM adopted the approximate schedule for the FY90 drilling program shown. Following the Lau-Tonga Leg there will be a transit of the JOIDES Resolution eastwards across the Pacific to Site 504B and the East Pacific Rise for engineering operations to prepare for lithospheric drilling in these locations.

Drilling Plans for 1991

From panel evaluations to date, it became obvious that more high ranking programs are in the eastern Pacific than in the central Pacific. The present stage of engineering developments, the stage of proposal revisions, and other factors do not disclose at this time exactly which of these programs wil be ready for drilling in 1991, but it is anticipated that mature proposals will be forthcoming.

PCOM therefore will schedule the general ship track for calendar year 1991 from among the following list of programs given high priority by the thematic panels: Cascadia Accretionary Prism; Chile Triple Junction; Eastern Equatorial Pacific Neogene Transect; East Pacific Rise Bare Rock Drilling; Hydrothermal Processes at Sedimented Ridge Crests; Lower Crust at Site 504B.

Drilling Plans Following 1991

Having issued a call for proposals, PCOM is reluctant to plan the general position of the vessel beyond 1991 until there is reasonably sufficient opportunity for new and revised proposals to be submitted for thematic evaluation and ranking into programs. Thematic panels will meet twice (early fall 1989, late winter 1990) before spring 1990, when PCOM will determine the general direction of the vessel through spring 1994.

Approximate Cruise Schedule for FY90

129	Nov.-Dec.	1989	2 mo.	Old Pacific
130	Jan.-Feb.	1990	2 mo.	Ontong Java Plateau
131	Mar.-Apr.	1990	2 mo.	Nankai
132	May -June	1990	2 mo.	Engineering (Shatsky, MIT, Mariana)
133	July-Aug.	1990	2 mo.	NE Australia Margin
134	Sep.-Oct.	1990	2 mo.	Vanuatu
135	Nov.-Dec.	1990	2 mo.	Lau-Tonga

Publications Policy

The problem of publications was extensively discussed since a major criticism of reviewers of ODP has been the delay in publication of Initial Reports and Scientific Results, as well as the lack of thematic (synthesis) publications. Related is the problem that ODP publications have not become fully accepted as peer-reviewed literature, especially outside the drilling community. There is strong sentiment among some that policy be changed to favor more immediate and unrestricted publication in the open literature. A return to the style and guidelines of DSDP days has also been suggested, which could even be speeded up because so much work can now be done onboard ship with computers.

The Performance Evaluation Committee II report (PEC II) recommended that Part A (Initial Reports) be published so as to appear within one year of the end of the cruise, "even if this means some sacrifice in appearance and makes for unhappy paleontologists." Two-thirds of respondents to the IHP survey thought Initial Report (IR) publication could be accelerated by 1 to 4 months. The present schedule calls for 14 months, but the IRs are appearing about 16 to 18 months post-cruise. With most IR material now ready for publication at the end of a leg, the main requirements for time seem to be for: 1) biostratigraphic adjustments; 2) preparing or improving illustrations; 3) editing; and 4) printing and binding.

PEC II also suggested that "every effort be made to publish Part B (Scientific Results) in less than 30 months." Sixty per cent in the IHP poll thought the results should be published less than 30 months post-cruise; only 5% said 36 months or more. At present, 36 months is the target, but about 45 months is the actual time to appearance of the SR volumes. A major delay is post-schedule receipt (or non-receipt) of manuscripts from authors.

PCOM endorsed the publication policy outlined below and forwarded it to EXCOM for adoption by ODP.

Thematic Publications

The subcommittee of PCOM on Thematic Publications chaired by Margaret Leinen recommended that thematic publications cover multiple-leg topics, focus on themes (e.g. processes, conceptual models, environments, history), and highlight ODP results in the framework of their influence and contributions to science. They suggest a "Dahlem Conference" model, where papers are submitted in advance as a pre-requisite for attendance; papers evolve as a result of interactions; volumes of papers are published quickly; and the "Dahlem" model is familiar to geoscientists. Thematic panels would suggest appropriate themes. Publication of the volumes would be by outside firms or societies, rather than ODP. Thematic symposia at meetings are also to be encouraged, especially those that result in special issues of journals. PCOM has asked the thematic panels to take the lead toward thematic publications.

In a related development JOI/USSSP has announced that "seed money" is available to help defray out-of-pocket expenses for convening or editing ODP thematic volumes. See the Bulletin section page 63 for more information.

Long Range Planning Document

The Long Range Planning document was reviewed and some minor suggestions for improvement were made. PCOM endorsed the Long Range Planning document and forwarded it to EXCOM for adoption by ODP. JOI will provide funds for publication and distribution of the document to the scientific community.

ODP Publication Policy

In order to provide a framework for more timely publication, both in the ODP literature and in the open literature, while maintaining the integrity of the "Scientific Results" volumes, PCOM recommends the following policies for publications.

A. The "Initial Reports" volume will be scheduled to appear within one year of the end of a drilling leg. A small meeting of the Co-Chief Scientists and key personnel, about 3 or 4 months post-cruise, will refine, edit, and complete the "Initial Reports" volume, which essentially will be what had been written onboard ship.

B. The "Scientific Results" volume will be scheduled to appear 30 months from the end of a drilling leg. The volume can be composed of contributions directly to the volume, as well as reprints and preprints of publications submitted to the open reviewed literature. These latter two options are subject to the following restrictions:

1. Any submission for publication within 12 months post-cruise must have had its authorship and theme agreed to by a consensus of the scientific party before the end of the cruise. The Co-Chief Scientists will examine the manuscript to ensure that the agreement about theme and authorship has been fulfilled.

2. Any submission for publication between 12 months post-cruise and the fulfillment of the author's obligation to the "Scientific Results" volume must have had its theme and authorship agreed to by a consensus of the scientific party at the main post-cruise meeting. The Co-Chief Scientists will examine the manuscript to ensure that the agreement about theme and authorship has been fulfilled.

3. After the author's contribution to the "Scientific Results" volume has been accepted, authors may publish at will in the open literature.

C. Within this policy framework PCOM will direct its Information Handling Panel to advise it of more detailed guidelines. They will include for example, issues regarding copyright, site-survey publications, lead times to meet publication dates, and editorial policy including the need for an editorial review board.

PROPOSALS RECIEVED BY THE JOIDES OFFICE THROUGH 22 MAY, 1989

Ref. No.	Theme/Area	Author(s)	Date Rec'd.
	ATLANTIC OCEAN		
1/A	Pre-mid Cret. History, SE Gulf of Mexico	Phair & Buffler	12/82
5/A	Struct. & Sed. Carbonate Platforms	Mullins, et al.	7/83
6/A	Labrador Sea, Ocean Crust & Paleocean	Gradstein, et al.	5/84*
7/A	Gulf of Mexico & Yucatan	Buffler, et al.	8/83
9/A	Pre-Messinian Hist. of Mediterranean	Hsu, et al.	1/84
10/A	Cenozoic Circulation off NW Africa	Sarnthein, et al.	4/85*
11/A	Porto & Virgo Seamounts, Iberian Margin	Kidd, et al.	1/84
12/A	Tyrrhenian Back-arc Basin Transect	Cita & Malinverno	1/84
15/A	Formation of Atlantic Ocean	Herbin	1/84
16/A	Atlantic/Mediterranean Relationship	Faugeres	1/84
17/A	Gorringe Bank, Deep Crust & Mantle	Mevel	1/84
18/A	Off Galicia Bank	Mauffret, et al.	6/84*
19/A	Eleuthera Fan, Bahamas	Ravenne & Le Quellec	1/84
20/A	Subduction Collision:Outer Hellenic Arc	J. Mascle	1/84
21/A	Tyrrhenian Basin: Rift, Stretch, Accretion	Rehault & Fabbri	7/85*
22/A	Rhone Deep Sea Fan	Bellaiche, et al.	1/84
23/A	Carribean Basins	A. Mascle & Biju-Duval	1/84
24/A	Barbados Transects	A. Mascle & Biju-Duval	1/84
32/A	Yucatan Basin	Rosencrantz & Bowland	1/84
33/A	Mediterranean Drilling [same as 9/A]	Hsu	
35/A	Barbados Ridge Accretionary Complex	Westbrook	2/84
36/A	Norwegian Sea	Hinz & NOR-WG	5/84*
38/A	Gulf of Mexico (DeSoto Canyon)	Kennett & T. Moore	2/84
39/A	Cape Verde Drilling	Hill	2/84
40/A	Logging Site 534 (Blake-Bahamas Basin)	Sheridan, et al.	2/84
41/A	N. Barbados Forearc: Struct. & Hydrology	C. Moore	3/84
45/A	Equatorial Atlantic: Paleoenvironment	Ruddiman	3/84
58/A	W Baffin Bay	Grant & Jansen	3/84
59/A	Cont. Margin Instability Testing	Weaver & Kidd	9/88*
60/A	Newfoundland Basin: E Canadian Margin	Masson	4/84
63/A	Madeira Abyssal Plain [idea proposal]	Duin, et al.	6/84
64/A	Site NJ-6	Poag	6/84
68/A	Deep Basins of Mediterranean	Montadert	7/84
72/A	Two-leg Transect, Lesser Antilles Forearc	Speed, et al.	7/84
74/A	Cont. Margin of Morocco, NW Africa	Winterer & Hinz	8/84
81/A	Ionian Sea Transect, Mediterranean	Hieke & Makris	9/84
85/A	Margin of Morocco, NW Africa	Hayes, et al.	9/84
122/A	Kane Fracture Zone	Karson	12/84
125/A	Bare-rock Drilling, Mid-Atlantic Ridge	Bryan, et al.	1/85
204/A	Florida Escarpment Transect	Paull, et al.	10/86*
205/A	Bahamas: Carb. Fans,Escarp. Erosion,Roots	Schlager, et al.	12/85
254/A	NW Africa: Black Shales in Pelagic Realm	Parrish & Tucholke	8/86
255/A	Black Shales in Gulf of Guinea	Herbin & Zimmerman	8/86
264/A	Montagnais Impact Struct., Scotia Shelf	Grieve, et al./ Jansa & Pe-Piper	12/86
276/A	Equatorial Atlantic Transform Margins	J. Mascle	4/87
310/A	Geochemical Sampling, E Greenland	Morton, et al.	9/88
311/A	Sed. Equivalent Dipping Refls., Rockall	Masson, et al.	9/88

