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# JOIDES Journal

Volume 18, Number 2, June 1992

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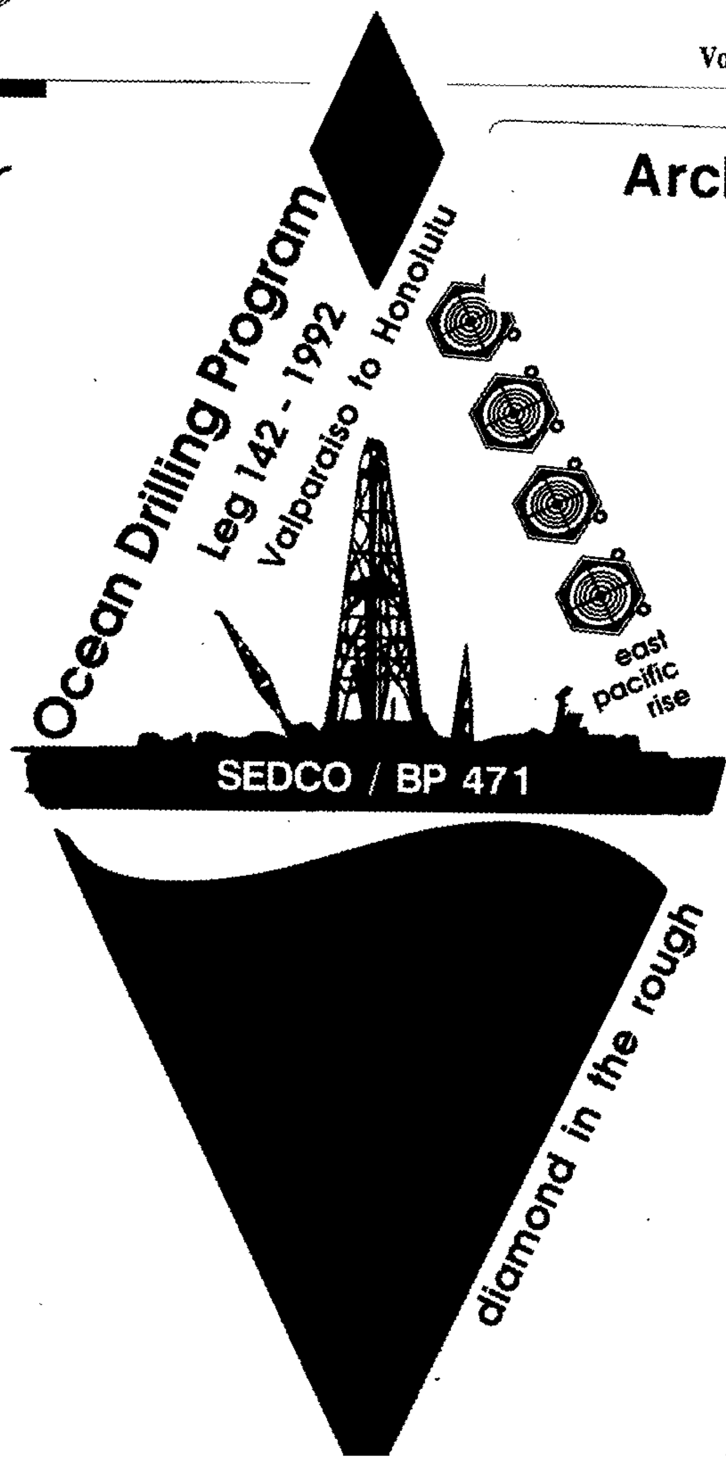

Joint Oceanographic Institutions for Deep Earth Sampling

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## Contents

# Focus

Spring 1992 finds ODP at a number of crossroads—in engineering development, computing and data handling, and the use of alternate/additional drilling platforms.

First, engineering development. Testing of the Diamond Coring System (DCS) on the East Pacific Rise (Leg 142) produced mixed results. While performance of seafloor systems (e.g., guidebases) improved considerably over Leg 132, problems with secondary heave compensation and drill bits prevented recovery of any diamond cores. Planning Committee, at its meeting in Corvallis in April, commissioned ODP-TAMU to do a complete analysis and projection of future DCS development. Based upon that report, PCOM in August will decide the role of DCS within ODP. Rising costs of a "big" engineering development like DCS within a scientific ocean drilling program characterized by limited finances may prove prohibitive. Unfortunately, lack of a drilling capability like DCS might forever compromise ODP's ability to sample certain types of interesting and important geologic environments—fractured basalts at ridge crests, shallow-water carbonates and intercalated chert/chalk sequences.

ODP is also facing the growing realization that demands for efficient data manipulation, both shipboard and shore-based, are beginning to outstrip the program's present computing capability and data base management systems. Building upon recommendations from its Data Handling Working Group, PCOM has commissioned a steering committee chaired by Ian Gibson (Chair, IHP and DH-WG) to formulate a plan to remedy this situation in concert with ODP-TAMU and then report to PCOM in August. Future efficiency and effectiveness of the drilling program will depend upon enhancing ODP's ability to organize and output information, but the solutions will not come cheaply.

PCOM has been actively considering the use of additional platforms since publication of the Long Range Plan in 1990. Most recently (April 1992), PCOM has asked for and received informal bids supplied by SEDCO/Forex to use such platforms at two candidate sites, one from the FY92 drilling schedule (MIT Guyot, western Pacific, Leg 144) and the other from the FY93 schedule (New Jersey continental shelf, Leg 150). Including mobilization/ demobilization costs, the use of such facilities will run ~$1.8M (U.S.) or more in each case. With the number of partners at present uncertain for the next phase of ODP, these funds do not appear to be available. PCOM is in the process of looking to EXCOM for guidance in this matter, but it is clear that a multi-platform approach to scientific ocean drilling in the 1990's will eventually require a budgetary commitment on the part of all ODP partners which is significantly higher than at present.

If all of this sounds negative, take heart. Since the beginning of scientific ocean drilling, the advisory structure has been faced with choices, and will continue to make them within the context of available resources for the maximum possible benefit to ODP. On the optimism front, encouraging words re: renewal are being heard from a number of ODP partner nations/consortia. The final word on funding for the next phase of ODP (1993-1998) should be in hand by the end of the summer.

In expectation of renewal, the Executive Committee will shortly take up the issue of subcontracting for ODP's next phase. A new mix of subcontractors may emerge. EXCOM will also empower a panel to review ODP's scientific advisory structure, which may suggest modifications to accommodate ODP's ever-changing array of drilling targets and technologies. As has been true in the past, those of us active within ODP welcome these reviews, which show that ODP is the most successful international effort in the history of the earth sciences.

Jamie

James A. Austin, Jr.
Planning Committee Chair

# Science Operator Report

## Leg 142: Engineering, East Pacific Rise

### Abstract

Leg 142 was devoted primarily to testing and development of new hardware components and techniques needed for drilling at axes of mid-ocean ridges and other areas with difficult-to-drill rocks (e.g., interbedded chert-chalk, reefal carbonates, etc.). Operations at Site 864 resulted in drilling of three holes (864A, 864B and 864C). Hole 864A has a guide base and is cased to 13.3 m below seafloor (mbsf). Hole 864B was abandoned. Hole 864C also has a guide base and could be reoccupied and deepened. New mini-Hard Rock Guide bases (HRB) were successfully deployed, moved and used for extensive drilling operations. They are now operational and can be used routinely. New nested, Drill-In Bottom Hole Assemblies (DI-BHA) were also used successfully and show great promise for future drilling. Continued development and refinement of bits and cutting structures should extend the depth to which future holes can be cased with multiple DI-BHA casing.

The Diamond Coring System (DCS) platform, the third essential component needed for successful ridge-crest drilling, did not perform as expected on the basis of its previous performance on legs 124E and 132. Problems with the secondary heave compensation system prevented successful DCS drilling and coring and resulted in destruction of slim-hole diamond core bits on three bit runs. Clearly, a careful, exhaustive study must be made to identify reasons for these problems and consider possible solutions.

Drilling, coring and milling operations on Leg 142 provided glassy to fine-grained, aphyric basalt samples recovered from 0 to 13.3 mbsf from holes 864A and 864B. These comprise two chemically distinct units of relatively-evolved (Mg# of 0.56-0.58), normal depleted mid-ocean-ridge basalt (N-MORB). These units were likely derived from similar parental melts, differing only slightly in the amount of crystal fractionation which they have undergone. Their magnetic properties, mineralogy and textures are typical of N-MORB. Seismic velocities range from 4.1 to 5.1 km/s (wet) and 3.0 to 4.1 km/s (dry).

In summary, Leg 142 was a mixed success. While performance of the DCS secondary heave compensation system is disappointing, the leg represents a significant step forward toward eventual success with ridge-crest drilling.

### Operational and Developmental Background

Previous efforts to conduct scientific drilling and coring operations at young crustal spreading centers have been frustrating because of failure to achieve desired goals. These included loss of multiple bottom-hole assemblies (BHAs), drill bits self-destructing in a matter of hours, a few meters of hole immediately falling in upon removal of the drilling assembly, etc. Undoubtedly, successful drilling and coring at oceanic ridge-crests is one of the most difficult technical problems faced today by ODP. Results of DSDP Leg 54 and ODP legs 106/109 have demonstrated that new technology and techniques are required to overcome formidable hurdles encountered in attempting to drill these areas.

Based on results from earlier legs, ability to drill and recover core at depth from a ridge-crest environment is dependent upon several developmental capabilities. These include the following:

1) Hard Rock Guide Base (HRB)—a relatively small, economic, seafloor structure that can be deployed quickly and efficiently; has the ability to stabilize a drill bit/BHA while attempting to initiate a hole in hard bare rock exposed at the seafloor; can accept a seafloor slope (or localized surface angle) of ≤25 degrees; allows for support of one or more casing strings; and preferably incorporates moving or recovery options due to complexities and time involved with locating an acceptable drill site.
2) Drill-In Bottom Hole Assembly (DI-BHA)—a reliable means to propagate a borehole in a hostile drilling environment; isolate one or more unstable (rubble) formations penetrated; allow separation from the emplaced drilling assembly without requiring the bit to be pulled off bottom or out of the borehole; provide adequate bit/center bit life to achieve required stability depth; allow multiple (nested) deployment capability to combat multiple unstable zones; provide large/small diameter drill collars/connections capable of surviving rotation above the seafloor without lateral support; and provide a through bore so that wireline coring systems can ultimately be deployed through the isolation strings, allowing continuous coring to target depth.
3) Diamond Coring System (DCS)—a wireline coring system capable of drilling and coring through highly-fractured, poorly-cemented, crystalline rock; including all supporting wireline systems such as overshots, jars, sinker bars, etc.; provide adequate flexibility in core-catcher selection; provide adequate alternative formation-sampling options; determine bit designs able to penetrate and core desired formations while maintaining an adequate minimum core diameter required for scientific analysis; develop friction reducer and mud programs for diamond drilling in fractured rock; and provide a slim hole drill rod/tubing string capable of fitting within ODP drill pipe ID, while maintaining adequate annular flow area, and capable of holding up to the rigors of high-speed operation with 4500 m-plus pipe lengths.

To accomplish item 3) above, a slim-hole DCS is essential. This in turn dictates development of a diamond drilling rig equipped with a high-speed top drive, closed-loop speed control for constant rpm, fine control of mud pumps for low flow rate requirements; and an active secondary compensation system that allows tagging bottom, drilling through voids, and maintaining constant/low weight-on-bit (WOB) without destroying the fragile narrow-kerf diamond core bits employed.

All development work had to be undertaken with very few facts about the targeted drilling environment. Details of rock physical properties, number of unstable zones, thickness and depth of unstable zones, etc., were unknown.

Leg 142 operations took place at Site 864 (EPR-2) on the East Pacific Rise (EPR), located approximately halfway between Valparaiso, Chile, and Honolulu, Hawaii, respective ports-of-call.

Leg 142 was the first attempt at drilling/coring on EPR since new technologies and systems to combat the hostile drilling environment have been under development. It was determined some time ago that certain advances in drilling technology would be required to conduct successful scientific drilling/coring operations at such a ridge-crest (Table 1). These include: a way to stabilize the unsupported bottom-hole assembly at the seafloor, enabling boreholes to be initiated on hard, bare rock; a means to isolate upper unstable "rubble" zones, allowing deeper drilling/coring objectives to be reached; and an effective way to drill, core and recover highly fractured volcanic rock while maintaining adequate borehole stability. These developmental systems were put to the test on Leg 142, where drilling conditions are arguably the most difficult encountered to date.

Leg 142 was the third at-sea test of the 3-component DCS and its integral platform-mounted drilling system (the DCS platform). It was the first at-sea test of the prototype hex-sided HRB using a gimballed and counter-balanced 8 ft-diameter reentry cone. It was also the first at-sea test of the prototype "nested" DI-BHA. Although earlier versions of both HRB and DI-BHA systems had been deployed on Leg 132 with mixed success, neither system had been deployed or tested at sea in its upgraded/expanded configuration.

Performance of the new HRB system was excellent. Two deployments, one seafloor move, initiation of 3 bore-holes, and a record 35 reentries into an 8 ft-diameter reentry cone amply demonstrated that existing HRB technology is now ready for operational use.

The back-off system for the DI-BHA system also performed well in its "nested" configuration. The system was successfully backed-off on 3 out of 3 attempts in both 10-3/4 in. and 6-3/4 in. sizes. The 6-3/4 in. drill collars utilized with the second stage DI-BHA also functioned well, suffering no failures even after many hours of unsupported, above the seafloor, rotation. Primary weakness of the DI-BHA system is in bit life, both in hours and footage. Progress in this area is still required before an integral DI-BHA system can be considered operational. Promising test data gathered on both carbonado surface set and impregnated diamond bits, however, do give hope. Although the related Diamond Core Barrel (DCB) system had problems circulating/reaming to bottom in "rubble" fill, it also showed promise in trimming a short piece of core out of a large block of rubble while still several meters off bottom. DCB is designed to drill a 7-1/4 in. hole while recovering a 2.312 in. core inside a standard ODP Rotary Core Barrel (RCB) wireline system. It is believed that changes in junk slot (outside flow area) size and configuration can improve hole-cleaning ability of the bit and pave the way for this system to become another tool in the ODP arsenal of coring systems.

The DCS platform-mounted drill rig, despite apparently having a functional secondary compensation system on two earlier legs (124E and 132) was not able to cut core successfully at EPR. "Improved" software code written for Leg 142 did not work. The Leg 132 version of the code was used throughout the leg with mixed success. By leg's end, the DCS compensator appeared to be compensating adequately in "standby" mode, using only a velocity signal from an accelerometer installed in the drillship's moon pool. When required to go into "approach" mode, however, the system would not function correctly and, on many occasions, appeared to amplify the heave problem. Three DCS bit runs ended with three destroyed core bits and no core recovery. Several problems may have contributed to poor performance. A possible bent forward feed cylinder, as well as an erratic load cell, caused introduction of erroneous data into the computer. These false data led to erratic and erroneous string-weight information. String weight is a key component of the secondary compensation system, because it is this starting weight that provides the baseline for the computer to sense and modify WOB for the small, fragile DCS core bits. Without correct load-cell data, the system will not function appropriately in "approach" mode. Leg 142 was operating DCS in deeper water, and under more severe, albeit moderate, sea-state conditions. Higher string loads and larger heave/swell conditions than those experienced during Leg 132 led to higher inertial loads being imposed on the system. It is not certain at this time whether a properly-operating system would have been able to handle these conditions or not. This will require further study. What is known is that DCS must be able to operate in weather and sea-state conditions equaling or exceeding those experienced on Leg 142. This may require introducing more hydraulic horsepower into the system, or modifying hydraulic/servo valve design to allow movement of higher volumes of hydraulic fluid at a faster rate. This, too, will require further study. Finally, the entire approach to DCS secondary compensation—that is, computer code, hydraulic system, horse-

Table 1. Capabilities required for ridge-crest drilling (EastPacific Rise)

| Required/Desired Capability | Leg 54 | Leg 106 | Leg 109 | Leg 124E | Leg 132 | Leg 142 |
|---|---|---|---|---|---|---|
| Hard Rock Guide Base | | X | X | | X | X |
| Provide sea floor stability | | X | X | | X | X |
| Handle 25° slopes | | | | | X | X |
| HRB tilt indicator (mech. or elec.) | | X | X | | X | X |
| Small/economical | | | | | X | X |
| Efficient assembly/deployment | | | | | | X |
| Multiple casing strings | | | | | | X |
| Movable at sea floor | | | | | X | X |
| Recoverable aboard ship | | | | | X | X |
| Drill-In Bottom Hole Assembly | | | | | X | X |
| Provide 4 in. DCS through bore | | | | | X | X |
| Isolate one unstable zone | | | | | X | X |
| Detach from drill string | | | | | X | X |
| Adequate bit/center bit life | | | | | | |
| Multiple unstable zones | | | | | | X |
| Option to spud with small dia. bit | | | | | | X |
| Small collars/connections | | | | | | X |
| Optional 7-1/4 in. dia. core barrel | | | | | | X |
| Diamond Coring System | | | | X | X | X |
| Slim hole coring system | | | | X | X | X |
| Rugged wireline components | | | | | X | X |
| Drill rod/tubing—2000 m | | | | X | X | X |
| Drill rod/tubing—4500 m | | | | | X | X |
| Optional/multiple core catchers | | | | | | X |
| Sampler options for core barrel | | | | | | X |
| Friction reducer/drilling mud | | | | | X | X |
| Slim hole bit designs | | | | X | X | X |
| Diamond Drilling Rig | | | | X | X | X |
| High-speed top drive | | | | X | X | X |
| Constant RPM speed control | | | | | X | X |
| Fine/low flow pump control | | | | | X | X |
| Active secondary compensation | | | | X | X | |

Note: HRB and DI-BHA back-off assemblies were considerably more refined on Leg 142, although the design concepts were proven on Leg 132.

power and control theory—should be reviewed by appropriately qualified vendors/industrial contacts to ensure that the approach taken with the current system is the correct methodology and not overly complex, and whether the system can be made more predictable and reliable for future deployments.