Ref. No.	Theme/Area	Author(s)	Date Rec'd.
Atlantic Ocean, continued			
312/A	Potential Drilling on Reykjanes Ridge	Cann & Powell	9/88
313/A	Evol. of Oceanogr. Pathway, Eq. Atlantic	Jones, et al.	9/88
320/A	High Northern Lat. Paleoc. & Paleoclimate	E. Jansen, et al.	3/89
323/A	Gibraltar Arc	M.C. Comas, et al.	4/89
324/A	Tecton. Evol. of W & E Meditt. since Mesozoic	P. Casero, et al.	4/89
326/A	Continental Margin of NW Morocco	K. Hinz et al.	5/89
	INDIAN OCEAN		
30/B	Davie Ridge & Malagasy Margin	Clocchiatti, et al.	8/85*
31/B	Red Sea, Paleoenvironmental History	Guennoc	1/84
44/B	Andaman Sea: Tectonic Evolution	Peltzer, et al.	3/84
55/B	Makran Forearc, Pakistan	Leggett	3/84
56/B	Intraplate Deformation	Weissel, et al.	10/84*
57/B	Deformation of African-Arabian Margin	Stein	10/84*
61/B	Madagascar & E Africa Conjugate Margins	Coffin & Matthias	10/84*
62/B	Davie Fracture Zone	Coffin, et al.	12/84*
65/B	S Australian Margin: Magnetic Quiet Zone	Mutter & Cande	10/84*
77/B	Seychelles Bank & Amirante Trough	Mart	8/84
78/B	Indus Fan	Kolla	8/84
79/B	Tethyan Stratigraphy & Oceanic Crust	Coffin & Chanell	10/84*
86/B	Red Sea	Bonatti	9/85*
87/B	Carlsberg Ridge/Arabian Sea: Basalt Obj.	Natland	10/84
88/B	Chagos-Laccadive-Mascarene Volc. Lin.	Duncan, et al.	5/85*
89/B	SWIR, Mantle Heterogeneity	Dick & Natland	5/86*
90/B	SE Indian Ridge Transect	Duncan	10/84
91/B	SE Indian Ocean Transect	Langmuir	10/84
92/B	Crozet Basin, Seismic Observatory	Buttler & Brocher	8/85*
93/B	W Arabian Sea: Upwelling, Salinity, etc.	Prell	10/84
94/B.	Owen Ridge: History of Upwelling	Prell	10/84
95/B	Asian Monsoon, Bay of Bengal	Cullen & Prell	10/84
96/B	Bengal Fan (Indus & Ganges Fans)	Klein	10/84
97/B	90°E Ridge: High Res. Drilling Transect	Peterson	7/85*
98/B	History of Atm. Circ. (Autralian Desert)	Rea	10/84
99/B	Agulhas Basin Paleocean. Climate Dynam.	Coulbourn	10/84
100B	SE Indian Ridge Transect: Strat. Section	Hays & Lazarus	10/84
101B	Ridge Crest Hydrothermal Activity	Owen & Rea	10/84
102/B	Somali Basin	Matthias	10/84
103/B	Laxmi Ridge, NW Indian Ocean	Heirtzler	10/84
104/B	90°E Ridge Transect	Curray & Duncan	10/84
105/B	Timor, Arc-continent Collision	Karig	10/84
106/B	Broken Ridge	Curray, et al.	10/84
107/B	SE Indian Ridge: Stress in Ocean Lithosph.	Forsyth	10/84
112/B	Lithosphere Targets	SOP -Kennett	10/84
113/B	Agulhas Plateau	SOP -Kennett	10/84
115/B	Agulhas Plateau & Adjacent Basins	Herb & Oberhansli	4/85*
116/B	90°E Ridge & Chagos-Laccadive Ridge	Oberhansli & Herb	4/85*
117/B	N Red Sea	Cochran	10/84
118/B	Cenozoic History of E Africa	Kennett, et al.	11/84
119/B	Early Opening of Gulf of Aden	Stein	12/84
120/B	Red Sea, Atlantis II Deep	Zierenberg, et al.	12/84

Ref. No.	Theme/Area	Author(s)	Date Rec'd.
Indian Ocean, continued			
121/B	Exmouth/Wallaby Plateaus, Argo Abys. Plain	Von Rad, et al.	5/86*
134/B	Gulf of Aden	Girdler	4/86*
135/B	Broken Ridge: Thermo-Mechanical Models	Weissler & Karner	3/85
137/B	Fossil Ridges in Indian Ocean	Schlich, et al.	3/85
138/B	Rodriques Triple Junction	Schlich, et al.	8/85*
139/B	Agulhas Plateau, SW Indian Ocean	Jaquart & Vincent	8/85*
140/B	Central & N Red Sea Axial Areas	Pautot & Guennoc	8/85*
141/B	Indus Fan	Jacquart, et al.	8/85*
150/B	90°E Ridge/Kerg.-Gaussb.Ridge: Hard Rock	Frey & Sclater	7/85
173/B	Seychelles, Mascarene Pl., NW Indian Ocean	Patriat, et al.	8/85
183/B	Periplatform Ooze, Maldives	Droxler, et al.	3/87*
196/B	90°E Ridge: Inpact of India on Asia	Peirce	12/85
197/B	Otway Basin/W Tasman Sea Region	Wilcox, et al.	12/85
208/B	Ancestral Triple Junction	Natland, et al.	1/86
211/B	Deep Stratigraphic Tests	SOHP - Arthur	1/86
215/B	Red Sea: Sed. & Paleocean. History	Richardson & Arthur	2/86
219/B	Gulf of Aden Evolution	Simpson	3/86
223/B	Central Indian Ocean Fracture Zone	Natland & Fisher	4/86
226/B	Eq. Indian Ocean: Carb. System & Circ.	Prell & Peterson	8/86*
240/B	Argo Abyssal Plain	Gradstein	7/86*
246/B	Mesozoic Upwelling off S Arabian Margin	Jansa	7/86
251/B	Seychelles-Mascarene-Saya de Mayha Region	Khanna	8/86
262/B	Mid Indus Fan	Haq	11/86
288/B	Repositioning EP2 to EP12, Exmouth Plateau	Mutter & Larson	8/87
300/B	Return to Site 735-B Deep Crustal Drilling	Dick, et al.	2/88

SOUTHERN OCEANS

Ref. No.	Theme/Area	Author(s)	Date Rec'd.
54/C	Sub-Antarctic & Weddell Sea Sites	Kennett	3/84
71/C	Drilling on the Shaka Ridge [idea proposal]	Sclater	7/84
73/C	Antarctic Margin off Adelie Coast	Wannesson, et al.	8/84
108/C	E Antarctic Cont. Margin (Prydz Bay)	SOP	5/87*
109/C	Kerguelen - Heard Plateau	SOP - Kennett	10/84
110/C	Wilkesland - Adelie Cont. Margin	SOP - Kennett	10/84
111/C	SE Indian Ocean Ridge Transect (Subantarc.)	SOP - Kennett	10/84
114/C	Crozet Plateau	SOP - Kennett	10/84
129/C	Bounty Trough	Davy	5/86*
136/C	Kerguelen - Heard Plateau	Schlich, et al.	7/85*
169/C	S Tasman Rise	Hinz & Dostmann	7/85
185/C	Kerguelen Plateau: Origin, Evol. & Paleo.	Coffin, et al.	8/85
209/C	Eltanin Fracture Zone	Dunn	1/86
228/C	Weddell Sea (E Antarctic Cont. Margin)	Hinz, et al.	5/86
230/C	Wilkes Land Margin, E. Antarctica	Eittreim, et al.	5/86
244/C	W Ross Sea	Cooper, et al.	8/86*
273/C	S Kerguelen Plateau	Schlich, et al.	3/87
296/C	Ross Sea, Antarctica (Subs. for 244/C)	Cooper et al.	12/87
297/C	Pacific Margin, Antarctic Peninsula	Barker, et al.	12/87