Unfortunately, no core was cut during Leg 142 operations at EPR, thus compromising a major goal of the leg. It is important to recognize, however, that it was a non-functional secondary heave compensation system that prevented core from being recovered at EPR, not the hostile operating environment. Likewise, lack of core should not completely overshadow accomplishments made during the leg. Important steps toward a comprehensive capability for future recovery of valuable scientific data from a ridge-crest environment were taken during Leg 142.

To reiterate, EPR is one of the toughest areas of the world in which to initiate drilling/coring operations. As referenced in Table 1, ability to recover scientific cores successfully from this environment requires development of many new technologies and techniques beyond those of the DCS platform itself. The majority of these are now either proven or well-advanced toward operational status. Ability to recover unique scientific data, blaze new ground, and initiate exciting new science has never been closer at hand. If ODP is to continue being a leader in scientific discovery, it must also pay the developmental price for the technology required.

## Scientific Results

### Introduction

The scientific importance of drilling at spreading ridge-crests has been recognized since the inception of ocean-floor drilling. Indeed, such drilling is still viewed as a very high priority, with 12 additional legs of drilling recommended in the Long Range Plan. DSDP Leg 54 was the first serious attempt to drill at EPR, but it was unsuccessful because of technological shortcomings of unsupported, conventional RCB drilling on, essentially, bare rock. Despite these early problems, COSOD I, COSOD II and several thematic panels of ODP (notably Lithosphere, Tectonics and Sedimentary and Geochemical Processes) have consistently reaffirmed the scientific importance of understanding the early origin of oceanic crust by drilling near and at axes of mid-ocean ridges. ODP legs 106 and 109 at the Mid-Atlantic Ridge showed that new technological capabilities were essential for spudding into bare rock, for establishing/casing a drill hole, and for coring to the desired depth at a ridge crest.

DCS was designed and built to overcome some of the initial problems encountered in ridge-crest drilling, especially problems of poor hole stability and low core recovery. DCS drills a small diameter (3.96 in.) hole using narrow-kerf diamond drilling, and has been used to drill successfully in fractured rocks on land. DCS has been tested and modified after two initial engineering legs, 124E and 132. ODP Leg 142 was meant not only to continue testing and development, but also to provide the first scientific results from drilling at EPR. Leg 142 was conceived as the first leg of a multi-leg drilling program at EPR, developed by the East Pacific Rise Working Group (EPR-WG) and the East Pacific Rise Detailed Planning Group (EPR-DPG).

EPR-DPG listed five scientific objectives of fundamental importance to understanding the origin of young ocean crust. These objectives address questions of: 1) structure and composition of "zero-age" crust; 2) fluid-rock interaction above a shallow magma chamber; 3) fluid flow and mineralization; 4) temporal variation of lava chemistry erupted at the ridge axis; and 5) crustal calibration for geophysical remote-sensing studies, such as seismic reflection, refraction, tomography and others. Further, EPR-DPG recommended several sites in the general area of EPR at 9°30' N to implement a strategy of segment-scale drilling. Initially, Leg 142 was planned to focus on a site 1 km west of the EPR axis (Site EPR-1). However, on the basis of site survey work discussed later, the primary site for the leg was changed to Site EPR-2 (drilled as Site 864), exactly at the axis. Drilling during Leg 142 resulted in spudding of holes 864A, 864B and 864C. The first two are cased to 13.3 and 7.1 mbsf. In addition, holes 864A and 864C have HRBs so that they can be reoccupied and deepened in the future. Alternatively, the HRBs could be picked up and moved to other sites (e.g., EPR-1), if desired.

### General Geology

Site 864 is located at a depth of 2581 m on the axis of EPR at 9°30.85' N, 104°14.66' W (Figure 1), near the mid-point of a second-order ridge segment bounded to the north at 10°10' N by the Clipperton transform fault, and to the south at 9°03' N by an overlapping spreading center (OSC). Full spreading rate along this segment is ~11 cm/yr. Width of the ridge-crest tapers southward, from a maximum of 4 km near the Clipperton transform to only 2 km at the 9°03' N OSC. Southward narrowing of the ridge is accompanied by a general increase in axial depth, from <2600 m on top of an axial high at 9°50' N to 2760 m at the 9° 03' N OSC. From 9°51.5' N to 9°26.1' N, the ridge axis is marked by a narrow trough, <200 m wide and 5-15 m deep. This feature is called an "axial summit caldera" (ASC) because it has apparently formed primarily from volcanic collapse along the ridge axis following magma drainback.

Between the Clipperton transform and the OSC at 9°03' N, small bends, offsets and discontinuities of the ASC and ridge axis partition the ridge-crest into eleven fourth-order segments, 5-15 km in length.

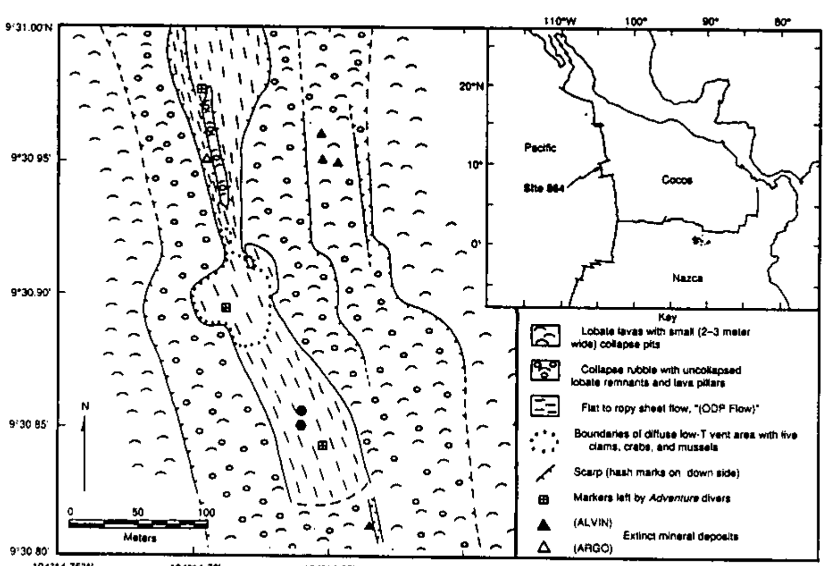



**Figure 1. Location and geologic map of Site 864 and vicinity. Hard rock guide bases (HRBs) for holes 864A and 864B are shown by solid hexagons; the southern hexagon represents Hole 864A.**

These *en echelon* segments consistently step right along the EPR axial zone south of 9°54' N. Near-bottom images and submersible observations confirm that the youngest lavas in the area are present on the axial high at 9°45'-51.5' N. In April 1991, divers in *Alvin* observed evidence of an active eruption in the ASC along this segment. On successive fourth-order segments southward from the eruption area, relative ages of axial lavas increase systematically, except in the area from 9°21' N to 9°12' N, where older lavas are partially to completely buried by fresh flows. South of this area, age of lavas along the axial zone continues to increase to the tip of the OSC.

Variations observed along strike in age of axial lavas and depth to ridge axis (both increasing away from the axial high at 9°50' N) are spatially correlated with along-strike variations in compositions of axial lavas and distribution of hydrothermal vents and deposits. Detailed petrologic study of dredge rock samples collected at ~1.8 km intervals along the ridge axis has shown that axial basalts of this ridge segment are N-MORB derived from a single parent magma. These lavas exhibit a general increase in degree of fractionation southward from the axial high at 9°50' N to the 9°03' N OSC. Many hydrothermal vents and mineral deposits were mapped in the ASC along this ridge segment and are known collectively as the Venture Hydrothermal Fields (Haymon et al., 1991a). The hottest and most abundant active vents are found on the actively erupting segment between 9°45' N and 9°51.5'N. Number of active vents decreases, and number of extinct mineral deposits increases, on successively older fourth-order segments southward from the eruption area to the southern limit of the ASC at ~9°26' N. Except for sparse occurrences of galatheid crabs and hydrothermal staining of basalt, little evidence of past or present vent activity is found on older axial lavas south of 9°26' N. Nevertheless, one additional active smoker, located at 9°16.8' N, is associated with the area of fresh lava flows at 9°21'-12' N.

A robust seismic reflector thought to be the top of an axial magma chamber (AMC) is present beneath the ridge axis between the Clipperton transform and ~9°09' N. The reflector is detected at ~1.5 kmbsf at 9°45'-50' N, where active eruptions were observed in April 1991. It deepens southward to a depth of ~1.7 kmbsf beneath Hole 864A, and deepens abruptly south of 9°28' N to ~2.0 kmbsf. This apparent deepening of the AMC reflector south of 9°28' N may be due to a westward shift in axis of the AMC with respect to the topographic ridge axis. For the Clipperton-9°N segment as a whole, apparent southward increase in depth of the AMC reflector along strike has been interpreted to be genetically linked with the observed southward increase in degree of magma fractionation and decrease in hydrothermal venting.

## Geology at Site 864

Three ODP site surveys were conducted in 1989-1991 to gather detailed information about the EPR segment south of Clipperton and to establish local geology in the vicinity of Site 864: 1) a near-bottom optical/acoustic study of the axial zone from 9°09' N to 9°54' N using the ARGO camera/sonar sled; 2) a near-bottom seismic refraction experiment (NERO); and 3) an *Alvin* submersible dive program (*Adventure*).

Site 864 is located ~25 km south of the 9°45' N-9°51.5' N recent-eruption area (Figure 1). At 9°30.8'-31' N, the ASC and seafloor out to 100-200 m away were imaged with ARGO and surveyed on four submersible dives. Width of the ASC across the top is ~200 m, and it is 8-11 m deep. Outside the ASC to a distance of at least 100-200 m from the rim are sedimented lobate flows pocked with shallow collapse pits 1-2 m deep and 2-3 m across. Inside the ASC is an extensive deposit of collapse rubble consisting of platy pieces 5-20 cm thick. These are remnant pieces of lobate crusts that were frozen roofs of lava ponds. When magma drained out from underneath, the lobate crusts collapsed into a chaotic jumble of polygonal plates, or, where the crust was thicker (20-40 cm), into a cracked pavement of larger pieces similar in appearance to a buckled concrete slab. The rim of the ASC is a ragged lip that has formed from roof collapse. Overhangs are present where uncollapsed, pillar-supported roof remnants extend out from the rim over caverns in the ASC walls. Depth of the ASC rim is 2571 m, and the walls bounding the ASC are 5-9 m high. Their 60° to 90° slopes are covered with collapse rubble interspersed with lava pillars and uncollapsed, lobate-topped roof remnants. The west wall is ~60 m wide adjacent to Site 864, while the east wall is ~90 m wide. This assymmetry is due to the presence of benches 3-20 m wide on the east wall at depths of 2574 and 2577 m.

The central floor of the ASC lies at a depth of 2581-2583 m. It is flooded by a distinctive, flat-to-ropy, massive basalt flow (dubbed "ODP flow") that is ~3.5 m thick and 60 m wide at the drill site. The glassy, sediment-dusted flow is younger than the lobate lavas outside the ASC. "ODP flow" extends for at least 260 m along strike and varies in width from 20 to 80 m. Flow striations are oriented subparallel to the strike of the ASC. Submersible observations of contact relationships indicate that "ODP flow" traveled along strike and ponded within a preexisting linear collapse or depression along the west margin of the ASC. "ODP flow" does not appear to have spilled out of the containing depression, suggesting that the eruption was a small one issuing from a fracture now buried beneath the flow. Fissures and cooling cracks in the flow are up to several meters wide, and may have vertical offsets of up to 1 m near the margin of the flow. Spacing between cracks is variable, from 2-5 m to 8-15 m.

In a 1500-meter-square area ~50-100 m north of Hole 864A, diffuse venting of low-temperature (11-14°C) hydrothermal fluid from fissures in "ODP flow" supports a community of mussels, clams and crabs. Extinct sulfide edifices up to 10 m high are found within 200 m north and south of the drill site. Nearest active high-temperature vents are located in the ASC ~700 m north of Site 864. These active hot vents are barely flowing and appear to be dying. Closest vigorous black smoker is located at 9°33.5' N. Abundant inactive edifices mapped with ARGO are strung out along the ASC south to 9°27' N. Haymon et al. propose that the hydrothermal system in this area of EPR is in a late stage of evolution and is dying from south to north.

Two passive markers were left on "ODP flow": marker 1 at a site where fissure density was low and flow surface very flat (9°30.85' N, 104°14.66' W), and marker 2 in the area of diffuse hydrothermal venting and vent biota (9°30.89' N, 104°14.69' W). Marker 1 was located on Leg 142 using the video camera on the drill string, and Hole 864A is sited ~20 m northwest of it (Figure 1).

## Seismic Studies

One of the primary reasons for interest in scientific ODP drilling at EPR was identification from MCS of a coherent reflector marking the top of an AMC. Beneath the axis of EPR crest, top of the AMC is 1.7 kmbsf at the drill site, but this apparent depth to the AMC lessens to the west. In three-dimensional mapping of the seismic structure of EPR crest near Site 864, Toomey et al. found that the AMC reaches its shallowest depth of ~1 kmbsf ~1 km west of the rise axis, beneath crust 20,000 years old. This depth and offset from the axis are right at the limits of resolution of the existing tomographic inversion, but it is clear that an AMC reaching to within 1.5 km of the seafloor exists under the near western flank of the rise. Such a shallow AMC is an intriguing target for drilling; it was hoped that experiments in bare-rock drilling on EPR crest would lead to establishment of drill holes which might eventually be reentered to recover rock from the roof of the AMC itself. Two potential sites were chosen: EPR-1 above the shallowest point of the AMC, and EPR-2 (Site 864) within the axis of the ASC. The axial low velocity zone is 3-4 km wide and could be reached from either EPR-1 or EPR-2.

To measure detailed shallow structure of proposed drill sites, Purdy et al. carried out seismic refraction experiments using deep-towed explosive source NOBEL and ocean-bottom hydrophones. By using shots within a few meters of the ocean bottom, this experiment avoided the geometry of traditional seismic experiments in which little energy (and hence little information) is returned from the shallowest seafloor. Purdy et al. made seismic measurements along ridge-parallel refraction lines at each proposed drill site and at several other sites to make up a cross-ridge transect at 9°30' N. They also made measurements within the ASC at 9°33' and at 12°50' N. Their results show that the structures of the ASC and flanks differ markedly. A thin (<100 m), slow (2- ~2.5 km/s) layer forms the top of zero-age crust, and this is underlain by a faster layer with velocities of 5.3 km/s at 200 mbsf. On the flanks, the surficial low-velocity layer is significantly thicker (130-180 m) and faster (2.4-3.2 km/s). This is underlain by a layer with velocities ranging from 4.2 to 4.7 km/s.

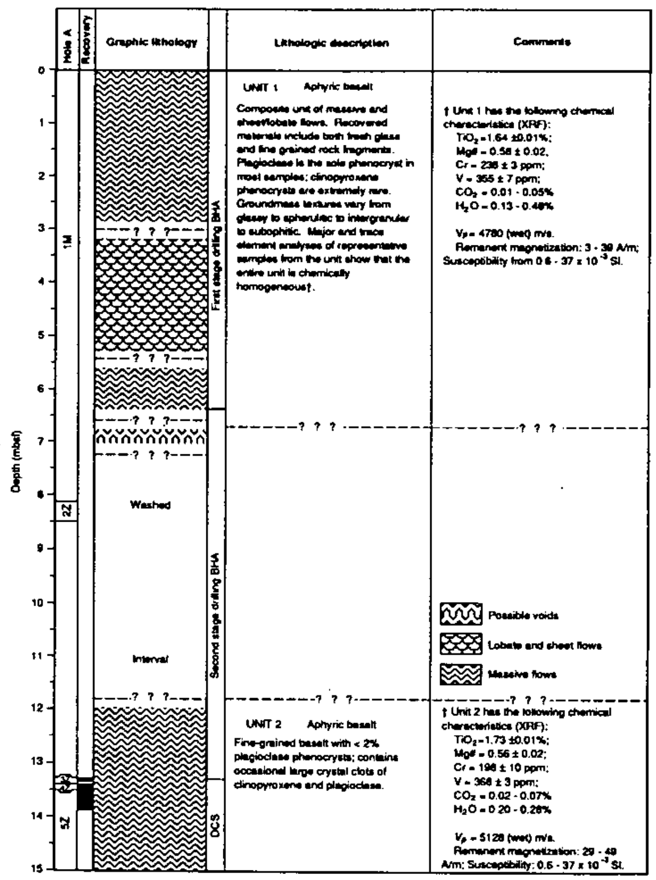
Christeson et al. interpret the low-velocity surface layer to be fractured and brecciated basalt, with the increase in velocity explained by modest cementation or difference in morphology. ASC lavas are predominantly sheet and lobate flows, whereas the flanks have pillows erupted over lobated flows (*Alvin* submersible observations by R. Batiza and others during February and March 1992, on dives 2489 and 2491). More difficult to explain is the apparent decrease in velocity of material beneath the low-velocity layer in going from axis to flanks. Christeson et al. offer two explanations: 1) the 5.4 km/s on zero-age lines represents fairly massive, low-porosity basalt which is fractured tectonically, reducing its velocity to the 4.2-4.7-km/s seen on the flanks; and 2) the 5.4-km/s material of zero-age lines is mostly dikes, while the flank 4.2-4.7 km/s material is fractured flows. Drilling could help to distinguish between these possibilities. Of all lines run in the Purdy et al. experiment, the thinnest surficial low-velocity layer detected was at site EPR-2 within the ASC, where the thickness was only 50 m. Everywhere else the layer was thicker. In particular, at EPR-1, original primary choice for an EPR Leg 142 site, the layer is 165 m thick. Therefore, because of difficulty in drilling through thick sequences of fractured rock, primary location for drilling was switched to EPR-2, drilled as Site 864.