Ref. No.	Theme/Area	Author(s)	Date Rec'd.
	WESTERN PACIFIC OCEAN		
25/D	New Hebrides Arc	ORSTOM Team	1/84
26/D	Tonga-Kermadec Arc	Pelletier & Dupont	6/86*
27/D	Sulu Sea Marginal Basin	Rangin	7/85*
28/D	S China Sea	Letouzey, et al.	1/84
29/D	Ryukyu Island & Okinawa Backarc Basin	Letouzey	1/84
42/D	Sunda Straits Area	Huchon	3/84
43/D	SW Pacific Drilling Outline	Falvey	3/84
46/D	S China Sea Margin History	Hayes, et al.	11/87*
47/D	Manila Trench, S China Sea	Lewis & Hayes	3/84
48/D	Sulu Sea & S China Sea	Hinz & Schlueter	12/85*
49/D	E Banda Arc/Arafura Sea	Schlueter & Frisch	3/84
50/D	Nankai Trough & Shikoku Forearc	Kagami, et al.	8/85*
51/D	Sea of Japan	Tamaki, et al.	3/84
52/D	Solomon Sea	Milsom	3/84
67/D	Tonga-Lord Howe Rise Transect	Falvey, et al.	7/84
80/D	Sunda and Banda Arc	Karig and G. Moore	10/84*
82/D	Sulu Sea	Thunell	9/84
83/D	Isu-Ogasawara (Bonin) Arc Transect	Okada & Takayanagi	4/86*
126/D	Drilling in the Australasian Region	Crook, Falvey, Packham	1/85
127/D	E Sunda Arc & NW Australian Collision	Reed, et al.	1/85
130/D	Evolution of SW Pacific (N of New Zealand)	Eade	1/85
131/D	Banda Sea Basin: Trapped Ocean Crust etc.	Silver	3/85
132/D	TTT-type Triple Junction off Boso, Japan	Ogawa & Fujioka	6/85*
144/D	Kuril forearc off Hokkaido: Arc-arc Collision	Seno, et al.	6/86*
145/D	Ryukyu Arc: Left-lateral Dislocation	Ujiie	6/86*
146/D	Toyamu Fan, E Japan Sea	Klein	7/85*
147/D	S China Sea	Wang, et al.	6/85
148/D	Near TTT-type Triple Junction off Japan	Ogawa, et al.	6/85
149/D	Yamoto Basin, Japan Sea: Active Spreading	Kimura, et al.	6/86*
151/D	Japan Sea: Mantle Plume Origin	Wakita	7/85
154/D	Banda-Celebes-Sulu Basin Entrapment	Hilde	7/85
156/D	Kita-Yamamoto Tr., Japan Sea, Massive Sulf.	Urabe	7/85
157/D	Japan Sea Paleoceanography	Koizumi & Oba	7/85
158/D	Japan Sea & Trench: Geochem. & Sed.	Matsumoto & Minai	7/85
163/D	Zenisu Ridge: Intraplate Deformation	Lallemant, et al.	4/88*
164/D	Japan Trench & Japan-Kurile Trench Junction	Jolivet, et al.	7/85
165/D	Shikoku Basin Ocean Crust	Chamot-Rooke,LePichon	7/85
166/D	Japan Sea: Evolution of Mantle Wedge	Tatsumi, et al.	7/85
167/D	Okinawa Trough & Ryukyu Trench	Uyeda, et al.	6/86*
168/D	Japan Sea: Siliceous Sediments	Iijimi, et al.	7/85
170/D	Valu Fa Ridge/Lau Basin: Back-arc Spreading	Morton, et al.	7/85
171/D	Bonin Region: Intra-oceanic Arc-Trench Dev.	B. Taylor	4/86*
172/D	Mariana Forearc, Arc & Back-arc Basin	Fryer	8/85
174/D	Japan Sea: Forearc Tectonics	Otsuki	8/85
175/D	Japan Trench: Origin of Inner Wall	Niitsuma & Saito	8/85
176/D	S Japan Trench: Migration of Triple Junction	Niitsuma	8/85
177/D	Zenisu Ridge: Intra-ocean Plate Shortening	Taira, et al.	9/87*
178/D	Nankai Trough Forearc	Shiki & Miyake	8/85
179/D	Daito Ridges Region: NW Philippine Sea	Tokuyama, et al.	6/86*
180/D	N Philippines Sea: Kita-Amami Basin/Plateau	Shiki	8/85

Ref. No.	Theme/Area	Author(s)	Date Rec'd.
Western Pacific Ocean, continued			
181/D	Izu-Ogasawara-Mariana Forearc: Crust/Mantle	Ishii	8/85
184/D	Papua New Guinea/Bismarck Sea Region	Exon, et al.	8/85
187/D	New Hebrides Arc Region, SW Pacific	F. Taylor & Lawver	9/85
189/D	Tonga Ridge - Lau Ridge Region	Stevenson, et al.	10/85
190/D	New Hebrides (Vanuatu) Arc-ridge Collision	Fisher, et al.	10/85
191/D	Solomon Isl.: Arc-plateau Coll./Intra-arc	Vedder & Bruns	10/85
194/D	S China Sea	Liu, et al.	4/88*
198/D	Ulleung Basin: Neogene Tectonics & Sed.	Chough, et al.	12/85
206/D	GBR: Mixed Carb/Epiclastic Shelf	Davies, et al.	12/85
216/D	S China Sea	Rangin, et al.	2/86
217/D	Lord Howe Rise	Mauffret & Mignot	2/86
218/D	Manila Trench & Taiwan Coll. Zone, SCS	Lewis, et al.	2/86
220/D	Three Sites in Lau Basin	Hawkins	3/86
235/D	Solomon Sea: Arc-Trench Devel., Back-arc	Honza, et al.	6/86
239/D	Two Sites in Lau Basin	Cronan	6/86
242/D	Backthrusting and Back-arc Thrust, Sunda Arc	Silver & Reed	9/87*
243/D	Outer Tonga Trench	Bloomer & Fisher	6/86
260/D	Ogasawara Plateau, Near Bonin Arc	Saito, et al.	10/86
265/D	W. Woodlark Basin	Scott, et al.	12/86
266/D	Lau Basin	Lau Consortium	12/86
268/D	Hydrothermal Ore Dep. Queensland Plateau	Jansa, et al.	12/86
274/D	S China Sea	Zaoshu & Yan	3/87
281/D	Accr. Prisms: Kurile/Japan Trench & Nankai	Okamura & Yamazaki	6/87
292/D	Drilling in SE Sulu Sea	Hinz, et al.	3/88*
293/D	Drilling in Celebes Sea	Hinz, et al.	9/87
294/D	Ophiolite Analog. in Aoba Basin, Vanuatu	Shervais	10/87
295/D	Hydrogeol. & Struct., Nankai Accr. Complex	Gieskes, et al.	12/87
301/D	Integrated Proposal	Gieskes, et al.	3/88
314/D	Fluid Flow & Mechan. Resp., Nankai Accr. Pr.	Karig, et al.	9/88

CENTRAL AND EASTERN PACIFIC OCEAN

2/E	Mid-America Trench & Costa Rica Margin	Crowe & Buffler	12/82
3/E	Flexural Moats, Hawaiian Islands	Watts, et al.	10/88*
4/E	Tuamoto Archipelago (French Polynesia)	Okal, et al.	6/83
8/E	S Chile Trench	Cande	9/83
14/E	Zero-Age Drilling: EPR 13°N	Bougault	1/84
34/E	Pacific-Aleutian-Bering Sea (Pac-a-bers)	Scholl & Vallier	2/84
37/E	Costa Rica, Test of Duplex Model	Shipley, et al.	8/84*
75/E	Gulf of California	Becker, et al.	8/84
76/E	EPR: Oceanic Crust at Axis	Francheteau & Hekinian	11/84*
84/E	Peru Margin	Kulm & Hussong	9/84
123/E	Studies at Site 501/504	Mottl	12/84
124/E	Deepening Hole 504B	LITHP-Becker	1/85
142/E	Ontong-Java Pl.: Eq. Pac. Depth Transect	Mayer & Berger	4/85
153/E	Three Sites in SE Pacific	Hays	7/85
182/E	Sounder Ridge, Bering Sea: Stratig.	Taira	8/85
192/E	Baranoff Fan, SE Gulf of Alaska	Stevenson & Scholl	10/85
195/E	Bering Sea Paleoenviron. & paleoclim.	Sancetta	10/88*
199/E	N Pacific: Pelagic Sed. in Subarctic Gyre	Janecek, et al.	10/88*
202/E	N Marshall Isl. Carbonate Banks	Schlanger	12/85

Ref. No.	Theme/Area	Author(s)	Date Rec'd.
Central and Eastern Pacific Ocean, continued			
203/E	Guyots in Central Pacific	Winterer, et al.	12/85
207/E	Bering Sea Basin & Aleutian Ridge Tectonics	Rubenstone	1/86
210/E	NE Gulf of Alaska: Yakutat Cont. Margin	Lagoe & Armentrout	1/86
212/E	Off N & Central California	Greene	1/86
213/E	Aleutian Subd.: Proc. Controlling Accret.	McCarthy & Scholl	1/86
214/E	Cent. Aleutian Forearc: Trench-slope Break	Ryan & Scholl	1/86
221/E	Eq Pacific: Late Cenozoic Paleoenv.	Pisias, et al.	3/86
222/E	Ontong Java Pl.: Origin, Sed., Tectonics	Kroenke, et al.	7/87*
224/E	Escanaba Trough (Gorda Ridge), NE Pacific	Fisk, et al.	9/87*
225/E	Aleutian Basin, Bering Sea	Cooper & Marlow	10/88*
227/E	Aleutian Ridge, Subsidence & Fragmentation	Vallier & Geist	5/86
229/E	Bering Sea, Beringian Cont. Slope & Rise	Cooper, et al.	5/86
231/E	N Pacific Magnetic Quiet Zone	Mammerickx, et al.	10/88*
232/E	N Juan de Fuca R.: Hi Temp./Zero-Age Crust	Davis, et al.	5/86
233/E	Oregon Accr. Complex: Fluid Proc. & Struct.	Kulm, et al.	5/86
234/E	Aleutian Trench: Kinematics of Plate Conv.	von Huene, et al.	6/86
236/E	N Gulf of Alaska	Bruns, et al.	6/86
237/E	Active Margin off Vancouver Island	Brandon & Yorath	6/86
241/E	Gulf of Alaska (Yakutat Block) & Zodiac Fan	Heller	6/86
245/E	Transform Margin off California	Howell, et al.	7/86
247/E	NE Pacific: Ocean., Climatic & Volc. Evol.	Bornholm, et al.	1/88*
248/E	Ontong Java Plateau	Ben-Avraham & Nur	8/86
249/E	Sedimentation in Aleutian Trench	Underwood	8/86
250/E	Navy Fan, California Borderland	Underwood	8/86
252/E	Loihi Seamount, Hawaii	Staudigel, et al.	10/86*
253/E	Shatsky Rise: Black Shales in Ancestr. Pac.	Schlanger & Sliter	8/86
256/E	Queen Charlotte Transform Fault	Hyndman, et al.	9/86
257/E	Farallon Basin, Gulf of California	Lawver, et al.	9/86
258/E	Stockwork Zone on Galapagos Ridge	Embley, et al.	10/86
259/E	Meiji Sediment Drift, NE Pacific	Keigwin	10/86
261/E	History of Mesozoic Pacific Ocean	Larson & Lancelot	10/86
263/E	S Explorer Ridge, NE Pacific	Chase, et al.	11/86
269/E	Aleutian Pyroclastic Flows in Marine Env.	Stix	12/86
271/E	Paleocean. Trans. of California Current	Barron, et al.	10/88*
275/E	Gulf of California (Composite Proposal)	Simoneit & Dauphin, eds	10/88*
277/E	Aseismic Slip in Cascadia Margin	Brandon	4/87
278/E	Blanco Trans. Fault: Alter., Layer Three	Hart, et al.	5/87
279/E	Seamount 6 Near EPR	Batiza	5/87
280/E	Cret. Seamounts & Guyots, W. Pacific	Vogt, et al.	6/87
282/E	Tracing Hawaiian Hotspot	Niitsuma & Okada	6/87
283/E	Kuroshio Current & Plate Motion History	Jacobi, et al.	6/87
284/E	Escanaba Tr., S Gorda Ridge Hydrotherm.	Zierenberg, et al.	7/87
285/E	Jurassic Quiet Zone, W. Pacific	Handschumacher, et al.	7/87
286/E	Return to 504B, Layer 2/3 Trans.	Becker	7/87
287/E	M-Series Drilling, W. Pacific	Handschumacher & Vogt	8/87
289/E	Mass budget in Japan Arc-10Be Geoch. Ref.	Sacks, et al.	9/87
290/E	Axial Seamount, Juan de Fuca Ridge	Johnson, et al.	9/87
291/E	Marquesas Volcanic Moat, Apron	Natland & McNutt	9/87
303/E	Fracturing/Volcanism on Hawaiian Swell	Keating	4/88
306/E	Old Pacific History	Lancelot, et al.	6/88

Ref. No.	Theme/Area	Author(s)	Date Rec'd.
Central and Eastern Pacific Ocean, continued			
307/E	Cross Seamount, Hawaiian Swell	Keating	7/88
308/E	Seamounts in Line Islands Chain	Keating	7/88
316/E	Gas-Hydrate Hole	Hesse, et al.	10/88
317/E	N. Cascadia Subduction Zone (Rev.)	R.D. Hyndman, et al.	12/88
318/E	Chile Margin Triple Junction (Rev.)	S.C. Cande, et al.	1/89
319/E	Extinct Hydrotherm. Syst. E. Galapagos (Rev.)	M.R. Perfit, et al.	2/89
321/E	EPR Ridge Crest Near 9°40'N	D.J. Fornari, et al.	3/89
322/E	Ontong Java Plateau-Pipelike Structures	P.H. Nixon	3/89
325/E	High Temp. Hydrotherm. Site N Juan de Fuca	H.P. Johnson, et al.	5/89

GENERAL AND INSTRUMENTAL / DOWNHOLE EXPERIMENTS

13/F	Water Column Research Lab	Wiebe	1/84
53/F	Vertical Seismic Profiling	Phillips & Stoffa	3/84
66/F	Laboratory Rock Studies to Reveal Stress	Whitmarsh	9/87*
69/F	Rock Stress Measurements, Norwegian Sea	Stephansson	7/84
70/F	Borehole Seismic Exp., Sites 417 & 603	Stephen, et al.	7/84
128/F	Phys. Props. in Accretionary Prisms	Karig	1/85
133/F	In-situ Pre Fluid Sampling	McDuff & Barnes	3/85
143/F	In-situ Magnetic Susc. Measurements	Krammer & Pohl	12/85*
152/F	Borehole Seismic Exp., Tyrrhenian Sea	Avendik & Detrich	7/85
155/F	Downhole Meas., Japan Sea	Suyehiro, et al.	9/87*
159/F	Phys. Cond. Across Trench: Izu-Mariana	Kinoshita, et al.	7/85
160/F	Lith. Plate Geophys. Cond., Weddell Sea	Kinoshita, et al.	7/85
161/F	Magnetic Field & Water Flow Meas.	Kinoshita, et al.	7/85
162/F	Offset VSP, SW Ind. Ocean Fract. Zones	Stephen	7/85
186/F	SW Ind. Ocean Fract. Zones: Hydrology, etc.	von Herzen	8/85
188/F	395A Boreh. Geophys./418A Drill & Geophys.	DMP - Salisbury	9/85
193/F	Upper Ocean Part. Fluxes, Weddell Sea	Biggs	11/85
200/F	Boreh. Magnetic Logging, Leg. 109 (MARK)	Bosum	12/85
201/F	High-precision Borehole Temp. Meas.	Kopietz	12/85
238/F	Pore Pressure in Makran Subd. Zone	Wang & von Huene	6/86
267/F	Conv. Margin Old Crust, Argo & W Pacific	Langmuir & Natland	12/86
270/F	Tomographic Imaging of Hydrotherm. Circ.	Nobes	1/87
272/F	Long-term Downh. Meas. Around Japan	Kinoshita	2/87
298/F	Acquiring VSP, Nankai Trough ODP Sites	G. Moore	1/88
299/F	Def. of Seds., Self-bore P-meter	Brandon & Moran	2/88
302/F	Elect. Conductivity Structure, Japan Sea	Hamano, et al.	3/88
304/F	ODP Nankai Downhole Observatory	Kinoshita, et al.	6/88
305/F	Arctic Ocean Drilling	Mudie, et al.	6/88
309/F	VSP at Bonins	P. Cooper & B. Taylor	9/88
315/F	Network of Ocean Floor Broad Band Seismom.	Purdy & Dziewonski	10/88

*indicates date of most recent revision

JOIDES/ODP BULLETIN BOARD

JOIDES MEETING SCHEDULE (05/22/89)

Date	Place	Committee/Panel
2-4 May	Oslo, Norway	PCOM
23-24 May	La Jolla, CA	DMP
31 May-2 June	Palisades, NY	EXCOM & ODP Council
13-15 June	Ottawa, Canada	SRDPG
19-20 July*	Palisades, NY	SGPP
25-26 July	College Station, TX	PPSP
22-24 August	Seattle, WA	PCOM
8-11 September*	FRG	LITHP**
11-12 September*	FRG	DMP
19-20 September*	GEOMAR, FRG	SGPP**
25-28 September*	Honolulu, HI	TECP**
2-3 October	Palisades, NY	SMP
3-5 October*	The Netherlands	EXCOM
16-18 October*	Hannover, FRG	SSP
26-28 October*	Giessen, FRG	OHP**
16-17 November*	Palisades, NY	CEPDPG
26 November	Woods Hole, MA	Panel Chairmen
27-30 November	Woods Hole, MA	PCOM
24-26 April, 1990	France	PCOM
7-9 August, 1990	Hawaii	PCOM
25 November, 1990	La Jolla, CA	Panel Chairmen
26-29 November, 1990	La Jolla, CA	PCOM
? Date*	Palisades, NY	ex-IOP & Co-Chiefs

* Tentative meeting; not yet formally requested and/or approved.

** Each of the thematic panels will also meet between about 1 February and 15 March 1990.

ODP/TAMU PANEL LIAISONS

Downhole Measurements Panel - SUZANNE O'CONNELL
Information Handling Panel - RUSS MERRILL
Pollution Prevention & Safety Panel - LOU GARRISON
Site Survey Panel - AUDREY MEYER
Technology & Engineering Development Committee - BARRY HARDING

CALL FOR ODP DRILLING PROPOSALS

Although the planning structure of JOIDES has undergone some changes, ODP remains a proposal-driven program. Through proposals, individual scientists and groups have the opportunity to respond to the major thematic drilling priorities for ODP and contribute their expertise. The two major sources for defining the direction of ODP science are the COSOD II report and priorities developed by the thematic panels and published in the JOIDES Journal.

The listing of proposals received by the JOIDES Office has traditionally been organized by oceans. However, the JOIDES Office forwards proposals to **All** thematic panels; if a proposal is accepted as having merit in terms of thematic issues, then that proposal is forwarded to the appropriate service panels, working groups and detailed planning groups for further evaluation. If a proposal is found to have no merit in terms of thematic issues, then the deficiencies are summarized and the proposal is returned to the proponent.