## Petrologic Studies

Langmuir et al. have described samples dredged from EPR between 8°N and 15°N. A detailed study of the axis in the area of the seismic tomography experiment (the area of Site 864) has been conducted by Batiza and Niu using dredges spaced every ~1.8 km along axis. Additional samples on the axis and flanks of EPR have been collected by Perfit et al. So far, these studies show that axial lavas are primarily N-MORB, with rare, more-enriched E-MORB occurring at some fourth-order discontinuities along axis and at other places on the flanks, off axis. Batiza and Niu show that there is a correlation between axial depth and chemistry between 9°17' N and ~9°50' N, with shallow areas of the axis having more primitive lavas (higher MgO contents and MgO/FeO) and deeper areas having more fractionated lavas. Furthermore, since there is a correlation between axial depth and depth of the seismic AMC, there is also a correlation between chemistry of axial lavas and AMC depth. Chemical differences among samples of N-MORB can all be explained by crystal fractionation involving a single parental melt. Batiza and Niu invoke an AMC that has compositional zoning along-axis to explain observed along-axis chemical variation in the vicinity of Site 864.

## Site 864 Summary

Site 864 was located on a flat, relatively unfissured lava flow flooring the ASC of EPR at ~9°30' N (Figure 1). Three holes were drilled, and two (864A and 864B) yielded samples in the form of angular fragments recovered by DCS, miscellaneous junk-basket and bit-recovery samples, and a cylindrical wash core cut by DCB. On the basis of geochemical and petrographic results, two lithologic units have been identified (Figure 2). Unit 1 consists of massive glassy to fine-grained aphyric basalt. Recovered fragments commonly show thin (<1 cm thick) glassy margins grading into microcrystalline interiors; some angular fragments consist entirely of pure glass, whereas others are entirely crystalline. Drilling conditions and nature and chemistry of recovered material indicate that Unit 1 consists of a 2 to 3 m-thick massive flow, underlain by several meters of glassy lobate or sheet flows (Figure 2), all likely emplaced during a single eruptive event. An




**Hole 864A Lithology**

**Figure 2. Inferred stratigraphy at Site 864 from drilling parameters and petrological observations. Unit and lithological boundaries are highly uncertain.**

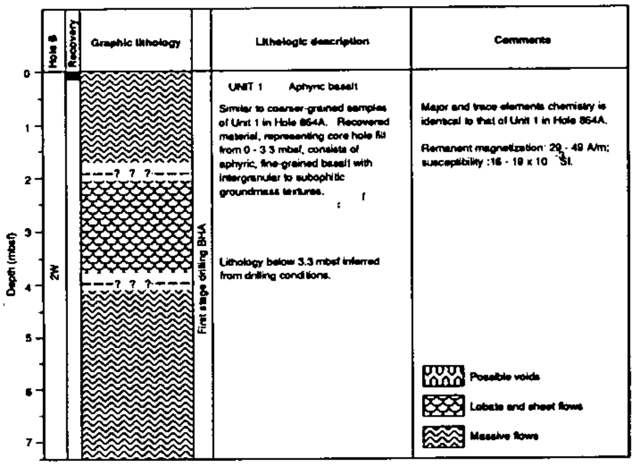



**Figure 2 (continued): Hole 864B lithology**

additional massive flow of unknown thickness, possibly sampled by junk basket, may underlie the lobate and sheet flows; total thickness of Unit 1 is unknown but is likely to be <6.6 m. Phenocrysts in Unit 1 samples are sparse (<1%) and consist of euhedral, prismatic plagioclase (up to 1.5 mm in length) and rare clinopyroxene. Groundmass consists of varying proportions of glass, cryptocrystalline mesostasis, microcrystalline to fine-grained plagioclase, olivine, clinopyroxene, titanomagnetite, and small (5-10 microns) Fe-sulfide globules. Groundmass textures are consistent with differing rates of quench crystallization and cover a complete spectrum from glassy and spherulitic to microlitic to fine-grained intergranular, some with subophitic intergrowths of plagioclase and clinopyroxene. Vesicularity is low (0 to 5%). In general, samples are quite fresh, but microcracks and fracture surfaces of some fragments exhibit thin coatings of secondary precipitates, including opaline silica and cryptocrystalline quartz, Fe-oxyhydroxide minerals, minor pyrite and chalcopyrite, Cu-sulfate(?), and possible clay minerals.

Unit 2 is a massive, microcrystalline to fine-grained, aphyric to slightly plagioclase phyric basalt. It is separated from Unit 1 by an interval of no recovery during drilling and washing (Figure 2), and represents a thick, jointed lava flow or dike of unknown thickness recovered from 11.8 to 15.0 mbsf. One recovered fragment displays well-developed polygonal jointing. Phenocrysts are sparse (up to 2%) and consist of euhedral, tabular to prismatic plagioclase crystals (<2.1 mm long) and rare olivine. Scattered, large (up to 1 cm), coarse-grained crystal clots of euhedral, prismatic clinopyroxene and plagioclase are present. Groundmass mineralogy and textures are identical to Unit 1. Vesicularity is low, but is generally higher than in Unit 1 (0 to 6%). All samples are fresh, but traces of hydrothermal alteration are found as thin coatings of opaline silica, cryptocrystalline quartz and Fe-oxyhydroxide minerals. Rust-colored clay minerals rarely occur as partial vesicle fillings.

Representative whole rock and picked glass samples from Unit 1 (n=13) and whole rock samples from Unit 2 (n=2) were analyzed for major and trace elements by X-ray fluorescence. Within each unit, samples yielded identical values within analytical precision (Table 2). Units 1 and 2 are compositionally very similar, relatively evolved N-MORB (Figure 3), with average $Mg/(Mg^{+}+Fe^{2+})$ of 0.58 and 0.56, respectively. Compared to Unit 1, Unit 2 is characterized by slightly higher $TiO_2$ (1.78% vs. 1.64%), $Na_2O$ (2.63% vs. 2.55%), Y (40 vs. 36 ppm), and V (369 vs. 355 ppm), and by slightly lower $Al_2O_3$ (14.03% vs. 14.30%), CaO (11.45% vs. 11.71%), and Cr (188 vs. 238 ppm). Nb, $K_2O$ and $P_2O_5$ are low in both units (3 ppm, 0.14%, 0.11% to 0.12%, respectively), and $CO_2$ and $H_2O$ contents of glass from Unit 1 range from 0.01% to 0.04% and 0.13% to 0.23%, respectively. Units 1 and 2 were derived from parental lavas similar to those which produced other N-MORBs from this portion of EPR, with minor differences between the two Leg 142 units consistent with Unit 2 having undergone slightly more low-pressure fractionation of olivine, plagioclase and clinopyroxene than Unit 1.

Table 2.

| | Unit 1 Average | Unit 1 1σ | Unit 2 Average | Unit 2 1σ | | Unit 1 Average | Unit 1 1σ | Unit 2 Average | Unit 2 1σ |
|---|---|---|---|---|---|---|---|---|---|
| $SiO_2$ | 49.91 | 0.12 | 49.71 | 0.10 | Y | 36.4 | 0.6 | 40.3 | 1.1 |
| $TiO_2$ | 1.64 | 0.01 | 1.78 | 0.04 | Zr | 111 | 1 | 122 | 2 |
| $Al_2O_3$ | 14.30 | 0.08 | 14.03 | 0.09 | Nb | 2.9 | 0.2 | 2.7 | 0.6 |
| $Fe_2O_3$ | 11.61 | 0.05 | 12.09 | 0.18 | Zr/Y | 3.06 | 0.04 | 3.02 | 0.04 |
| MnO | 0.20 | 0.01 | 0.21 | 0.00 | Nb/Zr | 0.026 | 0.002 | 0.022 | 0.005 |
| MgO | 7.30 | 0.11 | 7.15 | 0.18 | Ti/Zr | 88.3 | 0.8 | 87.4 | 0.6 |
| CaO | 11.72 | 0.05 | 11.45 | 0.06 | | | | | |
| $Na_2O$ | 2.55 | 0.03 | 2.63 | 0.02 | Or | 0.85 | 0.13 | 0.95 | 0.11 |
| $K_2O$ | 0.14 | 0.02 | 0.14 | 0.00 | Ab | 21.90 | 0.33 | 22.35 | 0.47 |
| $P_2O_5$ | 0.11 | 0.01 | 0.12 | 0.01 | An | 27.38 | 0.41 | 26.73 | 0.36 |
| Total | 99.49 | | 99.30 | | Di | 25.10 | 0.19 | 25.37 | 0.42 |
| $CO_2/H_2O$ | L.O.I. | | | | Hy | 16.44 | 0.51 | 15.68 | 0.36 |
| Mg# | 0.581 | 0.003 | 0.565 | 0.010 | Ol | 2.78 | 0.46 | 3.20 | 0.72 |
| | | | | | Mt | 1.71 | 0.02 | 1.73 | 0.04 |
| V | 353 | 9 | 369 | 3 | I lm | 3.17 | 0.09 | 3.27 | 0.13 |
| Cr | 237 | 6 | 188 | 18 | Ap | 0.24 | 0.02 | 0.25 | 0.01 |
| Ni | 73 | 4 | 69 | 5 | | | | | |
| Cu | 77 | 11 | 70 | 1 | | | | | |
| Zn | 92 | 6 | 93 | 2 | | | | | |
| Sr | 122 | 1 | 119 | 2 | | | | | |

Note: Rb, Ba and Ce are below detection limits and are not reported. MG# refers to Mg/(Mg+$Fe^{2+}$), where $Fe^{2+}$ is assumed to be 0.9 times $Fe^{Total}$; L.O.I.=loss on ignition.

Grain densities of Leg 142 basalt samples range from 2.99 to 3.02 $g/cm^3$, with wet bulk densities of 2.94 to 2.99 $g/cm^3$ indicating porosities of 1.8% to 2.1%. Compressional wave velocities are low for basalts, ranging between 4.1 to 5.1 km/s (seawater-saturated) and 3.0 to 4.1 km/s (dry). Large differences between wet and dry velocities exhibited by most samples tested imply that a significant part of rock porosity consists of microcracks. Mean magnetic susceptibility of basalts (0.015 SI units) is comparable to that of other ocean-ridge basalts, and shows a great range (0.00066 to 0.033 SI units). Natural remanent magnetization (NRM) of samples is also broad (0.17 to 0.49 A/M), with lowest values measured from glassy samples. Magnetic and thermal coercivities of samples are low, consistent with multidomain Ti-rich magnetite being the dominant carrier of the NRM.

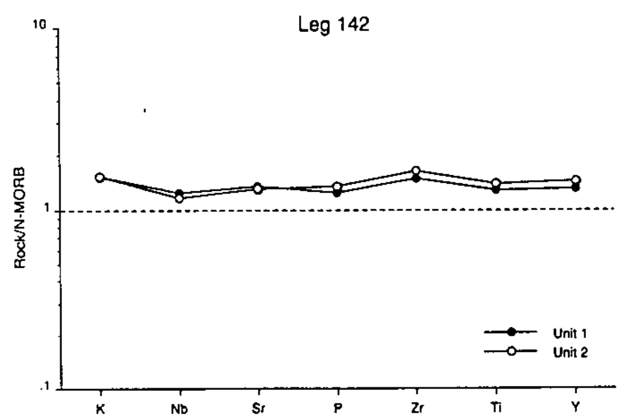



**Figure 3. Average compositions of units 1 and 2 normalized to standard N-MORB composition. Leg 142 units are typical N-MORB in composition.**

# Leg 145 Prospectus: North Pacific Transect


## Abstract

Primary objectives of Leg 145 in the North Pacific Ocean are to determine: 1) high-resolution variations of deep-water circulation and chemistry during the Neogene; 2) Late Cretaceous and Cenozoic history of atmospheric circulation, ocean chemistry and continental climate; and 3) age and nature of sea floor. To address these objectives, at least six sites will be drilled in horizontal and vertical (depth) transects to record latitudinal changes in ocean fronts and currents, span changes in deep-water masses and place age constraints on plate motion history.


## Introduction

Sub-Arctic Pacific sediments contain a critical record of late Mesozoic and Cenozoic oceanographic and climatic changes, but existing sites are too few and generally too disturbed by rotary drilling to permit detailed reconstructions. The region, therefore, represents a large gap in knowledge of the evolution of earth's climate and oceanic system. The area (Figure 1) extends over 35 x $10^6$ $km^2$ and includes two major boundary currents (Oyashio and Alaskan), and an oceanic and atmospheric frontal zone (Sub-Arctic Front), which is believed to have migrated over several degrees of latitude on both short and long time scales. Passes through the Aleutian and Kuril arcs provide exchange sites for deep waters that exert a strong influence upon the properties of North Pacific Intermediate Water. The area is a source of heat and moisture for the North American continent and is one of the most biologically productive areas of the world ocean.

At least six Advanced Hydraulic Piston Core(APC)/Extended Core Barrel (XCB) holes are to be drilled to obtain undisturbed sedimentary sections for studies of Cretaceous and Cenozoic paleoceanography and paleoclimatology of the North Pacific Ocean. Horizontal (latitudinal and longitudinal) and vertical (depth) transects will provide critical information for reconstruction of latitudinal changes in ocean fronts and surface currents, while the vertical transect will address history of deep water circulation and ocean chemistry.

## Scientific Objectives

Leg 145 has a number of scientific objectives with the overall goal of understanding paleoceanography and paleoclimatology of the North Pacific: 1) high-resolution Neogene record of the sub-Arctic region; 2) nature and history of formation of North Pacific Deep Water; 3) middle Miocene onset of silica deposition - the "silica shift" problem; 4) Late Cretaceous and Cenozoic record of atmospheric circulation; 5) Late Cretaceous and Cenozoic record of ocean chemistry; 6) records of Northern Hemisphere continental climate; 7) paleoceanography of the late Mesozoic superocean; 8) tephrochronology of the Kuril and Aleutian arcs; 9) age and nature of basement in regions where it is poorly understood.

At present, the North Pacific is the terminus of the deep-ocean circulation route originating in the northern North Atlantic and the Southern Ocean and the beginning of the return surface circulation. These old deep waters are nutrient-rich, oxygen-poor and highly-corrosive to calcium carbonate. Recent evidence suggests that at various times in the Quaternary there was better calcite preservation in both the deep northeast and northwest Pacific, but it is not clear to what extent these and other changes reflect changes in deep ocean circulation, as opposed to local changes in depositional conditions.

An unusually-thick sediment body in the northwest Pacific known as the Meiji Tongue, a drift deposit, holds the key to understanding deep-ocean circulation patterns for two reasons: 1) its apparently recent deposition may have been controlled by production of a young, nutrient-depleted water mass in the late Quaternary; and 2) benthic and planktonic foraminifers are well preserved, so that their chemistry can be used for both high-resolution chronology and as a proxy for ocean circulation changes. Thick calcareous-siliceous sediments on Detroit and Patton-Murray seamounts provide similar sites in the northwestern and northeastern Pacific, permitting longitudinal comparisons of Neogene phenomena. High-resolution ice-rafted detritus records from the Patton-Murray and Detroit areas will permit reconstruction of timing and extent of glaciation, and comparison of this continental signal to the oxygen isotope record of climate change.