Guidelines for the submission of proposals can be found in the JOIDES Journal, Special Issue No. 6 published December 1988, or an updated document "Guidelines for the Submission of Proposals and Ideas" can be obtained from the JOIDES Planning Office, Hawaii Institute of Geophysics, 2525 Correa Road, Honolulu, HI 96822. Under the new submission guidelines, proponents must forward ten copies of the proposal to the JOIDES Office. Proponents are asked to attach a one page abstract to the proposal, supply as complete a data base as possible, note anticipated safety problems, and note upcoming surveys. [Note: Keep foldouts to a minimum as they slow down copying and mailing of proposals.]

LOGGING SCHOOL

INTERNATIONAL GEOLOGICAL CONGRESS: July 8, 1989, Washington, D.C.

The first JOI-USSAC sponsored Ocean Drilling Program Logging Schools were taught at the Geological Society of America annual meeting in Denver and at the fall meeting of the American Geophysical Union in San Francisco. The next Logging School will be held at the International Geological Congress in Washington, D.C.

The ODP Logging School has been designed to introduce the scientific applications of downhole logging used in the Ocean Drilling Program to scientists of varying disciplines. ODP logging specialists from Borehole Research Group at Lamont-Doherty Geological Observatory will demonstrate how logging data are being used to solve scientific problems of paleoenvironment, stratigraphy, geochemistry, basement structure, hydrogeology, geomechanics, and tectonics.

The course will be taught at a hotel across from the Washington D.C. Convention Center. There will be a fee of $50 for the short course. Preregistration for the course is recommended. For information about the course, contact: Robin Smith at JOI, Inc., 1755 Massachusetts Ave., NW, Suite 800, Washington, D.C. 20036-2102, Tel: (202) 232-3900, telemail: R.Smith.JOI (omnet). For information about IGC, contact: 28th International Geological Congress, PO Box 727, Tulsa, OK 74101-0727

WORKSHOPS SCHEDULED

GLOBAL OCEAN PROCESSES AND THE PALEOCEANOGRAPHIC RECORD

A JOI-USSAC-sponsored workshop is being convened to discuss the interrelationship between paleoceanographic studies and global change initiatives. Three goals of the workshop are: 1) to examine how global initiatives studies such as WOCE, GOFS and GLOBEC help improve the understanding of how marine sequences record past environments; 2) to define how paleoceanographic studies can enhance the scientific success of global initiatives studying the present ocean; and 3) to foster interdisciplinary study of past climates. Topics of discussion will include: Ocean Modelling; Global Climate Change; Contemporary and Past Ocean Fluxes; Ecosystem Responses to Climate Change.

Conveners are Drs. N. Pisias, M. Lyle, A. Mix, W. Prell, and R. Thunell. The meeting date and place are 6-8 June 1989 at College of Oceanography, Oregon State University. A limited amount of funds from the JOI/USSAC contract will be distributed to defray travel and subsistence expenses on the basis of applicants eligibility and need. For more information on this workshop contact Dr. Nicklas Pisias, College of Oceanography, Oceanography Admin. Bldg. 104, Oregon State University, Corvallis, OR 97331-5503; Tel: (503) 754-2296; Telemail: n.pisias. Deadline for application is May 15, 1989.

ODP GEOCHEMISTRY: PROGRESS AND OPPORTUNITIES

A JOI/USSAC-sponsored workshop on the importance of GEOCHEMISTRY to the continuing scientific success of the Ocean Drilling Program will be held, January 9-12, 1990 at the UCLA Conference Center, Lake Arrowhead, California. The workshop will bring together geochemists studying a spectrum of geochemical problems that use the resources of the Ocean Drilling Program. The central topics to be discussed and evaluated are: 1) Sedimentary Geochemical Problems (e.g., element recycling, paleoceanography, diagenesis); 2) Basement Geochemical Problems (e.g., trace element and isotope abundances, high and low temperature crustal alteration); 3) Organic Geochemistry; 4) Geochemical Logging (e.g., core logging, new logging tools, log/core comparisons); 5) Tools and Techniques (e.g., shipboard measurements, special sampling/coring programs, fluid sampling). The workshop will review the results to date and consolidate proposals for new programs in geochemistry and for new tools and techniques.

Conveners are Drs. Miriam Kastner and Garry Brass. Attendance will be open, but only limited travel support for US participants is available through funding from JOI/USSAC. Applications must be received by October 15, 1989. Questions and applications for participation and travel funds should be directed to either Dr. Garrett W. Brass, RSMAS-MGG, University of Miami, 4600 Rickenbacker Cswy., Miami, FL 33149 (Telemail G.BRASS) or Dr. Miriam Kastner, Scripps Institution of Oceanography, SVH A-012, LaJolla, CA 92093 (Telemail M.KASTNER).

CANADIAN ODP PROPOSALS WORKSHOP
Atlantic and Mediterranean

The Canadian National Committee for the Ocean Drilling Program is sponsoring an informal discussion workshop to formulate drilling proposals and site surveys for the Atlantic and Mediterranean with a view to the *JOIDES Resolution* returning to the Atlantic in the early 1990s.

The workshop will be held at the Oceanography Conference Room, Life Science Building, Dalhousie University, Halifax, Nova Scotia, on June 26-27, 1989. Further information may be obtained from Felix Gradstein (902) 426-4870 (Bedford Institute of Oceanography) or Bill Collins (709) 737-4708 (Memorial University of Newfoundland).

Those interested in attending may register through the Canadian Secretariat for the Ocean Drilling Program at (709) 737-4708; FAX: (709) 737-4702, Bitnet: ODP@MUN or OMNET: J.MALPAS.

WORKSHOP REPORTS AVAILABLE

The following reports are available. For copies please write to JOI/USSAC Workshop Report, 1755 Massachusetts Ave. NW, Suite 800, Washington, D.C. 20036-2102.

Scientific Seamount Drilling, Tony Watts and Rodey Batiza, conveners.

Vertical Seismic Profiling (VSP) and the Ocean Drilling Program (ODP), John Mutter and Al Balch, conveners.

Dating Young MORB?, Rodey Batiza, Robert Duncan and David Janecky, conveners.

Downhole Seismometers in the Deep Ocean, Mike Purdy and Adam Dziewonski, conveners.

Ocean Drilling and Tectonic Frames of Reference, Richard Carlson, William Sager and Donna Jurdy, conveners.

Science Opportunities Created By Wireline Reentry of Deep-Sea Boreholes, Marcus G. Langseth and Fred N. Speiss, conveners.

Wellbore Sampling, Richard K Traeger and Barry W. Harding, conveners

South Atlantic and Adjacent Southern Ocean Drilling, James A. Austin, convener.

Measurements of Physical Properties and Mechanical State in the Ocean Drilling Program, Daniel K. Karig and Matthew H. Salisbury, conveners.

Paleomagnetic Objectives for the Ocean Drilling Program, Kenneth L. Verosub, Maureen Steiner and Neil Opdyke, conveners.

Cretaceous Black Shales, Michael A. Arthur and Philip A. Meyers, conveners.

ODP THEMATIC PUBLICATIONS OPPORTUNITIES

The JOI-US Science Support Program is seeking US scientists interested in serving as conveners or leading editors for ODP thematic volumes. JOI-USSSP has seed money available to defray out-of-pocket costs such as postage, telephone, copying, travel to consult with colleagues or potential publishers, etc. for US scientists. These volumes would be published by outside firms or societies, rather than ODP. For more information, write or call Ellen Kappel at the JOI Office.

FELLOWSHIP OPPORTUNITIES

Joint Oceanographic Institutions/US Science Advisory Committee is now accepting applications for Ocean Drilling Graduate Fellowships. The fellowships provide opportunities for scientists of unusual promise and ability who are enrolled at U.S. institutions to conduct research compatible with that of the Ocean Drilling Program.

☞ $ The award for a doctoral candidate is **$18,000.00** , to be used for student stipend, tuition and benefits, research costs and incidental travel, if any.

✔ ✍ Applications for upcoming legs should be submitted to JOI according to the following schedule:

Drilling Legs		Application Deadline
133	NE Australia Margin	September 1, 1989
134	Vanuatu	September 1, 1989
135	Lau-Tonga	January 1, 1990

Applications that do not involve participation in an ODP cruise must be submitted by January 1, 1990. Summary information about upcoming legs as well as information on applications and procedures, all necessary forms, and a list of supporting documents are available in the application packet from: JOI/USSAC Ocean Drilling Fellowship Program, JOI, Inc., 1755 Massachusetts Ave., N.W., Washington, D.C., 20036-2102. Qualified applicants will receive consideration without regard to race, creed, color, sex, age, or national origin.

COLOR CORE PHOTOS AVAILABLE ON SLIDES OR VIDEO DISK

The entire collection of color core photographs from the Deep Sea Drilling Project (DSDP) and the Ocean Drilling Project (ODP) is now available to the scientific community. The photos show cores recovered from holes drilled at more than 750 sites in the world's oceans. The collection includes over 23,000 photographs and comes in two formats: 35-mm slides or 12-inch video disk. The 35-mm slides are boxed and consecutively numbered. Both the slides and video disk come with an Introduction booklet giving details on their use and an index. To view the video disk, the user must have access to a NTSC standard disk player with random access capabilities and a video monitor. (An example of such a player is the Sony video disk player #20002-2.)