Work in other regions of the world suggests a series of events or rapid changes in ocean circulation and global climate during the late Neogene. These include latest Miocene, believed to be a time of expansion of Antarctic glaciers, late Pliocene growth of ice in the northern hemisphere, and the more recent increase in amplitudes of northern hemisphere glaciation during the middle Pleistocene. Longer-term changes appear to have been superimposed upon ongoing high-frequency cycles of variability at roughly Milankovitch periods. The effect of these changes upon

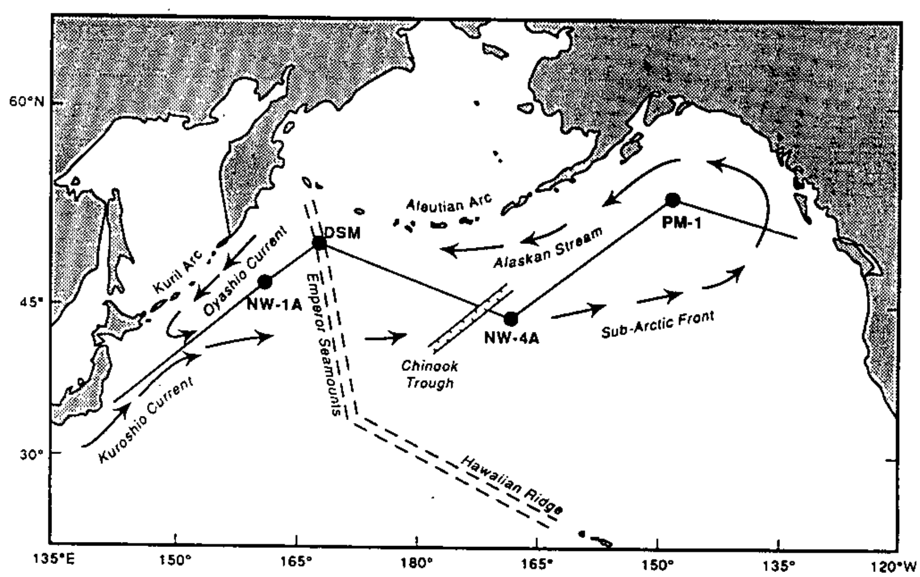



**Figure 1. Proposed ship track (straight lines) and site locations (solid circles) for Leg 145. These sites include the northwest Pacific transect sites (NW-1A and NW-4A), the Detroit Seamount sites (DSM-1, -3, and -4), and the Patton-Murray Seamount site (PM-1).**

the North Pacific is largely unknown, given the small number of previous sites and absence of calcareous sediments at those sites. Strategic location of drilling sites within the sub-Arctic gyre, situated upon oceanic highs and in deep basins, will permit generation of latitudinal, longitudinal and depth transects to complete the global picture of climate and circulation throughout the latest Neogene.

Limited recovery from North Pacific and Bering Sea COST wells suggests that regional sedimentation in the Eocene and early Oligocene was calcareous; this was followed by a period of pelagic clay deposition until the middle Miocene, when siliceous sediments began to accumulate throughout the region. Timing and rate of decreased calcareous production is not known; siliceous sediments appeared abruptly at 14-15 Ma. While plate migration may account for a portion of this trend, it does not explain several elements: occurrence of *in situ* calcareous sedimentation in the Bering Sea, and rapidity and synchroneity of appearance of siliceous sediments throughout the North Pacific. This evidence implies a change in regional circulation and productivity from a mid-Paleogene ocean that was warm, stratified and with net downward transport (like the North Atlantic today), to a mid-Neogene ocean which was cool and well-mixed with net upward transport. Such a change would probably affect nutrient concentrations downstream, leading to lower production in the Atlantic and Indian oceans, and may signal a change in atmospheric circulation and climate. However, the number and locations of existing sites are such that considerable doubt remains concerning the extent of the change; most sites lie near continents and may reflect changes in boundary currents rather than in the open gyre. Drilling sites within the sub-Arctic gyre will permit assessment of regional changes in mass flux and global silica budget during the Cenozoic.

Atmospheric circulation and its link to sea-surface circulation and biological productivity is an important component of climatic change. Understanding of this aspect of climate change during the Cenozoic has come from three North Pacific cores (DSDP sites 576 and 577 and LL44-GPC-3), generally of low biostratigraphic resolution and all sited along about the same latitude, precluding any understanding of latitudinal variation in the global wind system. Sites located to enhance the latitudinal span of eolian records will permit: 1) enhanced definition of any changes in atmospheric circulation associated with the Cretaceous-Tertiary boundary; 2) evaluation of latitudinal variability of the known large change in atmospheric circulation associated with the Paleocene-Eocene boundary (important for comparison to computer models of climate change); 3) a test of the suggestion that enhanced Northern Hemisphere atmospheric circulation and concommittant biological productivity were directly responsible for onset of massive silica sedimentation in the Miocene; and 4) documentation of changes in atmospheric circulation associated with Pliocene onset of Northern Hemisphere glaciation.

Pelagic clays are reliable recorders of ocean paleochemistry; signals reflecting terrigenous input, sea-floor hydrothermal activity, volcanism, biological activity, authigenesis, bollide impacts, etc. are captured by these clays. Prior work has shown the presence of the Ir anomaly associated with the Cretaceous-Tertiary boundary and the influx of hydrothermal components associated with earliest Eocene plate-boundary rearrangements. Drilling on the North Pacific transect, especially at sites NW1A and NW4A, should recover all these signals, along with the geochemical signal associated with plate boundary reorganization that occurred during Late Cretaceous Magnetic Quiet Zone time. The rifting episode that resulted in formation of the Chinook Trough in the central North Pacific is part of this event and Site NW-4A just south of the trough on somewhat older crust, should provi[de] a clear, proximal geochemical record of intra-plate rifting.

During the middle and later portion of the Cretaceous, the Indo-Pacific was the single, broad, global ocean; the Atlantic was a narrow, salty river. Paleoceanographic history of the Northern Hemisphere portion of this late Mesozoic superocean is very poorly known. Drilling locations planned for Leg 145 underlie the paleo-North Pacific sub-tropical gyre and should provide a useful record of the old superocean. Validity of Cretaceous paleoceanographic reconstructions is only as good as knowledge of drillsite paleo-locations. This is more of a problem in the North Pacific than elsewhere because of a major plate boundary reorganization that occurred during Late Cretaceous Magnetic Quiet Zone time; the exact nature of that history and ensuing Late Cretaceous and Paleogene plate motions remain a matter of interpretation. Seafloor ages at two Leg 145 drilling locations may further understanding of the tectonic history of the North Pacific.

## Drilling Approach:

Discovery of foraminifer-bearing sediments on Detroit and Patton-Murray seamounts in the last few years allows techniques of isotope paleoceanography to be applied to the sub-Arctic Pacific Ocean. Drilling in these locations will permit both a depth (2400 to 3800 m) and a longitudinal (148°W to 168°E) transect to be conducted in rapidly-deposited sediments, resulting in high-resolution paleoceanographic information. These sediments, dominantly foraminifer-bearing siliceous clays, should provide a record of both carbonate and isotopic chemistry of North Pacific deep waters through the Neogene. Silica deposition should reveal detailed records of the activity and productivity of the Oyashio and Alaskan currents, especially details of onset of voluminous silica deposition in the North Pacific in the middle Miocene. Continentally-derived materials found at these sites, such as ice-rafted debris, hemipelagic mud and eolian dust, will permit interpretations of the nature of continental climate in respective source regions. Similarly, these sections should contain a good record of tephrochronology of the Kuril and Aleutian arcs. The Meiji Tongue, a thick drift deposit prograding south along the east side of the Emperor Seamounts, should permit recovery of a physical, and possibly chemical, record of bottom-water movement in this portion of the North Pacific. The Meiji drift is presumed to be Pliocene-Pleistocene in age, but no data are presently available to address this question.

Miocene onset of silica deposition in the North Pacific may be the result of establishment of a more modern deep-water circulation, resulting in transport of nutrient-rich deep waters to the North Pacific and their subsequent upwelling, or of increased vigor of atmospheric circulation resulting in stronger ocean surface circulation and thus greater biological productivity. Drilling at NW-1A and NW-4A should allow linking of the eolian dust record of atmospheric circulation and the opal record of silica deposition to investigate these questions. NW-1A provides the northernmost site along the north-south transect across the Kuroshio-Oyashio confluence started by DSDP Leg 86 (sites 578, 579, 580 and 581) and, together, those sites will permit evaluation of latitudinal variability of oceanographic processes. Both NW-1A and NW-4A should recover siliceous sediments overlying pelagic clays overlying, in turn, Cretaceous limestones. Pelagic clays at these sites contain a record of eolian processes and paleochemistry; important boundaries. Further, Late Cretaceous rifting responsible for creation of the Chinook Trough should have left a strong geochemical imprint on sediments of Site NW-4A. These two sites are situated more than 10° north of locations of existing eolian records and will provide some latitudinal definition of important events seen elsewhere at the Paleocene-Eocene boundary and associated with general Neogene intensification of circulation.

Lower portions of the section at NW-1A, NW-4A and DSM-1 will encounter Late Cretaceous limestones and will provide information on the nature of the northern subtropical Pacific portion of the large Cretaceous super-ocean. Basement ages at these sites will help in understanding details of Cretaceous tectonic evolution of the North Pacific.

## Drillsites

*NW-1A:* This site will serve as a northward extension of the transect begun by Leg 86. It is expected to monitor extreme northward shifts of the Sub-Arctic Front during the Pliocene-Pleistocene. The record of ice-rafted debris should be good. The site probably moved north from the highly-productive equatorial water mass during Late Cretaceous Magnetic Quiet Zone time, and calcareous fossils in basal sediments should provide good age control and paleoceanograpic information. Age and paleomagnetic information obtained from igneous basement (to be drilled if time permits) will provide a data point to constrain northwest Pacific Mesozoic plate reconstructions. Sediments are ~360 m thick (Table 1) and expected to be siliceous clays overlying pelagic clays overlying Cretaceous limestones. The site will be double-APC cored until refusal, with XCB coring to basement. If time is available, an XCB/MDCB core will be drilled into basement. Logging operations will consist of the three standard logging runs (Geophysical, Geochemical and FMS tool strings).

*DSM-1, -2, -2A, -3 and -4:* These sites form a depth transect between 2400 m atop Detroit Seamount and 3800 m on Meiji Tongue, which blankets the eastern flank of Detroit Seamount (Table 1). By comparison with DSDP Site 192 on Meiji Seamount and several piston cores, proposed sites will have sediment thicknesses upwards of 1000 m, rates of sedimentation in excess of 50 m/m.y., and contain useful amounts of calcareous microfossils. These sections are the highest-latitude carbonate-bearing locations in the open northwest Pacific, and will be essential for depth transects and comparison with Ontong-Java Plateau drilling (Leg 130) results. Study of sediments from the Meiji Tongue drift may also resolve questions concerning the origin of this sediment body and its relationship to possible major changes in deep-water distribution and flow paths. For the first time, stable isotope stratigraphy will be linked with high-latitude siliceous microfossil biostratigraphy, magnetic reversal stratigraphy, and the northwest Pacific record of ice rafting. DSM-1, the shallow site atop Detroit Seamount (Figure 2), will be double-APC cored until refusal and then single-XCB/RCB cored to basement, recovering thick Neogene and thin Paleogene and uppermost Cretaceous sections. Intermediate site DSM-3 will be double-APC cored to refusal, followed by a single-XCB hole to ~300 mbsf. The other intermediate sites DSM-2/2A are alternates and will be drilled in a similar manner to DSM-3, should time become available. The deep site on Meiji Tongue, DSM-4, will be double-APC

Table 1. Leg 145 Time Estimates.

| Site | Location Latatitude | Longitude | Water Depth | Penetration (m) | Drill (days) | Log (days) | Total (days) | Transit (nmi) | Transit (days) |
|---|---|---|---|---|---|---|---|---|---|
| **Primary Sites** | | | | | | | | | |
| Yokohama | 35°30′N | 139°45′E | | | | | | | |
| | | | | | | | | 1221 | 4.8 |
| NW-1A | 47°06′N | 161°30′E | 5330 | 360 | 5.7 | 1.2 | 6.9 | | |
| | | | | | | | | 282 | 1.1 |
| DSM-3 | 50°21′N | 167°37′E | 3307 | 300 | 3.5 | 0.0 | 3.5 | | |
| | | | | | | | | 51 | 0.2 |
| DSM-1 | 51°12′N | 167°45′E | 2415 | 850 | 8.2 | 1.7 | 9.9 | | |
| | | | | | | | | 30 | 0.1 |
| DSM-4 | 51°33′N | 168°20′E | 3830 | 800 | 9.7 | 1.4 | 11.1 | | |
| | | | | | | | | 1019 | 4.0 |
| NW-4A | 44°43′N | 168°17′W | 5700 | 150 | 2.9 | 0.0 | 2.9 | | |
| | | | | | | | | 956 | 3.8 |
| PM-1A | 54°22′N | 148°27′W | 3660 | 350 | 5.8 | 1.1 | 6.9 | | |
| | | | | | | | | 992 | 3.9 |
| Victoria | 48°30′N | 123°30′W | | | | | | | |
| | | Subtotals: | | 2750 | 35.8 | 5.4 | 41.2 | 4551 | 17.9 |
| | | Grand total: | | | 59.1 days at sea | | | | |
| **Alternate Sites** | | | | | | | | | |
| DSM-2 | 51°06′N | 167°52′E | 2775 | 300 | 3.2 | 0 | 3.2 | | |
| DSM-2A | 50°12′N | 167°46′E | 2812 | 300 | 3.2 | 0 | 3.2 | | |
| PM-1B | 54°25′N | 149°13′W | 3550 | 350 | 5.6 | 1.1 | 6.7 | | |
| PM-1C | 54°22′N | 148°54′W | 3727 | 400 | 5.9 | 1.1 | 7.0 | | |

Note: transit times are calculated for a speed of 10.5 kt.

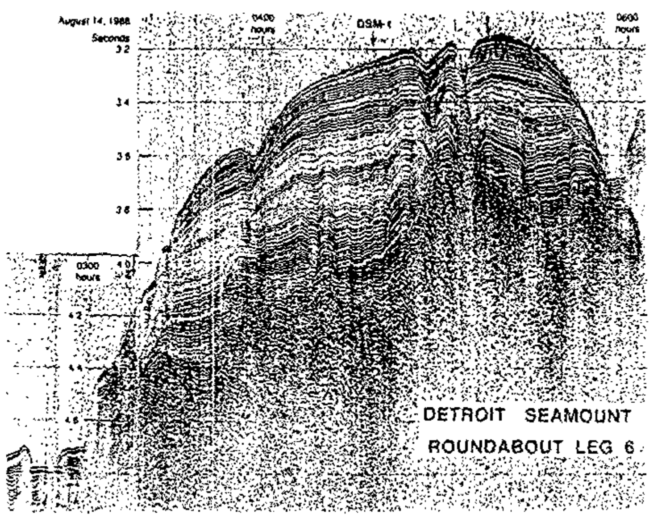



**Figure 2. Single-channel seismic reflection profile of Detroit Seamount showing location of Site DSM-1. Data collected by *R/V Thomas Washington* during Leg 6 of the Roundabout Expedition in August 1988.**

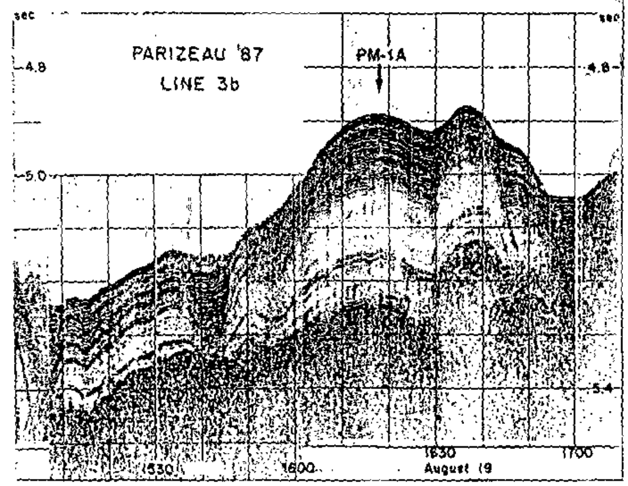



**Figure 3. Single-channel seismic reflection profile of Pattom-Murray Seamount group showing location of Site PM-1A. Data collection: *Parizeau*, August 1987.**

cored to refusal, and then single-XCB/RCB cored to ~800 mbsf.

The three standard logging strings will be run at DSM-1 and DSM-4. Two additional logging strings, one containing a susceptibility tool and one a magnetic tool, will be run at DSM-1. No logging operations are presently scheduled for DSM-3 due to time constraints.

*NW-4A:* Recovery of biosiliceous and eolian-derived material at NW-4A will permit determination of middle Miocene timing of increased biosiliceous production, major changes in atmospheric circulation patterns and general changes in surface water masses. Information gathered at NW-4A can be combined with that from similar sections at NW-1A to provide a longitudinal transect of atmospheric and oceanic circulation. NW-4A probably moved north from the highly-productive equatorial water mass during Late Cretaceous Magnetic Quiet Zone time, and calcareous fossils in basal sediments should provide good age control and paleoceanograpic information. Age information obtained from sediments directly overlying basement will provide a data point to constrain north-central Pacific Mesozoic plate reconstructions. Sediment geochemistry of hydrothermally-derived components should record formation of the Chinook Trough. Sediments are expected to be siliceous clays overlying pelagic clays overlying Cretaceous limestones. This site will be double-APC cored to refusal and continued with a single-XCB hole through the ~150 m thick section to basement. No logging operations are presently scheduled due to time constraints (Table 1).

*PM-1A:* This site is located in the northeastern Pacific, on the broad platform level of the Patton-Murray Seamount group (Figure 3); it is elevated well above the abyssal plain, thus precluding turbidite sedimentation and ensuring recovery of representative pelagic, carbonate-bearing sediments. Examination of 10 piston and gravity cores taken in this locality during 1987 revealed moderate carbonate contents (up to 55%), both benthic and planktic foraminifers adequate for stable isotope analysis, biosiliceous zones, abundant ice-rafted debris and some ash layers. Significant changes in productivity and terrigenous input have occurred in the area, as shown by repetitive succession of very distinct lithologies. Proposed drilling consists of ~300 m of apparently uninterrupted hemipelagic sediments. Sites PM-1B and PM-1C are alternates with similar sediment thicknesses. Available ages for the plateau are 25.7 Ma for Murray Seamount and 26.3 Ma for Patton Seamount. Thus, average sedimentation rate might be ~1 to 1.5 cm/k.y. Rates were presumably lower in the pre-Pliocene section, due both to northward migration of the site closer to the Alaskan margin and to effects of continental glaciation. Late Quaternary rates average 6 cm/k.y., with deglaciation rates of 15-20 cm/k.y. This site will be double-APC cored to refusal, single-XCB cored as far as possible, and then rotary drilled ~50 m into basement (Table 1). The three standard logging strings will be run.

# Leg 146 Prospectus: Cascadia Margin

## Introduction and Objectives

Sediments on oceanic crust of the subducting Juan de Fuca plate, and pore water, organic and inorganic compounds that are contained within them, are brought into conditions of increased pressure and temperature as they are incorporated into, or subducted beneath, the thickening accretionary wedge at Cascadia margin (Figure 1). Compaction under increased load drives pore water out of sediments. Resulting outflow can be widespread and diffuse, but it is also channeled along zones of high permeability, such as faults, which produce vents at the seafloor. Increased temperature and bacterial activity produce methane and other hydrocarbons from organic material in the sediment. The presence of methane in this region is demonstrated by widespread occurrence of bottom-simulating reflectors (BSRs) that represent the base of sediment containing methane hydrate, by dissolved methane in water escaping from vents, and by occurrence of pavements of diagenetic carbonate generated by oxidation of methane in fluids seeping from the seafloor. Other diagenetic reactions produce changes in fluid chemistry, and can generate additional water, such as in the transition from smectite to illite. Production of volatiles can contribute additional pressure to drive fluids through the system.

Leg 146 will investigate fluid flow from, and sediment deformation in, the accretionary wedge that forms the continental margins off Oregon and Vancouver Island. The scientific program is dedicated to advancing knowledge of budgets, sources, pathways, and ultimate fates of sediment, water and dissolved chemicals, and the relationships between tectonics and fluid regime. The objective is to gather information on fluid chemistry and pressure, sediment physical properties, and nature and history of diagenetic events associated with accretion and fluid discharge. In light of the occurrence of extensive venting on Cascadia margin established by submersible observation, direct measurement, geochemical analyses, and inference from sidescan sonar images, Leg 146 promises to be the first ODP leg to determine the relationships between active fluid venting and subsurface physical and chemical conditions.

## Regional Geology and Tectonics

Cascadia margin has been a zone of convergent plate motion since the Eocene, as the Kula/Farallon and, most recently, Juan de Fuca plates subducted obliquely beneath the North American plate. This process accreted several terranes, most notably the Crescent and Pacific Rim terranes to the north (Vancouver Island and Olympic Peninsula) and the Klamath Terrane to the south.

Modern accretion on northern Cascadia margin (Vancouver Island) is characterized by thrust faulting which extends to oceanic basement. As a result, in contrast to accretion farther south, the entire sedimentary section is being transferred to the North American plate, and little if any of this sediment is being subducted.

The forearc Tofino Basin, where more than 3000 m of Eocene to modern sediments are deposited, covers most of the continental shelf off Vancouver Island. It has formed by deposition of Eocene to Holocene marine clastic sediments over the Pacific Rim and Crescent terranes and the modern accreting sedimentary wedge.

Crescent Terrane appears to consist of Eocene oceanic crustal rocks trapped on the margin by a westward jump of the subduction zone. Pacific Rim Terrane consists of Mesozoic sedimentary rocks wedged between older continent and ophiolitic Crescent rocks. The two terranes are assumed to have been emplaced in the same tectonic event. Beneath and against Crescent Terrane, the modern accretionary complex has formed by scraping off incoming sediments on subducting Juan de Fuca plate (Figure 2a). Subduction since the Eocene has been relatively simple, the continuous record of accretion having shown no evidence for arrival of allochthonous terranes.

Off central Oregon, Quaternary underthrusting of 9-m.y.-old oceanic crust blanketed with nearly 4 km of sediment produces a series of well-defined folds and thrust faults which make up the lower continental slope. The depositional system is characterized by rapid clastic influx associated with large submarine fans. The currently-forming accretionary wedge is the youngest part of the larger subduction complex that encompasses Paleogene and Neogene portions exposed on land (Figure 2b).

West of the Coast Range, four distinct geologic terranes are recognizable: 1) deep forearc basin on the inner shelf, 2) mid-shelf tectonic high, 3) mid- to outer-shelf Eocene-Miocene accretionary melange wedge, and 4) folds and thrust faults of the Pliocene-Pleistocene accretionary complex that makes up most of

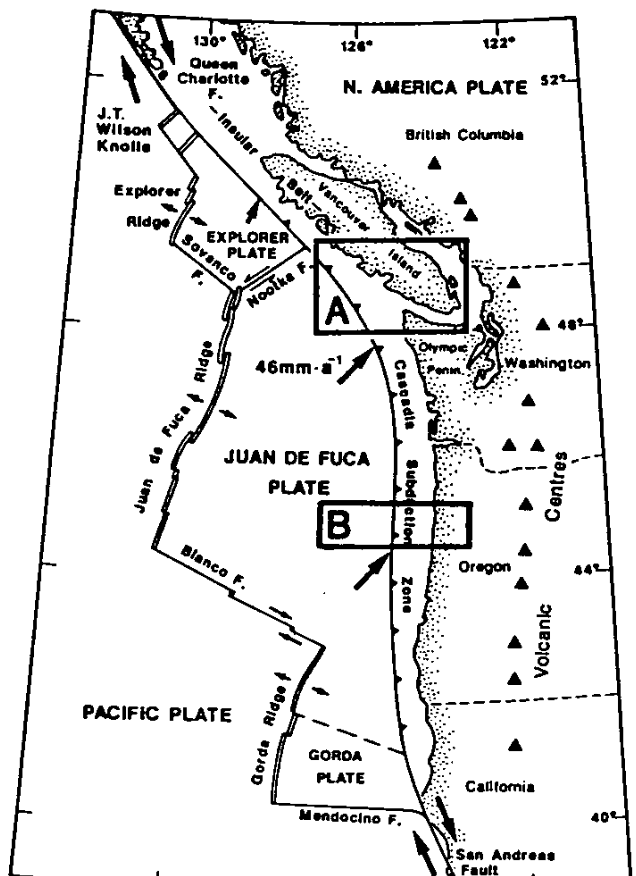



**Figure 1. Map of Cascadia margin, showing the two areas of proposed drilling activity off Vancouver Island (A) and Oregon (B).**

the continental slope. Eocene to Miocene sedimentation in the forearc (shelf) basin resulted in accumulation of more than 7000 m of sedimentary and volcanic rocks. Convergent episodes in the late Eocene and middle Miocene formed thick accreted sequences of melange and broken formation that underlie the present outer shelf and upper continental slope. Modern subduction began in the late Miocene, and produced progressive westward migration of the continental slope as abyssal plain (Cascadia Basin)/deep-sea fan deposits were accreted to the margin. It is these Pliocene-Pleistocene deposits at which the drilling program is directed.

## Heat Flow and Geothermal Gradient

The continental margin off Vancouver Island is one for which heat flow has been measured extensively. Off Oregon, heat-flow data are less widespread, but even so the ninety or so measurements adequately define the main trends in heat-flow variation, which are similar to those off Vancouver. Heat flow from the ocean basin is high, ~140 $mW/m^2$, because of youthful oceanic lithosphere (8 Ma off Oregon, and 6 Ma off Vancouver). Heat flow decreases landward across the continental margin to ~60 $mW/m^2$, because of deepening of the oceanic lithosphere as it is subducted. The initial decrease is accentuated by tectonic thickening of the accretionary wedge, which stretches isotherms and reduces the thermal gradient. Local increases and decreases in heat flow over the margin are produced by effects of thrusting, erosion, localized deposition at high sedimentation rates, and outflow of warm pore fluid. For example, a heat-flow high of 182 $mW/m^2$ measured on Oregon margin in a ponded basin between major thrust sheets is attributed to advective movement of pore fluids through the accretionary complex. The broad distribution of temperature within the margin off Vancouver Island has been modeled, taking into account age of oceanic lithosphere, history of sedimentation and accretion of sediment at the margin. Beneath the ocean-basin floor, a temperature of 100°C is reached at a depth of 1.3 km, whereas 20 km landward of the toe of the accretionary wedge, this temperature is reached at a depth of 1.9 km. The pattern of isotherms off Oregon is similar.

## Drilling Strategy

Leg 146 will drill a series of relatively shallow (≤600 m) holes (Table 1), in contrast to some previous accretionary-prism programs which sought deep penetration to sample sediments of the décollement. These holes will be of two kinds:

1) Non-reentry holes will be cored with APC/XCB tools in the upper part of the section; RCB-coring will be used in deeper, indurated sediments. Extensive downhole logging and special sampling (PCS, GEOPROPS, LAST 1 and 2, WSTP) are to be carried out;
2) Two reentry holes will be cased to depth and fitted with ODP Borehole Seals (CORKs) for long-term monitoring of temperature and pressure, and subsequent fluid sampling and hydrogeologic tests. In addition to logging and special sampling procedures planned for non-reentry holes, packer-flowmeter tests will be run in cased portions.

Because it has been postulated that fluid flux is dispersed off Vancouver Island, and focused along fault zones off Oregon, two transects will be drilled. Vancouver Island sites (Figure 1) will document loss in porosity from Cascadia Basin onto the continental slope, and determine the relation between fluid flux and methane clathrates, which are manifested as a strong BSR. Sites on Oregon margin (Figure 1) were selected to penetrate fault zones suspected or known to be active aquifers, which focus fluid discharge.

## Description of Subareas and Scientific Basis for Drilling

### Vancouver Island Margin

The accretionary sedimentary wedge has formed by off-scraping of the sediment section overlying the incoming Juan de Fuca plate (Figure 3). This section is 2 to 3 km thick near Vancouver Island margin, and consists of over half Pleistocene turbidites overlying a thinner acoustically transparent (hemipelagic/fine-grained turbidites?) layer. Both the extension of seismically imaged thrust faults very close to the downgoing crust, and mass balance calculations (i.e., total sediment brought in compared to that in the wedge), indicate that most if not all of the sediment has been scraped from incoming oceanic crust over the past 42 m.y., forming the 70-km-wide prism. The detachment surface or décollement zone at present, and probably since the Eocene, is

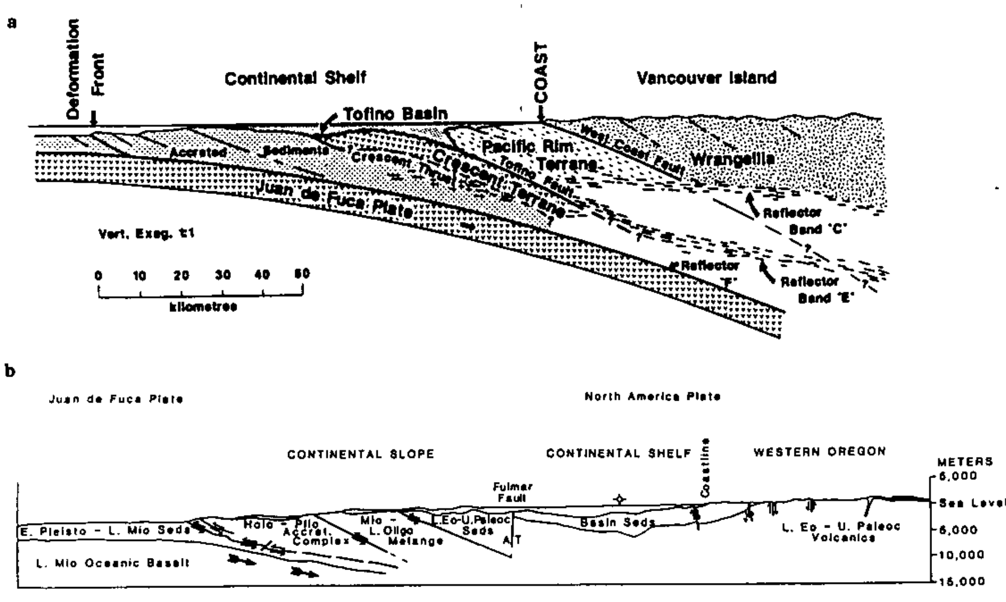



**Figure 2. (a) Schematic cross section of Vancouver Island margin. From Hyndman et al., (1990), "The northern Cascadia subduction zone at Vancouver Island: Seismic structure and tectonic history", *Canadian Journal of Earth Science*, 27, 313-329. (b) Schematic cross section of Oregon margin at 44° 52' N, after Snavely, Wagner, and Lander (1980), Geological cross section of the central Oregon continental**

Table 1. Leg 146 Time Estimates.

| Site | Location Latitude | Longitude | Water Depth | Penetr. (m) | Drill (days) | Log (days) | Downhole Experiments[1] | Total (days) | Transit (days) |
|---|---|---|---|---|---|---|---|---|---|
| **Primary sites** | | | | | | | | | |
| Victoria | 48°30′N | 123°20′W | | | | | | | |
| | | | | | | | | | 0.6 |
| VI-5 | 48°41.84′N | 126°52.30′W | 1290 | 400 | 9.6 | 1.7 | WVC | 11.3 | |
| | | | | | | | | | 0.1 |
| VI-2 | 48°15.13′N | 126°30.00′W | 2125 | 600 | 4.7 | 1.4 | WV | 6.1 | |
| | | | | | | | | | 0.1 |
| VI-1 | 48°09.97′N | 126°39.87′W | 2550 | 600 | 5.3 | 0.8 | WV | 6.1 | |
| | | | | | | | | | 0.3 |
| Hole 857D | 48°26.52′N | 128°42.65′W | 2431 | | | | | 1.1 | |
| | | | | | | | | | 1.1 |
| OM-3 | 44°38.59′N | 125°19.57′W | 2655 | 540 | 10.5 | 3.2 | WOC | 13.7 | |
| | | | | | | | | | 0.1 |
| OM-7 | 44°40.45′N | 125°07.23′W | 668 | 300 | 2.2 | 1.0 | W | 3.2 | |
| | | | | | | | | | 0.1 |
| OM-2a | 44°40.42′N | 125°21.53′W | 2865 | 500 | 5.1 | 1.2 | W | 6.3 | |
| | | | | | | | | | 3.2 |
| Santa Barbara | | | | | | | | 1.0 | |
| San Diego | 32°45′N | 117°10′W | | | | | | | |
| | | Subtotals: | | 2940 | 37.4 | 9.3 | | 50.8[2] | 5.6 |
| | | Grand total: | | | 56.4 days at sea | | | | |

[1] Downhole experiments to be conducted unclude WSTP and PCS (W), VSP (V), oblique VSP (O), and packer/ flowmeter and instrumented borehole seal or CORK (C).

[2] Included in this value is time allotted for GEOPROPS and LAST work (unallocated).

Note: transit times are calculated for a speed of 10.5 kt.

thus close to the top of the oceanic crust. Incoming sediments fail first along widely-spaced listric faults, although only 10-20 km behind the frontal fault, deformation must become more cataclastic, as regionally coherent reflectors are no longer observed (Figure 3).

Two types of data delineate regional fluid expulsion and porosity reduction across the deformation front on Vancouver Island margin: porosities from multichannel seismic velocity data, and vertical fluid flow from the effect on thermal regime. One drilling objective is to test the resulting model of dispersed fluid expulsion associated with compaction.

Porosity-depth profiles derived from MCS velocities for Vancouver Island margin, seaward of the deformation front, just behind the front, and for the area ~10 km farther landward, show a porosity decrease of ~10% in the upper 1 to 2 km over a distance of 20 km. Using convergence and sediment accretion rates, estimated surface fluid expulsion rate required to give this rate of porosity change is ~$1 \times 10^{-10}$ m/sec (3 cm/yr).