This collection will be particularly useful to those scientists working on samples from either DSDP or ODP. Those considering placing requests for DSDP or ODP samples will find the photographs make it easier to select the particular interval from which they want their samples taken.

The cost of the slide collection is US$4,500. The video disk costs US$50. These prices are in effect until July 1, 1989. Please call thereafter for a new quote.

To place an order, or for additional information, call or write to: Publications Distribution, Ocean Drilling Program, Texas A&M University, 1000 Discovery Drive, College Station, Texas 77840, U.S.A., Tel: (409) 845-2016.

BIBLIOGRAPHY OF THE OCEAN DRILLING PROGRAM

The publications below are available from ODP Subcontractors. Items from ODP/TAMU are available at 1000 Discovery Drive, College Station, TX 77840. Items from LDGO can be obtained from the Borehole Research Group, LGDO, Palisades, NY 10964.

ODP/TAMU, Texas A & M University

1. Proceedings of the Ocean Drilling Program, Initial Reports

Volumes 101/102 (combined) Dec 86	Volume 110 published Apr 88
Volume 103 published Apr 87	Volume 112 published Aug 88
Volume 104 published July 87	Volume 113 published Sept 88
Volume 105 published Aug 87	Volume 114 published Nov 88
Volume 107 published Oct 87	Volume 115 published Nov 88
Volume 108 published Jan 88	Volume 116 published Jan 89
Volumes 106/109/111 (combined) Feb 88	

2. Proceedings of the Ocean Drilling Program, Scientific Results

   Volumes 101/102 (combined) Dec 88
   Volume 103 published Dec 88

3. Technical Notes

   #1 Preliminary time estimates for coring operations (Revised Dec 86)
   #3 Shipboard Scientist's Handbook (Revised July 87)
   #5 Water Chemistry Procedures aboard the *JOIDES RESOLUTION* (Sept 86)
   #6 Organic Geochemistry aboard *JOIDES RESOLUTION* - An Assay (Sept 86)
   #7 Shipboard Organic Geochemistry on *JOIDES RESOLUTION* (Sept 86)
   #8 Shipboard Sedimentologist's Handbook (Aug 88)
   #9 Deep Sea Drilling Project data file documents (Jan 88)
   #10 A Guide to ODP Tools for Downhole Measurement (June 88)
   #11 Introduction to the Ocean Drilling Program (Dec 88)

4. Scientific Prospectuses

#17	(June 87)	Leg 117
#18	(June 87)	Leg 118
#19	(Sept 87)	Leg 119
#20	(Oct 87)	Leg 120
#21	(Mar 88)	Leg 121
#22/23	(June 88)	Legs 122 & 123
#24	(Aug 88)	Leg 124
#25/26	(Dec 88)	Legs 125 & 126
#27/28	(April 89)	Legs 127 & 128

5. Preliminary Reports

#17	(Nov 87)	Leg 117
#18	(Feb 88)	Leg 118
#19	(Mar 88)	Leg 119
#20	(June 88)	Leg 120
#21	(Aug 88)	Leg 121
#22	(Oct 88)	Leg 122
#23	(Dec 88)	Leg 123
#24	(Feb 89)	Leg 124
#25	(May 89)	Leg 125

6. Engineering Prospectuses

   #1 (Aug 88) Leg 124E

7. Engineering Preliminary Reports

   #1 (Mar 89) Leg 124E

8. Other Items Available

   - Ocean Drilling Program brochure (English, French, Spanish, German or Japanese)
   - Onboard *JOIDES RESOLUTION* (new edition, 24 pp.)
   - ODP Sample Distribution Policy
   - Micro Paleontology Reference Center brochure

Bibliography of the Ocean Drilling Program, continued

- Instructions for Contributors to ODP Proceedings (Revised Apr 88)
- ODP Engineering and Drilling Operations
- Multilingual brochure with a synopsis of ODP (English, French, Spanish, German and Japanese)
- ODP Poster

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY

- Wireline Logging Manual (3rd Edition, 1988)

DSDP DATA AVAILABLE SOON ON CD-ROM

The National Geophysical Data Center (NGDC) is currently working on a project to produce a 2-volume set of Compact Disks-Read Only Memory (CD-ROMs) of available digital data from the Deep Sea Drilling Project (DSDP). All marine geological data bases including the DSDP Index, Bibliography, and Core Sample Inventory files will be placed on Vol. 1; Vol. 2 will include logging information in the standard LIS format and underway geophysical data in the MGD77 exchange format. The CDs will be in the ISO 9660 format. Minimum system access requirements are: PC/XT/AT-compatible machines running DOS version 2.1 or higher with a minimum of 640K memory, hercules/monochrome or EGA graphics capability with a 10 megabyte hard drive and a CD-ROM reader. Accession software for Macintosh machines will be available in early summer. If you are interested in obtaining a set of CDs, contact: Ellen Kappel at JOI Inc., 1755 Massachusetts Ave., N.W., Suite 800, Washington, D.C., 20036-2102; telemail is e.kappel.

ODP SAMPLE DISTRIBUTION

The materials from ODP Leg 120 are now available for sampling by the scientific community. The twelve-month moratorium on cruise-related sample distribution is complete for Ocean Drilling Program Legs 101-120. Scientists who request samples from these cruises (after April 1989) are no longer required to contribute to ODP Proceedings volumes.

Preliminary sample record inventories for ODP Legs 101-122 are now in searchable database structures. The Sample Investigations database which contains records of all sample requests, the purpose for which the samples were used and the institute where the samples were sent, has reached a steady state. At present, the most efficient way to access this database is to request a search by contacting the Assistant Curator of ODP.

Request processing (number of weeks to receive samples) during the period January through March, 1989:

Repository	Avg. No. Weeks Processing	Total # Samples
ECR	14	3,636
GCR	8	908
WCR	11	516

Investigators requiring information about the distribution of samples and/or desiring samples, or who want information about the sample investigation or sample records database, should address their requests to: The Curator, Ocean Drilling Program, 1000 Discovery Drive, College Station, TX 77840, Tel: (409) 845-4819.

DSDP AND ODP DATA AVAILABLE

ODP Data Available

ODP databases currently available include all DSDP data files (Legs 1-96), geological and geophysical data from ODP Legs 101-121, and all DSDP/ODP core photos (Legs 1-121). More data are available as paper and microfilm copies of original data collected aboard the *JOIDES RESOLUTION*. Underway geophysical data are on 35 mm microfilm; all other data are on 16 mm microfilm.

All DSDP data and most ODP data are contained in a computerized database (contact the ODP Librarian to find out what data are available electronically). Data can be searched on almost any specified criteria. Files can be cross-referenced so a data request can include information from multiple files.

Computerized data are currently available on hard-copy printouts, magnetic tape, or through BITNET.

Photos of ODP/DSDP cores and seismic lines are available. Seismic lines, whole core and close-up core photos are available in black and white 8x10 prints. Whole core color 35-mm slides are available.

The following are also available: (1) ODP Data Announcements containing information on the database; (2) Data File Documents containing information on specific ODP data files; (3) ODP Technical Note #9, "Deep Sea Drilling Project Data File Documents," which includes all DSDP data file documents.

To obtain data or information contact: Kathy Lighty, Data Librarian, ODP/TAMU, 1000 Discovery Dr., College Station, TX 77840, Tel: (409) 845-8495, Tx: 792779/ODP TAMU, BITNET: %DATABASE@TAMODP, Omnet: Ocean.Drilling.TAMU Small requests can be answered quickly, free of charge. If a charge is made, an invoice will be sent and must be paid before the request is processed.

Data Available from National Geophysical Data Center (NGDC)

DSDP data files can be provided on magnetic tape according to user specifications (see table below). NGDC can also provide correlative marine geological and geophysical data from other sources. NGDC will provide a complimentary inventory of data available on request. Inventory searches are tailored to users' needs.

Information from DSDP Site Summary files is fully searchable and distributable on floppy diskette, as computer listings and graphics, and on magnetic tape. NGDC is working to make all DSDP data files fully searchable and available in PC-compatible form. Digital DSDP geophysical data are fully searchable and available on magnetic tape. In addition, NGDC can provide analog geological and geophysical information from DSDP on microfilm. Two summary publications are available: (1) "Sedimentology, Physical Properties, and Geochemistry in the Initial Reports of Deep Sea Drilling Project Vols. 1-44: An Overview," Rept. MGG-1; (2) "Lithologic Data from Pacific Ocean Deep Sea Drilling Project Cores," Rept. MGG-4.

Costs for services are: $90/magnetic tape, $30/floppy diskette, $20/microfilm reel, $12.80/copy of Rept. MGG-1, $10/copy of Rept. MGG-4. Costs for computer listings and custom graphics vary. Prepayment is required by check or money order (drawn of a U.S. bank), or by charge to VISA, Mastercard, or American Express. A $10 surcharge is added to all shipments ($20 for foreign shipments), and a $15 fee is added to all rush orders. Data Announcements describing DSDP data sets are available at no charge. For details, call (303) 497-6339 or write to: Marine Geology and Geophysics Div., Natl. Geophys. Data Center, NOAA E/GC3 Dept. 334, 325 Broadway, Boulder, CO 80303.

AVAILABLE DATA

Data Available	Data Source	Description	Comments
1. LITHOLOGIC and STRATIGRAPHIC DATA			
Visual Core Descriptions			
-Sediment/sedimentary rock	Shipboard data	Information about core solor, sedimentary structures, disturbance, large minerals and fossils, etc.	
-Igneous/metamorphic rock	Shipboard data	Information about lithology, texture, structure, mineralogy, alteration, etc.	
Smear slide descriptions	Shipboard data	Nature and abundance of sedimentary components.	
Thin section descriptions	Shipboard data	Petrographic descriptions of igneous and metamorphic rock. Includes information on mineralogy, texture, alteration, vesicles, etc.	
Paleontology	*Initial Reports, Proceedings*	Abundance, preservation and location for 26 fossil groups. The "dictionary" consists of more than 12,000 fossil names.	
Screen	Processed data	Computer-generated lithologic classifications. Basic composition data, average density, and age of layer.	
2. PHYSICAL PROPERTIES			
G.R.A.P.E. (gamma ray attentuation porosity evaluator)	Shipboard data	Continuous whole-core density measurements.	
Grain Size	Shore laboratory	Sand-silt-clay content of a sample.	Legs 1-79 only
Index properties: bulk and grain density, water content, and porosity	Shipboard data	Gravimetric and volumetric measurements from a known volume of sediment	
Liquid and plastic limits	Shipboard data	Atterberg limits of sediment samples.	
Shear-strength measurements	Shipboard data	Sediment shear-strength measurements using motorized and Torvane instruments.	
Thermal conductivity	Shipboard data	Thermal conductivity measurements of sediments using a thermal probe.	
Velocity measurements	Shipboard data	Compressional and shear-wave velocity measurements.	
Downhole measurements			
-Heatflow	Shipboard data	*In-situ* formation temperature measurements.	
-Pressure	Shipboard data	*In-situ* formation and hydrostatic pressure.	
3. SEDIMENT CHEMICAL ANALYSES			
Carbon-carbonate	Shipboard data, shore laboratory	Percent by weight of the total carbon, organic carbon, and carbonate content of a sample.	Hydrogen percents for Legs 101,103, 104, 106-108; nitrogen percents for Legs 101, 103, 104, 107, 108.
Interstitial water chemistry	Shipboard data, shore laboratory	Quantitative ion, pH, salinity, and alkalinity analyses of interstitial water.	
Gas chromatography	Shipboard data	Hydrocarbon levels in core gases.	
Rock evaluation	Shipboard data	Hydrocarbon content of a sample.	
4. IGNEOUS AND METAMORPHIC CHEMICAL ANALYSES			
Major element analyses	Shipboard data, shore laboratory	Major element chemical analyses of igneous, metamorphic, and some sedimentary rocks composed of volcanic material.	
Minor element analyses	Shipboard data, shore laboratory	Minor element chemical analyses of igneous, metamorphic, and some sedimentary rocks composed of volcanic material.	

AVAILABLE DATA (Continued)

Data Available	Data Source	Description	Comments
5. X-RAY MINERALOGY			
X-ray mineralogy	Shore laboratory	X-ray diffraction	Legs 1-37 only
6. PALEOMAGNETICS			
Paleomagnetics	Shipboard data, shore laboratory	Declination, inclination, and intensity of magnetization for discrete samples and continuous whole core. Includes NRM and alternating field demagnetization.	
Susceptibility	Shipboard data	Discrete sample and continuous whole-core measurements.	
7. UNDERWAY GEOPHYSICS			
Bathymetry	Shipboard data	Analog records of water-depth profile	Available on 35-mm continuous microfilm
Magnetics	Shipboard data	Analog records and digital data.	Available on 35-mm continuous microfilm
Navigation	Shipboard data	Satellite fixes and course and speed changes that have been run through a navigation smoothing program, edited on the basis of reasonable ship and drift velocities, and later merged with the depth and magnetic data.	Available in MGD77 exchange format
Seismics	Shipboard data	Analog records of sub-bottom profiles and unprocessed siganl on magnetic tape	Available on 35-mm continuous microfilm
8. SPECIAL REFERENCE FILES			
Leg, site, hole summaries	Shipboard data initial core descriptions	Information on general leg, site, and hole characteristics (i.e. cruise objectives, location, water depth, sediment nature, drilling statistics).	
DSDP Guide to Core Material	*Initial Reports*, prime data files	Summary data for each core: depth of core, general paleontology, sediment type and structures, carbonate, grain size, x-ray, etc.	Legs 1-85 only
AGEPROFILE	*Initial Reports*, hole summaries	Definition of age layers downhole.	
COREDEPTH	Shipboard summaries	Depth of each core. Allows determination of precise depth (in m) of a particular sample.	
9. AIDS TO RESEARCH			
ODASI	A file of ODP-affiliated scientists and institutions. Can be cross-referenced and is searchable.		
Keyword Index	A computer-searchable bibliography of DSDP- and ODP-related papers and studies in progress.		
Sample Records	Inventory of all shipboard samples taken.		
Site Location Map	DSDP and ODP site positions on a world map of ocean topography.		
Thin Section Inventory	Inventory of all shipboard thin sections taken.		

New ODP Offprint Policy

Current ODP policy calls for 50 offprints of every paper published in the "Scientific Results" volumes of the Proceedings of the Ocean Drilling Program to be made available without charge to the authors of these papers. If a paper has more than one author, the 50 offprints will be sent to the first author unless an alternative distribution is requested.

The practice of charging for offprints was begun almost 2 years ago as the result of a JOIDES policy in response to budget reductions in ODP publications. The financial burden this placed on authors whose institutions could not fund the purchase of offprints has been a major factor in the decision to discontinue charging for them.

It is possible, however, for an author who wants more than 50 offprints of a paper to order these additional copies through the Chief Production Editor at ODP headquarters. Authors must initiate such requests well before the volume is printed and be prepared to pay for the extra offprints ordered, which are provided at cost.

Anyone having questions about this policy should contact Russell B. Merrill, Manager of Science Services, or William D. Rose, Supervisor of Publications.

ODP EDITORIAL REVIEW BOARDS (ERB)

For each ODP cruise, an editorial board is established to handle review of the manuscripts intended for publication in the "Scientific Results" volume of the Proceedings of the Ocean Drilling Program. These boards consist of the Co-Chief Scientists and the ODP Staff Scientist for that cruise, one other scientist selected by the Manager of ODP Science Operations in consultation with the cruise Co-Chief Scientists, and an ODP Editor. These boards are responsible for obtaining adequate reviews and for making decisions concerning the acceptance or rejection of papers. The names of scientists serving on ERBs for Legs 106 through 123 are listed below. Please note that: *indicates Co-Chief Scientist; **indicates Staff Scientist; ***indicates Outside Scientist.

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* indicates Co-Chief Scientist
** indicates Staff Scientist
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A chairman for each ERB, usually a Co-Chief Scientist, has been elected since Leg 120.