A complementary estimate of fluid flow is obtained from thermal data. Surface heat flow has been constrained by 110 probe measurements and estimated from the depth to the BSR that represents the base of the stability field for methane hydrate (Figure 4). Values of heat flow derived from depth of the BSR are systematically lower than for nearly-coincident probe measurements, with some tendency for the difference to decrease landward. It is postulated that vertical advective fluid flow is responsible for the difference. Temperature at the depth of the BSR, obtained by extrapolating the surface temperature gradient downward, is

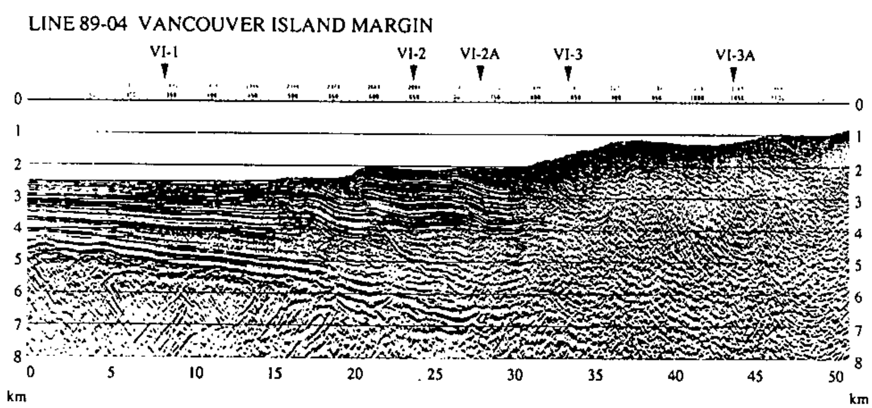



**Figure 3. Depth-converted migrated seismic reflection profile 89-04, showing proposed drill sites VI-1, -2, -2A, -3, and -3A, extending from Cascadia Basin across the deformation front and coherent and incoherent deformation zones.**

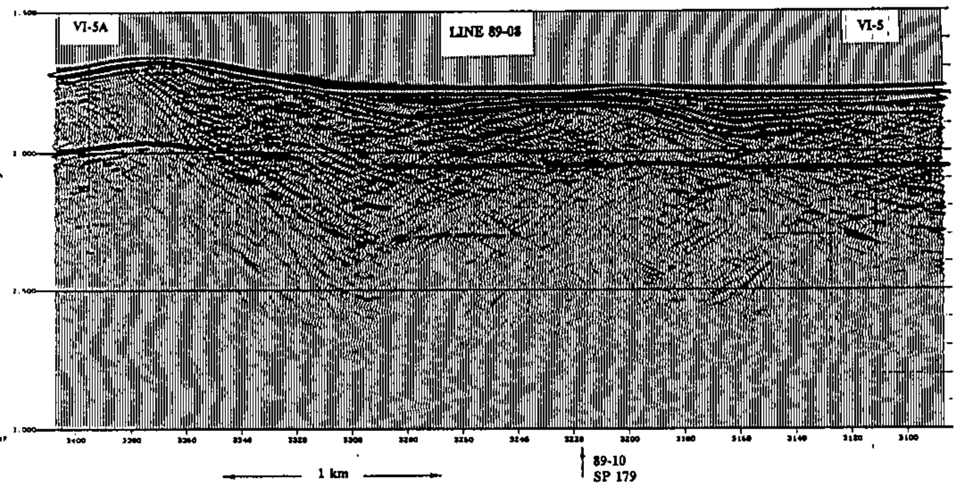



**Figure 4. Multichannel seismic line 89-08, showing position of site VI-5. Note flat BSR.**

substantially higher than the temperature derived from the hydrate stability field. A simple vertical advective fluid-flow model resolves the disparity if the near-surface rate is about $1 \times 10^{-9}$ m/sec. This flow rate is about an order of magnitude greater than that estimated from porosity loss, and so it is crucial to calibrate the temperature and pressure at which the BSR forms.

BSRs commonly occur several hundred meters beneath the seafloor in continental-slope sediments, particularly in subduction-zone accretionary prisms. That these reflectors mark the base of the region for hydrate stability is inferred from a number of observations, notably that pressure and temperature conditions estimated for BSRs agree with the maximum temperature and pressure at which hydrate is stable from laboratory data, and that interstitial and massive hydrates have been recovered in DSDP cores from sections above BSRs.

Numerous studies have focused on the problem of the configuration of hydrate and possible free gas required to generate BSRs. Main results are: 1) reflection polarity is usually reversed, which indicates that, for a simple interface contrast, there is a lower impedance (velocity x density) below the boundary; 2) BSR reflection coefficients are large, commonly 50% of that of the seafloor; 3) multichannel and other seismic velocity data indicate that there is generally very little increase in average velocity in the sediment section from BSR to the seafloor, indicating that the hydrate is concentrated at the base of the stability field, i.e., no more than several tens of meters thick; and 4) the BSR must be at least a quarter wavelength thick (5 to 10 m minimum) and there must be an abrupt contrast at the base of the layer. Lack of a reflection from the upper boundary of the hydrate layer indicates that the upper boundary is a gradual transition.

A model for formation of methane hydrate BSRs has been proposed (Hyndman and Davis, "A mechanism for the formation of methane hydrate and sea floor bottom simulating reflectors by vertical fluid expulsion", *JGR*, in press), which is to be tested on the northern Cascadia accretionary wedge. In the model, hydrate is formed primarily from dissolved methane removed from upward-advecting pore fluids as they pass into the hydrate stability field, rather than being formed from locally derived methane. Methane-saturated pore fluids containing free gas are not believed to be required. The very low percentage of organic carbon in the accreted sediments makes production of free gas *in situ* unlikely. The model provides explanations for why hydrate is concentrated in a layer at the base of the stability field, for the source of the large amount of methane required, and for BSRs being restricted to special environments. In normal sediment depositional regimes, there is no upward fluid advection into the hydrate stability field, so no hydrate BSR is formed. Upward fluid advection does occur through tectonic thickening and consolidation in subduction accretionary wedges and in areas where rapid deposition results in initial under-consolidation, and in these areas hydrate BSRs are commonly observed. Thus, BSRs may be an important indicator of fluid flow. The model predicts that hydrate concentration is greatest near the base of the stability field and decreases upward. It also predicts that methane and perhaps $CO_2$ concentrations are higher below compared to above the BSR, but that the BSR is permeable. A simple velocity/density/depth model, based on the distribution of hydrate from the theoretical model, has been formulated. The synthetic seismogram of this model is in good agreement in amplitude and form with reflection data; no low-velocity layer containing free gas is required below the BSR. A typical BSR reflector can be modeled with about half of sediment pore space filled by hydrate just above the BSR; i.e., sediment pore space is ~25% hydrate and 25% water. Such a layer would be a strong seismic reflector, but permeable to advecting fluids.

Given the specific expectations for hydrate composition, concentration, and distribution derived from this hypothesis, drilling on Leg 146 will evaluate this model against alternative mechanisms of formation. In relation to this and expulsion of methane-rich waters that form diagenetic carbonate and sustain biota around vents, microbiological control of methane cycling will be investigated. This will involve measurement of activity rates of bacterially-mediated methanogenesis methane oxidation, and sulfate reduction.

## Central Oregon Margin

MCS data from Oregon margin (Figure 5) indicate that subduction-related deformation begins on the abyssal plain about 5 km seaward of the frontal thrust, with development of incipient faults. Frontal thrust faults beneath the toe of the continental slope are moderately to shallowly rooted in the south, where they verge seaward (Figure 5a), and are deeply rooted (~4 km sub-bottom) in the northern subarea, where vergence is landward (Figure 5b). Additionally, seismic data show a variety of active backthrusts and out-of-sequence thrusts landward of the deformation front, where seaward vergence dominates. Direct submersible observations and sidescan imagery (SeaMARC-1A and GLORIA) demonstrate that many of these fractures represent active fluid conduits. As a result, this structural context affords the opportunity to tap fluids sourced from various depths in the incoming sedimentary section.

A BSR is commonly resolved ~10 km landward of the frontal thrust (Figure 5a). As off Vancouver island, the BSR is not ob-

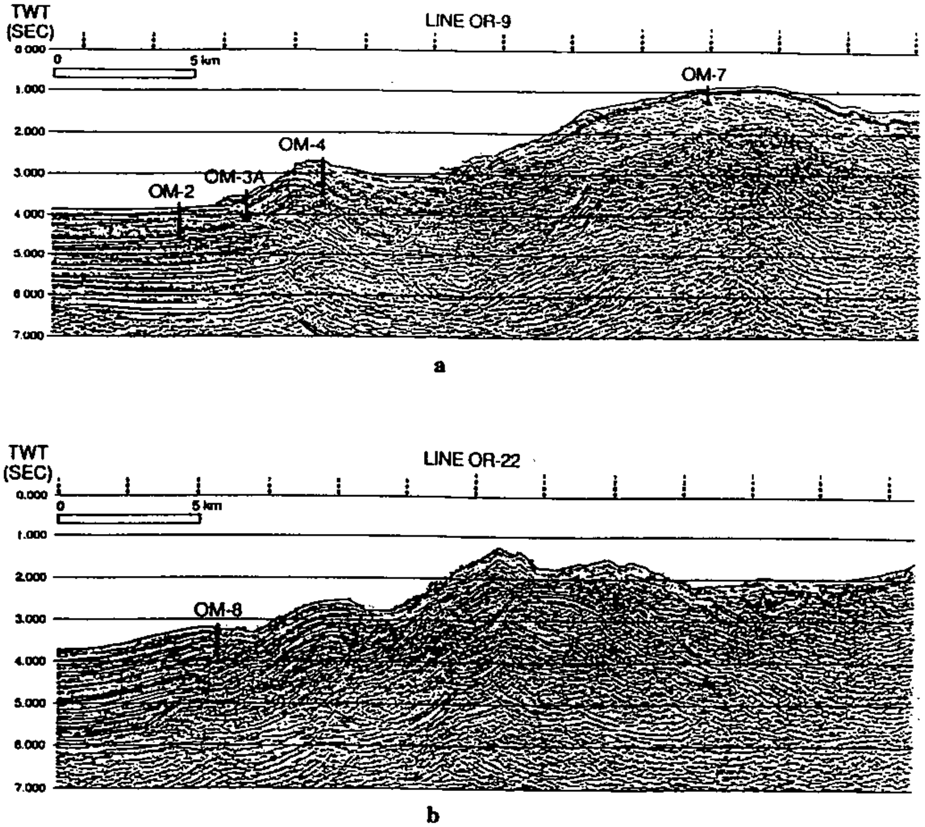



**Figure 5. (a) Multichannel seismic line OR-9 showing proposed drill sites OM-2, -3a, -4, and -7 extending from the proto-deformation zone in Cascadia Basin across the marginal ridge and onto the second ridge of the lower continental slope. (b) Multichannel seismic line OR-22, showing proposed drill site OM-8. Note landward vergence of the accreted section seaward of shot point 1100, and the deeply-rooted frontal thrust.**

served closely adjacent to the frontal thrust, but does occur locally beneath the first anticlinal ridge.

*Alvin* dives on the central Oregon accretionary prism provide information on locations and character of active, focused fluid vents. More than 10 fluid venting sites have been discovered along the initial deformation front (i.e., on the marginal ridge in the southern area and on an incipient fold on the abyssal plain, in the northern area). Many vent sites are characterized by unique animal communities, expulsion of methane or methane and hydrogen sulfide, and diagenetic carbonate deposits. The highly $^{13}C$-depleted carbon of this assemblage of biota, carbonates and methane suggests that expulsion of biogenic gas-bearing fluids and subsequent oxidation of reduced gasses is a major geochemical mechanism in accretionary prisms.

Magnitudes of methane concentrations measured above vents in the two Oregon subareas vary by a factor of at least 300, suggesting equivalent variability in flow rates. Methane in the fluids is highly depleted in $^{13}C$ (-66 to -73‰ PDB), indicating its microbial origin and probable derivation from shallow levels (<1 km) of the accretionary complex. A shallow and probably variable source depth of fluids is also evident from the presence of both hydrogen sulfide and methane in water venting from one location on the marginal ridge, and methane only in another.

Helium concentrations and isotopes from waters collected *in situ* from vents suggest that fluids from the southern subarea have a strong radiogenic component and hence were generated entirely from within the accretionary sediment pile ($\partial^3He$ <22‰). Conversely, preliminary evidence suggests that those fluids venting from a deeply rooted fault-fold intersection in the northern subarea have some primordial component ($\partial^3He$ >22‰) that suggests some contact with oceanic basement.

Rates of fluid flow from local vent sites on the marginal ridge in the southern subarea have been estimated from dissolved methane transfer and directly measured by flowmeters. Results imply a subsurface advective flow rate of ~100 m/yr. These discharge rates are several orders of magnitude higher than rates calculated for steady-state expulsion due to accretion-related consolidation, indicating that flow through vents is regionally focused and probably episodic. Similarly, the enormous variation in methane-expulsion rates (see above) attests to a nonhomogeneous distribution of flow paths. For comparison, heat-flow-based rates of dispersed intergranular flow through the slope sedimentary blanket off Vancouver are estimated to be ~3 cm/yr and are thought to account fully for the dewatering of the accretionary prism.

Flow is almost certainly focused by inhomogeneities in permeability. Mean permeability is ~$10^{-1}$ md, with no obvious control by grain size. Porosity of accreted slope sediments is also low, averaging 46% for surface samples and declining to ~12% at 2.2 km, the depth of the décollement.

That fluid expulsion is not evenly distributed across the lower margin is confirmed by sidescan sonar, which responds to diagenetic carbonate deposits precipitated by oxidation of methane-bearing pore waters. Analysis of GLORIA imagery indicates that carbonates are concentrated along fault traces. The most widespread cementation occurs on the second ridge (OM-7), with less extensive deposits on the marginal ridge and in the proto-deformation zone in Cascadia Basin.

## Logging and Downhole Measurements

Leg 146 will rely heavily on logging and other downhole measurements to meet highest-priority objectives of the scientific program. Important measurements include sub-bottom temperatures, pore pressures, fluid flux, sonic velocity, porosity and resistivity.

To accommodate the extensive program of downhole measurements within the time available for the six proposed drilling sites, it will be necessary to omit deployment of the geochemical logging suite at sites VI-1, VI-2, OM-3 and OM-2A. This will mean absence of records from the aluminum clay tool and gamma-ray spectrometry, but these do not contribute significantly to leg objectives. Without these tools, logging will comprise: sonic (waveform), gamma ray (spectral), resistivity, density, neutron porosity, caliper-temperature, formation microscanner (FMS) and general purpose inclinometer. In addition, FMS will have to be omitted from Site VI-1, which is in undeformed sediments, because of time constraints.

Sonic and density logs, and vertical seismic profiles (VSPs) are crucial to calibration of lateral variation in porosity-depth functions determined from surface seismic reflection data. Due to time constraints, most VSPs will be run as closely-spaced checkshot surveys rather than as true VSPs, with a typical geophone spacing of 20 or 30 m. At Site OM-3, a full-scale VSP and oblique seismic experiment are planned in conjunction with *R/V New Horizon* over a period of 36 hr.

Measurements of temperature will be made extensively with ADARA and WSTP tools (~10 measurements per site).

The pressure core sampler (PCS) will be used to retrieve core samples at *in-situ* pressures, on average, four or five times at each site, with greatest intensity of use at sites VI-5, OM-3 and OM-7 in critical intervals, such as those containing the gas hydrate BSR.

*In situ* measurements of pore-fluid pressure and stress will be made with LAST 1, LAST 2 and the GEOPROPS Probe. GEOPROPS will receive its first full operational test on this leg, and the extent to which it is utilized will clearly be dependent upon its effectiveness. Two days will be devoted to the LAST tools and GEOPROPS.

The Becker-Morin packer/flowmeter combination will be used at sites VI-5 and OM-3, where it will be deployed in cased sections of holes. Rather than injecting seawater, natural flow up the pipe will be relied upon to drive the flowmeter. If flow rates are below detection limits of the flowmeter, the packer will be set in the casing and a slug test performed to determine the integrated permeability of the lower, open section of the hole.

Long-term monitoring of temperature, pressure and fluid chemistry will be undertaken at two sites, VI-5 and OM-3, through deployment of sealed borehole systems (CORKs), incorporating pressure transducers, a fluid sampling tube, and a thermistor string, plus a data logger, which will record P-T data for 2 years. The CORKs will be accessed subsequently by submersible to retrieve fluid samples and data, and to conduct hydrogeologic tests on the boreholes.

## Special Operations

Because fluid sampling, physical properties, and downhole logging and experiments are fundamental to success of the scientific objectives, some nonstandard procedures are required on Leg 146.

Whole-round samples will be needed for shorebased determinations of permeability and deformation behavior and for extraction of interstitial water for geochemical and bacterial studies. As drilling time is extremely limited (Table 1), whole-round sampling will be necessary without the constraint of triple coring.

Hole instability in accretionary prisms has been a problem since the inception of ODP. While optimistic that carbonate cementation, elevated levels of mud in Cascadia sands, and relatively shallow holes will minimize spalling and hole degradation, we need to anticipate hole instabilities induced by formation overpressures, particularly during the extensive logging and downhole experimental programs. JOIDES Downhole Measurements Panel, in 1990, recommended treating holes with heavy mud prior to logging. Sufficient drilling mud to accommodate the proposed logging program should be available on Leg 146.

# Wireline Services Report

## Leg 138: Eastern Equatorial Pacific

Leg 138 drilled eleven sites and collected the first comprehensive set of paleoceanographic records across all of the major eastern Pacific equatorial currents. Data collection was designed to integrate information from both recovered core and well logs. Partly for this reason, nine of the eleven sites drilled were logged (sites 844-852), for a total of 1934 m of open-hole logging. High-quality sonic velocity, density, electrical resistivity, and geochemical logs were collected at seven sites. Each open hole section was also logged with the Formation Microscanner (FMS) electrical resistivity imaging tool and dipmeter. In addition, two sites with thin sedimentary sections (<100 m) were logged with the geochemical tool string alone, primarily through pipe.

Leg 138 served as a test bed for new techniques in 'real-time' stratigraphy—the Shipboard Party concentrated their efforts upon producing detailed stratigraphy and correlations between holes while at sea and refrained from detailed core sampling until after the cruise. Wireline logging was an integral part of the strategy, both to investigate distortion due to the coring process and to provide stratigraphic ties between holes and to regional, high-resolution seismic reflection surveys.