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Elderfield, H.*	SGPP	(44)223-337181	81240/CAMSPL G
Eldholm, O.	PCOM	(47)2-45-66-76	79367/ESCON N
Engebretson, D.	TECP	(206)676-3581	not available
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Froelich, P.*	SGPP	(914)359-2900X485	7105762653/LAMONTGEO
Fujii, T.*	LITHP	(81)3-812-2111X5751	25607/ORIUT J
Fujimoto, H.*	SRDPG,TEDCOM	(81)3-376-1251	25607/ORIUT J
Garrison, L.*	ODP/TAMU	(409)845-8480	62760290/ESL UD
Gibson, I.*	SMP	(519) 885-1221X2054	06955259/UOFW WTLO
Gieskes, J	DMP	(619)534-4257	9103371271/UCWWD SIO SDG
Gill, J.	WPDPG	(408)429-2425	7607936/UCSC UC
Goldhaber, M.	SGPP	(303)236-1521	9109370740/GSA FTS LKWD
Golovchenko, X.	LDGO	(914)359-2900X336	7105762653/LAMONTGEO
Gradstein, F.*	SGPP	(902)426-4870	01931552/BIO DRT
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Green, A.	PPSP	(713)965-4172	9108813649/USEPR TEX HOU
Grout, R.	ODP/TAMU	(409)845-2144	62760290/ESL UD
Harding, B.	ODP/TAMU	(409)845-2024	62760290/ESL UD
Harrison, C.*	EXCOM	(305)361-4610	317454/VOFM RSMAS MIA
Haseldonckx, P.	PPSP	(49)201-726-3911	8571141/DX D
Hayes, D.	EXCOM, PCOM	(914)359-2900X470	7105762653/LAMONTGEO
Heath, G.	EXCOM	(206)543-6605	9104740096/UW UI
Hedberg, D.	IHP	(46)-8-151-580	13599/RESCOUN S
Heinrichs, D.*	NSF,ODPC	(202)357-7837	7401424/NSFO UC
Helsley, C.*	EXCOM	(808)948-8760	7238861/HIGCY HR
Hey, R.	SSP	(808)948-8972	7238861/HIGCY HR
Hertogen, J.	SRDPG	(32) 16-201015	23674/KULEUV B
Hinz, K.	TECP	(49)511-643-3244	923730/BGR HA D
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Jones, E.	SSP	(44)1-387-7050	28722/UCPHYS G
Jones, M.*	IHP	(44)051-653-8633	628591/OCEANB G
Jung, R.	DMP	(49) 511-643-2857	923730/BGRHA D
Kappel, E.	JOI	(202)232-3900	7401433/BAKE UC
Kang, D.	DMP,FPAPWG	(607)255-3679	6713054/CORNELL ITCA
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Macdonald, K.	SRDPG	(805)961-4005	258976/KMAC UR
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Manchester, K.*	TEDCOM	(902)426-3411	01931552/BIO DRT
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Marx, C.	TEDCOM	(49)5323-722239	953813/TU ITE D
Maxwell, A.*	EXCOM	(512)471-4860	9108741380/UTIG AUS
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McLerran, A.	TEDCOM	(619)481-0482	not available
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Merrill, R.	ODP/TAMU	(409)845-9324	62760290/ESL UD
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Moore, J.C.	FPAPWG	(408)-429-2574	not available
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Nowak, J.	IHP	(49)511-643-2815	922739/GFIZ D
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ODP Databank	LDGO	(914)359-2900X542	7105762653/LAMONTGEO
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Okada, Hisakate*	OHP	(81)23631-1421X2585	25607/ORIUT J
Orcutt, J.*	LITHP	(619)534-2887	9103371271/UCWWD SIO SDG
Ottosson, M-O.	EXCOM, ODPC	(46)8-15-15-80	13599/RESCOUN S
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Pautot, G.	SSP	(33) 98-22-40-40	940627/OCEAN F
Paxton, A	TEDCOM	(44)224-574555	739721/BRTOIL G
Pearce, J.	LITHP	(44)632-328511	53654/UNINEW G
Perfit, M.	LITHP, SRDPG	(904)392-2128	not available
Peters, P.	JOI	(202)232-3900	7401433/BAKE UC
Peveraro, R.	DMP	(44)41-226-5555	777633/BRTOIL G
Phipps-Morgan, J.*	LITHP	(617)253-5951	not available
Pisias, N.*	PCOM	(503)754-2296	258707/JOID UR
Prahl, F.*	SGPP	(503)754-4172	5105960682/OSU COVS
Premoli-Silva, I.	OHP	(39)2-23698248	320484/UNIMI I
Puchelt, H.	LITHP	not available	not available
Pyle, T.*	JOI	(202)232-3900	7401433/BAKE UC
Rabinowitz, P.*	ODP/TAMU	(409)845-8480	62760290/ESL UD
Raleigh, B.*	EXCOM	(914)359-2900X345	7105762653/LAMONTGEO
Rea, D.*	CEPDPG	(313)936-0521	not available
Renard, V.	SSP	(33)98-22-42-26	940627/OCEAN F
Reynolds, R.	LDGO	914-359-2900x671	7105762653/LAMONTGEO
Rhodes, J.M.	SMP	(213)545-2841	not available
Richards, A.	SMP	(31)15-78-68-43	31448/NL
Riddihough, R.	TECP	(613)995-4482	not available
Riedel, K.	ODP/TAMU	(409)845-9322	62760290/ESL UD
Rischmüller, H.	TEDCOM	(49)511-654-2669	923730/BGR HA D
Roberts, D.	PPSP	(44)1-920-8474	888811/BPLDNA G G
Robertson, A.	TECP	(44)31-667-1081	727442/UNIVED G
Rutland, R.	EXCOM,ODPC	(61) 062 499111	not available
Saito, T.*	OHP	(81)236-311421X2585	25607/ORIUT J
Sancetta, C.*	CEPDPG	(914)359-2900X412	7105762653/LAMONTGEO
Sartori, R.	SSP	(39)51-22-54-44	511350/I
Saunders, R.	IHP	(41) 61-295564	not available
Schaaf, A.	IHP	(33)78-898124 x 3810	UCB 330 208
Schilling, J-G.	EXCOM	(401)792-6628	257580/KNAU UR
Schlanger, S.	CEPDPG	(312)491-5097	not available
Schrader, H.	CEPDPG	(47)5-21-35-00	42877/UBBRB N
Schuh, F.	TEDCOM	(214)380-0203	794784/ARCO PLNO

Scott, S.	WPDPG	(416)978-5424	0623887/GEOLOGY TOR
Sengör, A.	CEPDPG, ODPC	(90)1-1433-100	23706/ITU TR
Shackleton, N.*	OHP	(44)223-334871	81240/CAMSPL G
Shipley, T.*	PCOM,FPAPWG	(512)471-6156	9108741380/UTIG AUS
Simoneit, B.	SRDPG	(503)754-2155	5105960682/OSU COVS
Sliter, W.	CEPDPG	(415)329-4988	171449/PCS USGS MNPK
Small, L.	EXCOM	(503)754-4763	5105960682/OSU COVS
Smith, G.*	LITHP	(314)658-3128	550132/STL UNIV STL
Smith, R.	JOI	(202)232-3900	7401433/BAKE UC
Solheim, A.	SMP	(47)-2-123650	74745/POLAR N
Sondergeld, C.	DMP	(918)660-3917	200654/AMOCO UR
Spall, H.*	IHP	(703)648-6078	not available
Sparks, C.	TEDCOM	(33)1-47-52-63-95	203050/IFP A F
Spencer, D.	EXCOM	(508) 548-1400	951679/OCEANIST WOOH
Stanton, P.	TEDCOM	(713)940-3793	9108815579/USEPRTX HOU
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Stephansson, O.	DMP	(920)91359	not available
Stephen, R.*	DMP, SRDPG	(508)548-1400X2583	951679/OCEANIST WOOH
Storms, M.	ODP/TAMU	(409)845-2101	62760290/ESL UD
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Taira, A.*	PCOM	(81)3-376-1251X256	25607/ORIUT J
Tamaki, K.*	IHP,WPDPG, CEPDPG,LITHP,TECP	(81)3-376-1251	25607/ORIUT J
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Thierstein, H.	PCOM	(41)1-256-3666	53178/ETHBI CH
Thomas, E.*	SMP	(203)347-9411	not available
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Tucholke, B.*	PCOM	(508)548-1400X2494	951679/OCEANIST WOOH
Valet, J-P.	SMP	(33) 1-69-82-3558	601137/F CNRS GIF
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van Weering, Tj.	WPDPG	(31)02226-541	not available
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Villinger, H.*	DMP	(49)471-483-1215	238695/POLAR D
Vincent, E.	OHP	(33)1-43-36-25-25X5162	200145/UPMC SIX F
von Huene, R.	FPAPWG	(415)354-3144	not available
von Rad, U.	PCOM	(49)511-643-2785	923730/BGR HA D
Vorren, T.	SGPP	(47)83-44000	64251/N
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Weaver, P.	OHP	(44)9327-762672	296041/BPSUNA G
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Westbrook, G.	TECP,FPAPWG	(44)21-414-6153	333762/UOTSHAM G
Westgaard, L.	ODPC	(47)2-15-70-12	79913 /NAVF N
Whitmarsh, R.	SMP	(44) 42-879-4141	858833/OCEANS G
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Winterer, E.*	PCOM	(619)534-2360	9103371271/UCWWD SIO SDG
Wortel, R.	TECP	(31)30-53-50-86	40704/VMLRU NL
Worthington, P.	DMP	(44)9327-63263	296041/BPSUNA G
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Special Issue No. 1: Manual on Pollution Prevention and Safety, 1976 (Vol. II)

Special Issue No. 2: Initial Site Prospectus, Supplement One, April 1978 (Vol. III)

Special Issue No. 3: Initial Site Prospectus, Supplement Two, June 1980 (Vol. VI)

Special Issue No. 4: Guide to the Ocean Drilling Program, September 1985 (Vol. XI)

Special Issue No. 4: Guide to the Ocean Drilling Program, Supplement One, June 1986 (Vol. XII)

Special Issue No. 5: Guidelines for Pollution Prevention and Safety, March 1986 (Vol. XII)

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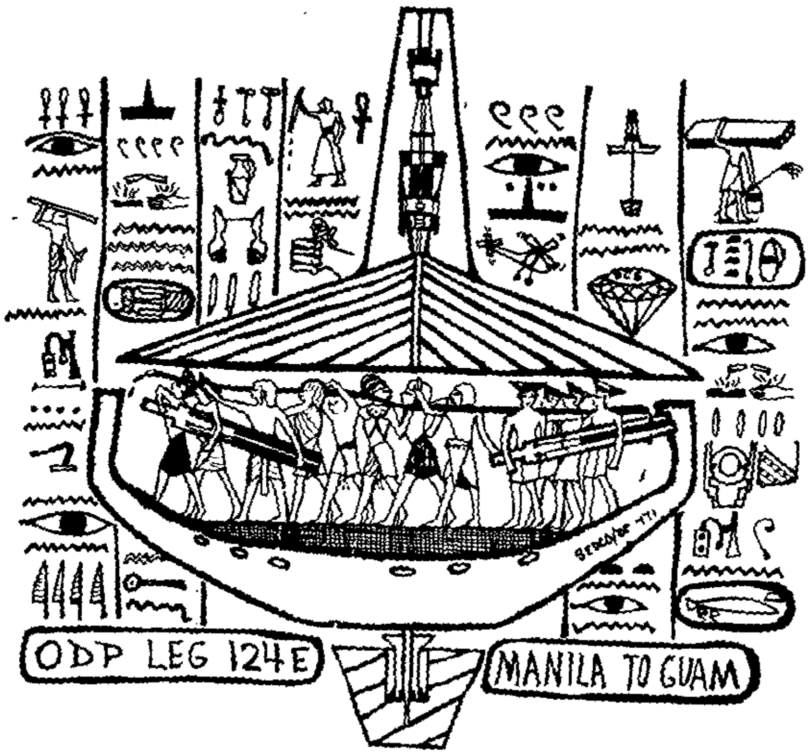
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