The process of 'real-time' stratigraphy depends strongly upon assembling a composite section by correlating Multi-Sensor Track (MST) physical properties measurements from multiple holes at each site while drilling and coring continue. If the process is done efficiently, the Shipboard Party can use the composite section to steer the drill bit, and re-core sections missed in earlier holes. The composite sedimentary section is then compared to logging data to fill in missing gaps and to correct for distortions due to the coring process. Leg 138 documented that Advanced Piston Coring (APC) typically stretches a sediment section by 10-15%. How stretching occurs is still problematic, because there is insufficient change between *in situ* (logging) density and that measured on cores to account for the stretch.

Logging proved especially useful for identifying missing section in the lower APC and Extended Core Barrel (XCB) sections of each hole (Figure 1). In the uppermost section, drill pipe is normally set to about 50 meters below sea floor (mbsf) and blocks most correlatable signals that can be measured by logging tools. Natural gamma ray activity is one of the few signals potentially useful for core-log integration, but these data are not yet measured on drill cores. Future upgrade of the MST track to include a natural gamma ray sensor will provide this capability. Below the "through-pipe" section, comparison of cores and logs can identify gaps in the cored section and can be used to create complete sedimentary sections. Figure 1 shows a shipboard attempt to correlate cores and logs from the XCB section at Site 850 (1°18'N, 110°31'W, 3786 m water depth). The top panel illustrates the correlation between composite GRAPE wet bulk density (measured on cores) and logging density. While there is some correlation, it is apparent that peaks have been offset. The bottom panel shows the same data, with individual cores shifted to correlate best with the logs. The majority of the interval has been recovered by XCB coring, but there are several coring gaps and overlapping sections. Lack of knowledge about these types of coring flaws strongly hinders high-resolution paleoceanographic studies in older Neogene sections drilled by ODP. Continued development of core-log integration techniques is needed to make these paleoceanographic studies possible.

Logging also contributes to paleoceanography by providing ground-truth to regional seismic studies, identifying the seismic signature of paleoceanographic events. Once identified, these events can be traced regionally by seismic reflection studies. Despite visual similarities between seismic profiles and geologic cross-sections, there is not necessarily a one-to-one correlation between seismic reflectors and sedimentary layers. The ability to interpret the seismic record directly is hampered by two important factors: 1) the seismic record is a function of seismic traveltime and not depth below sea floor; and 2) the seismic profile is an interference composite between fine-scale geologic layering and a limited-resolution seismic pulse. Logging measurements of *in situ* density and velocity are key information for

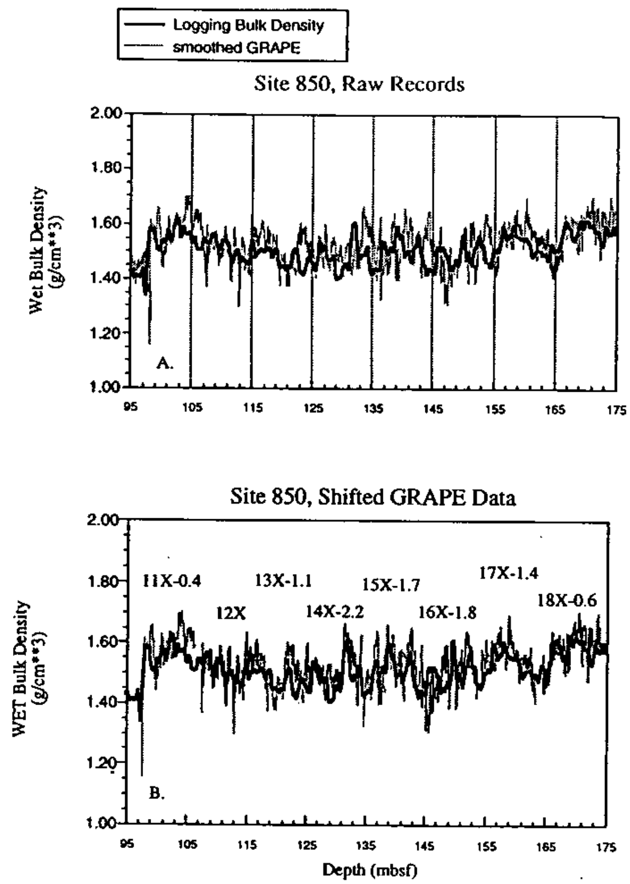



**Figure 1: A) A comparison of wet bulk density measured by logging tools *in situ* to a composite section generated by joining GRAPE (Gamma Ray Attenuation for Porosity Evaluation) wet bulk density measurements on individual cores. While there is a similarity between the two records, it is also apparent that individual peaks are offset.**

**B) A second comparison (same data as in A) of logging wet bulk density measurements to GRAPE measurements on core in which individual cores have been shifted to match the logging data best. The figure is labelled with individual core numbers and the extent and direction of each depth shift. The matched record identifies several coring gaps and overlapping sections in the 80 m section illustrated.**

converting information in a seismic trace to estimates of sedimentary properties.

In the eastern equatorial Pacific, density and velocity variations observed in logs and cores are directly related to variations of sedimentary carbonate content. Thus, there is potential to use the combination of regional seismic studies and logging data from Leg 138 to reconstruct regional profiles of carbonate burial, and investigate a new class of paleoceanographic problem not addressable by individual drillholes.

# Leg 141: Chile Triple Junction

The prime objective of Leg 141 was to study geological effects of fast subduction of young, hot oceanic crust from the Chile Ridge beneath the continental basement of South America. For this purpose, 5 sites were drilled at Chile Triple Junction: three sites along a transect of the lower, middle and upper continental slope north of the point where the ridge is being subducted; one site at the toe of the accretionary prism above the point of ridge subduction; and a fifth site on Taitao Ridge. Sites along the lower and middle continental slope, as well as the toe of the accretionary prism above the point of ridge subduction, were logged with the objective of measuring *in situ* properties of sediments that had been modified by hydrothermal circulation and near-trench volcanism, and to complement core observations in identifying deformation caused by rift subduction. For this purpose, a complete set of logs, including temperature, were obtained at two locations (sites 859 and 863). Because of operational difficulties, only the seismic stratigraphic toolstring and temperature tool were run at Site 860.

Preliminary log analysis during Leg 141 suggests that these data have contributed significantly to the primary objectives of the cruise. For example, the temperature profile from Hole 863B, located at the base of the trench slope at the point where the Chile Ridge is being subducted, shows the geothermal gradient to be nonlinear, providing strong evidence for active fluid migration. However, strong thermal effects expected of ridge subduction were not observed at this location. The temperature log and stations from Hole 863B document complex hydrothermal circulation patterns present above a subducted rift zone. Temperature gradient in the upper 70 m is ~100°C/km, decreasing to <50°C/km below that horizon (Figure 1). Core observations from the top 70 m indicate that the sediments have a high concentration of black sulfide minerals, suggesting infiltration of hydrothermal fluids into this interval. Deeper than 210 meters below sea floor (mbsf), an increase in thermal gradient implies active fluid circulation along bedding planes, which are nearly vertical below this horizon. Temperatures are elevated below this depth by fluids that advectively transport heat up to the base of the overlying lithologic unit.

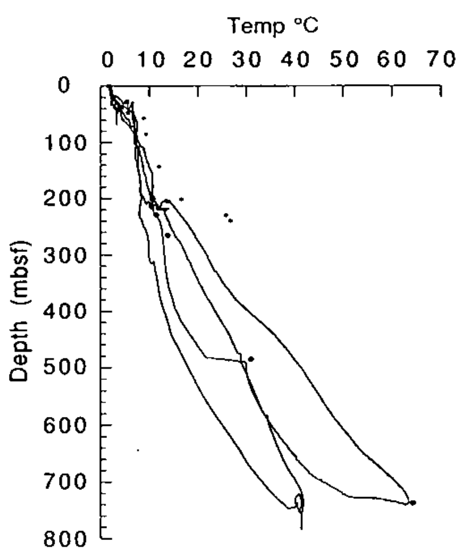



**Figure 1. Wireline temperature profiles from two Lamont-temperature runs, and the WSTP tool (diamonds) and ADARA tool (squares) formation temperatures. Circles are borehole temperatures derived from temperature stations taken while the tool was held stationary for 10 minutes to allow equilibrium temperatures to be predicted.**

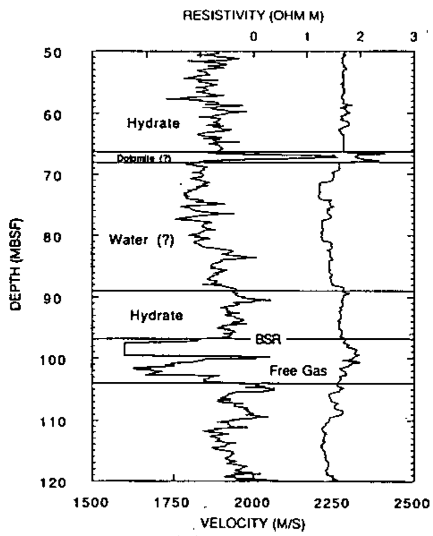



**Figure 2. Resistivity (right) and velocity (left) logs through part of the zone of hydrate stability and the interface interpreted to produce the Bottom Simulating Reflector (BSR) on a regional seismic profile.**

A secondary objective of Leg 141 was study of the physical properties of frozen methane gas hydrates that occur in near-surface sediments in this region. Leg 141 was the first ODP leg to drill intentionally into and through the bottom-simulating reflectors (BSRs) observed on seismic profiles. At the toe of the accretionary prism, a strong seismic reflector (phase-reversed, indicating a drop in seismic velocity or density) indicated that gas hydrate was at ~100 mbsf. The expectation was that a massive hydrate layer would be encountered at that depth. No hydrate was cored in Hole 859B, although methane was present in cores immediately after they were brought to the surface. Sonic and resistivity logs from this hole show higher resistivity and velocity between 88 and 97 mbsf, and 50 and 68 mbsf (Figure 2), indicating a quantity of gas hydrate in pore spaces. The small increase in velocity (~0.1 km/sec) indicates that hydrate is present in very small quantities, estimated to be ~10% from physical properties logs. Such estimates are not possible from core data, because gas hydrate dissipates during core retrieval or is present in such low quantities that it is megascopically imperceptible.

Between 97 and 105 mbsf, the decrease in velocity is probably caused by the presence of free methane gas at the base of the hydrate. This zone is of sufficient thickness and velocity contrast to produce the strong seismic reflection.

# WG Report

## Data Handling Working Group

The Data Handling Working Group (DH-WG) met in Toronto, Canada, on 5-6 March 1992.

### Introduction

Changes are urgently required to the shipboard computer system on *JOIDES Resolution*. The changes are needed because the work of shipboard scientists during legs is being seriously hampered by the difficulty of retrieving data relating to the current leg, and by a lack of sophisticated computing resources to manipulate those data. Integration of the increasing amount of logging results with core data is also essentially impossible within the confines of the present shipboard computing environment. Ship-to-shore data communications are poor, making "real-time" shorebased interaction with ongoing drilling difficult. Changes are also needed to allow storage and organization of the greatly increased amount of numerical data being generated on legs. The presently installed VMS-based S1032 database system is totally inadequate for this task, and unless changes are made there is grave danger of ODP being unable to archive shipboard data rationally for post-cruise and subsequent study. Current methods for disseminating ODP data to the wider shore-based community also need improvement.

DH-WG recognizes the seriousness of the situation, and outlines below a series of recommendations for changes in the ODP computing environment. The changes should be viewed as a package and represent the first major overhaul of the shipboard computing environment since ODP began some eight years ago—an eight-year period of unprecedented growth and change in the computing world.

### Recommendations

1) That a new on-board centralized data-repository be installed on *JOIDES Resolution* to allow the accumulation, organization and accessibility of data collected on each leg in "real-time".
2) The data repository should take the form of a standard (SQL) relational database, which should be large and sophisticated enough to accommodate all of the digital and text data-sets presently acquired during a leg, including the larger MST and logging data-sets, and pointers to larger data-structures (e.g., seismic data, digitized photographs, etc.).
3) The new relational database should be installed on a specially-purchased new computer system which would be dedicated to the task of acting as a database server. Thus, the new system would represent an addition to the present computer structure and initially, the new and old would run in parallel.
4) The new database server should run under the UNIX operating system, given the increasing use of this operating environment in the user community.
5) The new database server should be placed on the existing Ethernet network. Preliminary information suggests that it will co-exist happily with existing hardware and software elements.
6) New commercial database software for the server, along with the appropriate networking protocols, should be purchased, together with matching software for the existing 386-PC and MAC micro-computers and a group of new UNIX work-stations. All three types of devices would at times act as "client" machines to the database server. The new database system must at a minimum accommodate:
   a) Database sizes in excess of 1G
   b) Versioning, including journaling and a transaction log
   c) SQL
   d) A data dictionary
   e) Multi-vendor support for at least MAC, PC-386, SUN, HP, and DEC client systems
   f) Backup and recovery
7) In addition to the commercial database software noted above, it will be necessary to obtain ODP-specific data capture application software to reside on the client machines. It is essential that data capture software enhance the existing shipboard measurement environment and not hinder data acquisition. The following data-collection procedures need to be supported by new software:
   I) Data acquired directly from instruments
      a) MST
      b) Magnetometer
      c) Discrete DSV
      d) Thermal conductivity
      e) ADARA
      f) WSTP
      g) Slimhole temperature tool
      h) Electronic multi-shot
      i) SCM
      j) Totco
      k) XRD
      l) XRF
      m) Natural gamma (may be part of MST)
      n) Shear vane
      o) Resistivity
      p) Color reflectance
   II) Data entered into forms/spreadsheets
      a) Discrete index properties
      b) SAM
      c) Corelog
      d) VCD
      e) Smear slides
      f) Grain size
      g) Carbonate
      h) Pore water chemistry
      i) Organic geochemistry
      j) HARVI
      k) HR thin-section descriptions
      l) Micro-paleo
      m) Reference depth (from core/log integration)

   Additional data-sets will need to be added from time to time and facilities must exist to allow this incremental expansion.
8) DH-WG considers it important that the new data-base software incorporates data verification which should not hinder data-acquisition.

9) New ODP-specific application software will have to be acquired to allow users to retrieve easily information from the new database system. This software should automatically query the database via standard software packages (e.g., Excel).

10) DH-WG recommends that shipboard technical staff support data curation with the same level of effort as is now applied to sample curation, in recognition of the increasing importance of the orderly collection of numerical information during a leg.

11) DH-WG recommends that, following deployment of the new database system described above, one of the two shipboard computer systems managers on any one leg should be responsible for the new major Unix/Database environment described above.

12) An approximate time table for the development of a new database system is shown below. The intention is to have the new database structure fully operational and on-board JOIDES *Resolution* approximately two years from the start of the design phase. It should be noted that work on database design and specification, data-acquisition modules, and data retrieval modules should proceed in parallel.

13) It is envisaged that development of the new shipboard database system will be accompanied by implementation of a very similar shorebased system. In order to accommodate periodic updating of the shorebased system, communications with the drillship should be improved to allow periodic 9600/1.92Kb data links and routine EMAIL (internet). The shorebased database should be accessible over internet by the international community, and house data from both current and previous ODP legs.

14) DH-WG recommends that the existing computing hardware environment be supplemented by additional workstations for specific data handling requirements. These should be UNIX workstations with capability of handling large data sets. Workstations for the following laboratories are required in priority order:
   a) core-log data and image correlation stations (previous SMP/DMP recommendation);
   b) age-depth correlation station (previous SMP recommendation);
   c) downhole measurements laboratory;
   d) underway geophysics laboratory;
   e) physical properties laboratory;

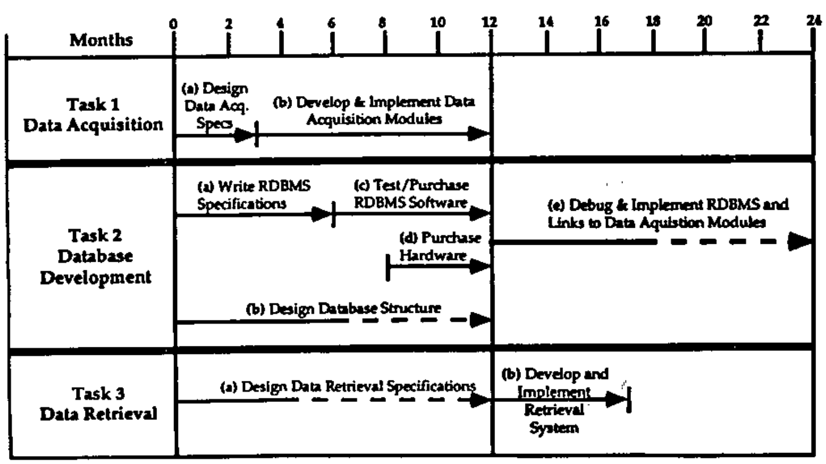
15) DH-WG recommends that implementation of the database system outlined above should be monitored by a Data-Handling Steering Group. This small group might contain members drawn from ODP Service Panels with additional invited expertise.

## Summary

DH-WG envisions a new fully-integrated shipboard ODP data handling system which includes the following elements:
   a) a large UNIX-based online database in a client-server configuration;
   b) a network of client PC-386 and MAC data-acquisition modules feeding data into the online database;
   c) powerful IBM-PC, MAC and UNIX workstations for data retrieval and interpretation;
   d) a parallel shore-based system, accessible over the internet, to house the ODP multi-leg database, and linked to the drillship by improved satellite communications.

## DH-WG Membership

Ian L. Gibson, University of Waterloo, (Chair). Jan Backman, Stockholm University. Bob Bookbinder, Lamont-Doherty Geological Observatory. Wilfred Bryan, Woods Hole Oceanographic Institution. John Coyne, ODP/Texas A&M University. Joseph P. Dauphin, National Science Foundation. Andrew Fisher, ODP/Texas A&M University. Jack Foster, ODP/Texas A&M University. Mike Hobart, Lamont-Doherty Geological Observatory. Peter Jackson, United Kingdom Geological Survey. Ellen Kappel, Joint Oceanographic Institutions, Incorporated. Yves Lancelot, CNRS, Laboratoire de Géologie du Quaternaire. Brian Lewis, University of Washington. Matt Mefferd, ODP/Texas A&M University. Greg Moore, University of Hawaii. Kate Moran, Atlantic Geoscience Centre. Philippe Pezard, Institut Méditerranean de Technologie. Paul Worthington, BP Research Centre.




**Notes:**
- **Task 1a should be prepared by TAMU with SMP and IHP input**
- **Task 1b is urgently needed; to speed up implemenation this task could be completed by a number of groups simultaneously**
- **Task 2a should be prepared by a group of: TAMU computing/database services with database experts from member institutions and countries**
- **Task 2b should be prepared with input from all panels**
- **Task 3a should be prepared by TAMU science services with input from panels, specifically IHP**

# JOIDES Committee Reports

## Planning Committee

PCOM met on 21-23 April 1992 at Oregon State University, Corvallis. The following decisions, with broad relevance to the scientific community, were made.

### FY92 Program Plan

- PCOM views the Santa Barbara Basin site as an exceptional scientific opportunity to obtain an important climate record at a logistically-convenient time. PCOM, therefore, approves the addition of a total of 24 hours to Leg 146 to allow drilling of this site at the end of this leg, contingent upon passing safety review. To maintain the schedule of subsequent Atlantic drilling, which is weather-dependent, Leg 148 [Hole 504B] will be shortened by 24 hours. PCOM nevertheless expresses strong concern about the lateness of the OHP request to drill this site and notes that, in the future, such requests normally will not be considered later than one year pre-cruise.

### FY93 Program Plan

- In view of the results of Leg 142 and to allow for their proper evaluation, PCOM confirms: 1) a postponement of further engineering test legs of DCS on *JOIDES Resolution*, and 2) that Leg 148 will be a return to Hole 504B in order to deepen that hole and carry out attendant logging operations.
- PCOM moves that the primary objective of Leg 149 be a deep hole at Site IAP-1 [see NARM-DPG report for details].
- PCOM endorses the proposal by designated Leg 150 Co-Chiefs that core to be collected as part of a proposed land drilling effort extending the NJ/MAT transect be treated as one with Leg 150 cores *[Note: Consensus]*.

### Four-Year Ship Track

- PCOM sets the direction of the drilling vessel for the next four years as follows:
  1) In the remainder of FY92, confirmed as is in the current Program Plan.
  2) In FY93, and beyond to November 1993, confirmed as is in the Program Plan approved at its December 1991 meeting in Austin, Texas, through Leg 152, East Greenland Margin, ending on or about 28 November 1993.
  3) In the remainder of FY94 through April 1996, in the Atlantic Ocean and adjacent seas* and the eastern Pacific. FY94 program to be finalized in December 1992 at the Annual Meeting of PCOM with Panel Chairs.

  PCOM reaffirms its stand that at its Spring 1993 meeting, and at subsequent meetings, it will evaluate again the state of panel recommendations, technological developments, and the overall state of ODP, and again set the general direction of the drilling vessel for the subsequent four years, with a relatively firm early track and a relatively flexible later direction.

* Defined as Caribbean, Gulf of Mexico, Mediterranean, Norwegian (including near-Arctic Ocean), Labrador, Red Sea.

### Engineering Developments/Prioritization

- PCOM, recognizing the need to develop a high-recovery system for coring difficult formations, requests ODP-TAMU to prepare for the August 1992 PCOM meeting a detailed plan to bring the diamond coring system (DCS) to operational status. This plan should include an analysis of previous work as well as an estimate of future costs. PCOM will use this information to decide the future of DCS development in ODP.
- Based upon advice by ODP-TAMU engineers, PCOM considers the following tools now operational: CORK, PCS I and MDCB. Their use should be encouraged by the Science Operator and the appropriate panels, with care that appropriate financial planning is in place.

  PCOM now prioritizes engineering developments as follows:

  1) System developments:
     a) DCS evaluation and improvements.
     b) Engineering developments for core-log integration, including TOTCO, core orientation and sonic core monitoring.
     c) Deep drilling system/capability.
     d) Improvements in existing coring techniques, i.e., APC, XCB and RCB.
  2) Leg-specific developments:
     a) Vibra-percussive corer in preparation for legs 146 and 150.

### Non-Engineering Developments

- PCOM commends the panels for prioritizing their needs regarding non-engineering items and recommends to JOI, Inc. to take appropriate action contingent upon availability of funds. As some of the items require but modest investment, it is anticipated that corresponding needs can be met in a timely manner.
- PCOM endorses the DMP guidelines for third-party tools, except that the wording on page 4, paragraph (iii) be changed to read:

  "If DMP proposes and PCOM endorses the Mature Tool Proposal, the Science Operator or Logging Contractor will progress the acquisition of the tool for ODP provided funds are available."

  *[Complete, revised guidelines will be published in the October 1992 issue of JOIDES Journal.]*

### Data Handling

- PCOM endorses the DH-WG recommendations, as contained in DH-WG's minutes of 5 - 6 March 1992, and requests of I. Gibson a list of possible candidates for a steering committee that will continue to work with ODP-TAMU on this issue. ODP-TAMU and the steering committee should jointly prepare a report for PCOM outlining the likely costs and implementation schedule to achieve the recommendations of DH-WG. This report should be presented at the August 1992 PCOM meeting.
- PCOM supports the DataNet concept as outlined in the White Paper prepared by ODP-LDGO, Wireline Logging Services Operator, to improve real-time core-log integration and data reduction, interpretation, archiving and dissemination.

# Lithosphere Panel

LITHP met in Davis, California, on 18-20 March 1992.

## Status of Engineering Developments

### Results of Engineering Tests on Leg 142 - East Pacific Rise

LITHP is concerned that this Engineering Leg not be viewed as a total failure of the concept of Diamond Coring System (DCS) drilling. Although this system has been linked most strongly to drilling highly fractured zero-age basalts and Leg 142 tested it in that environment, there are other lithologies of interest that can be successfully drilled only with DCS (e.g., alternating chert/ chalk sequences). Given the limited drilling and coring time that has been achieved with DCS, a fundamental question still remains concerning whether the system can core successfully from a drilling ship through any lithology, or whether the nature of zero-age crust is such that drilling and coring through it is beyond the capabilities of any currently available drilling techniques.

LITHP still strongly supports continuation of development of DCS as the most likely method for drilling a number of formations that are beyond the capabilities of the drilling techniques currently available on JOIDES *Resolution.*

### Plans for the FY93 Engineering Leg - Leg 148

The results from Leg 142 suggest that it is highly unlikely that ODP-TAMU Engineers will be ready to test the DCS again by Leg 148.

LITHP strongly endorses PCOM's recommendation that, if Leg 148 is not an Engineering Leg, a return to Hole 504B be scheduled. Hole 504B represents an extraordinary opportunity to further deepen the only continuous crustal section so far obtained, and LITHP has given it the highest position in its global rankings. In addition, LITHP is not in favor of incorporating APC coring in the Santa Barbara Basin into a return to Hole 504B.

On the basis of logistical considerations, the desire to test DCS in an environment less hostile than zero-age crust, and the need to maximize coring and drilling time, LITHP recommends that, if Leg 148 is an Engineering Leg, DCS be tested at the Vema transverse ridge site. The second choice would be a test at the Galapagos extinct hydrothermal mound.

### Update on the Status of Deep Drilling

LITHP again reiterates the importance of the deep drilling feasibility study for its future planning, and needs to determine whether the goal of a continuous section through the oceanic crust is realistic in terms of time, technology and cost.

## Global Ranking of Proposals

### Global Ranking

LITHP identified 27 programs (with associated proposals) that address high priority objectives, which were reduced to 15 for ranking. Results of ranking are listed below, together with an assessment of each program's drillability in FY94. Caveats and explanatory notes can be found in LITHP's Minutes:

| Rank | No. | Proposal | Members Voting | Score | Ready for FY94 drilling? |
|---|---|---|---|---|---|
| 1 | 410 | Return to 504B | 12 | 14.3 | Yes |
| 2 | 375 | Hess Deep | 13 | 13.0 | Yes |
| 3 | 369 | MARK Area | 12 | 12.9 | Yes |
| 4 | 361 | TA | 12 | 11.2 | (Yes) |
| 5 | 300 | Hole 735B All FZ | 13 | 9.6 | Yes |
| 5 | DPG | Sed. Ridges II | 12 | 9.6 | (Yes) |
| 7 | DPG | EPR II | 11 | 8.0 | No |
| 8 | 376/382 | Vema FZ | 13 | 7.8 | Yes |
| 9 | DPG | NARM Volcanic | 12 | 7.5 | Yes |
| 10 | 319 | Galapagos | 13 | 6.7 | Yes |
| 11 | 407 | 15°20'N FZ | 13 | 5.8 | (Yes) |
| 11 | 414 | Reykjanes Ridge | 13 | 5.8 | No |
| 13 | 325 | Endeavor Ridge | 12 | 4.8 | (Yes) |
| 14 | 368 | Return to 801C | 13 | 4.7 | Yes |
| 15 | 374 | Oceanogrphr. FZ | 13 | 3.5 | No |

### Other thematic interests

LITHP's interests extend beyond the themes that are currently indicated by the rankings. As noted above, some areas of interest are currently poorly represented in terms of numbers of drilling proposals (e.g., hot spots). In particular, three prospective programs or areas of drilling were discussed:

- Lithosphere Characterization - The concept of a program of drilling to examine scales of variation in oceanic crust has been discussed several times previously. Such a program might involve 2 to 3 closely spaced holes; however, spacing needs to be carefully considered and justified for the particular problem to be addressed and experiment to be conducted.
  LITHP endorses DMP's efforts to use the drillship in an experimental mode and is prepared to issue a joint RFP on the subject of lithosphere characterization.
- Large Igneous Provinces (LIPs) - LITHP is interested in seeing proposals for drilling deep holes in LIPs. LITHP is concerned that the panel's membership does not reflect this broader interest and so will attempt to bring in some expertise in the field during the regular rotation of panel members.
- Red Sea Drilling - About a year ago, LITHP requested information on the current status of gaining research clearance for the Red Sea. It now appears that drilling in this area might be a possibility; consequently, LITHP is interested in again seeing proposals addressing thematic objectives that request drilling in the Red Sea.

### Watchdogs

LITHP has set up watchdogs for each of the proposals that continues to be active and are of potential interest. Responsibilities of these watchdogs are:

(i) to keep track of developments affecting status of the proposal;

(ii) to assist proponents by providing information on improvements necessary, what additional work needs to be done, and whether it is worth resubmitting a revised proposal;

(iii) to make sure proponents know SSP requirements.

## Non-Engineering Needs

Prioritization of the list of non-engineering needs, compiled by Panel Chairs during early 1992, was considered.

LITHP reemphasized that the Pressure Core Sampler and Transfer Manifold are extremely important to it's objectives.

LITHP ranked only its four top priorities:

1) sidewall coring tool;
2) computer hardware and software for core-log Integration;
3) *in-situ* fluid sampling and measurement of pore-water pressure and permeability; and
4) CatScan or X-radiography of whole core.

## Other Items

### Panel Membership

LITHP's membership was reviewed for disciplinary balance as well as representation of a number of tectonic environments of interest to the panel.

A number of LITHP members are rotating off the panel: G. Smith, J. Erzinger, S. Cloetingh and J. Franklin have all provided a great deal of help and devoted considerable time to ODP activities; LITHP thanks them all for their dedicated service.

T. Brocher and J. McClain will both rotate off after the fall meeting, which means LITHP will be lacking in seismics expertise.

There is currently no-one with expertise in Large Igneous Provinces (LIPs) on LITHP. This need must be addressed in one of the replacements.

### Liaisons to Other Panels

The current status of liaisons to other Panels is as follows:

SGPP - R. Zierenberg
TECP - M. Cannat(?)
OHP - To Be Appointed
DMP - J. McClain (D. Moos from 9/92)
TEDCOM - D. Moos
OD-WG - S. Bloomer

### LITHP White Paper

In light of recent engineering developments, it is appropriate for LITHP to begin work on updating its White Paper to reflect its short-term and long-term objectives better. Although these have not changed substantially, there is likely to be a shift in emphasis for the next few years. The current White Paper was distributed to LITHP members with the LITHP Minutes in order to include discussion of changes in the fall meeting agenda. It is planned that the White Paper will be updated over the winter of 1992-1993.

In conjunction with this activity, LITHP will issue a RFP for drilling proposals addressing LITHP's high-priority thematic objectives in any ocean, including the Red Sea.

### Next Meeting

The next LITHP meeting is scheduled for 14-16 October 1992. The venue is not yet determined, but M. Cannat will be asked whether she would be willing to host it in France, either in Brest or Paris.

# Ocean History Panel

OHP held its spring 1992 meeting at the Department of Marine Sciences, University of South Florida, St. Petersburg, FL, hosted by Dr. Al Hine. OHP again strongly urged international representatives who will be absent to notify their alternates in sufficient time for them to be able to attend.

### Diamond Coring System

OHP is extremely concerned that continuing problems with development of the Diamond Coring System (DCS) will prohibit progress on several major thematic areas of interest requiring continuous recovery of alternating soft/hard sediment lithologies, and in particular, of chalk/black shale/chert sequences in Paleogene and Cretaceous sediments. OHP has highly ranked proposals of significant thematic interest which require this technology; these will be more highly ranked when this recovery capability is achieved. Therefore, OHP strongly recommends that high priority be given to providing both adequate shorebased resources and adequate ship time for development of DCS to ensure a fully operable system as rapidly as possible, ideally within the next several years as originally indicated in the Long Range Plan.

### Sediment recovery with the APC/XCB

Based on high-priority objectives involving high-resolution studies of sediments, OHP strongly advises that:

(a) *JOIDES Resolution* be equipped with computer capability to allow real-time hole-to-hole and core-to-log correlations, with capabilities at least equal to those demonstrated to be useful on Leg 138.

(b) ODP-TAMU engineers should evaluate the problem of sediment stretching/distortion with APC and provide improvements of the system to minimize this problem. Leg 138 provided complete documentation of these problems, which may be of use in such evaluations.

(c) ODP-TAMU engineers should evaluate issues involved in obtaining complete XCB-sections, and provide needed improvements to minimize these problems.

These capabilities and improvements will be particularly useful in achieving scientific objectives on upcoming legs, including Leg 145 (North Pacific Transect), Leg 150 (New Jersey margin/Mid Atlantic Transect) and Leg 151 (North Atlantic-Arctic Gateways, Leg I).

### Santa Barbara Basin Drilling

While recognizing the scientific importance of further drilling in the oceanic crustal section at Hole 504B (Leg 148) and of drilling at Hess Deep (Leg 147), OHP unanimously recommends that a single site in the Santa Barbara Basin with multiple APC sampling, as discussed in proposal 409 (received 10/4/91 at the JOIDES Office) and in proposal 386 as site CA-10, be scheduled on Leg 147 or Leg 148 as well. This site is ideally suited to ultrahigh-resolution studies of marine records with regard to issues of importance in global change and understanding the global carbon cycle; this sediment record will allow detailed resolution of climatic fluctuations over a substantial portion of the Quaternary in this important upwelling system. The small investment of time required, while not substantially affecting the progress possible at Hess Deep or Hole 504B, will result in multiple scientific yields important in understanding global change.

OHP notes also, as further support for this recommendation, that drilling of a Santa Barbara site was strongly endorsed by OHP at both its Fall 1990 and Fall 1991 meetings.

## Global Priority List of Highly-Ranked Programs

| Rank | Proposal number and abbreviated title | Score | Ready for FY94 drilling? |
|---|---|---|---|
| 1 | 388+388-Add, Ceara Rise | 0.98 | Yes |
| 2 | NAAG II + possible additions | 0.84 | Yes (FY95) |
| 3 | 415+403-Rev, Caribbean K/T | 0.77 | Yes? |
| 4 | 354-Rev, Angola/Namibia/Benguela | 0.74 | Yes |
| 5 | 253-Rev, Ancestral Pacific | 0.71 | No (DCS needed) |
| 6 | 386-Rev, CA Current | 0.68 | Yes? |
| 7 | 404/406, L Neogene N Atlantic | 0.54 | Yes? |
| 8 | 412, Bahamas Transect | 0.50 | No? |
| 9 | Bering Sea (CEPAC)+390 | 0.43 | Yes |
| 10 | 337, EXXON sea level test, N Zealand | 0.40 | No |
| 11 | 347, Cenozoic S-equat. Atlantic | 0.38 | No? |
| 12 | 363-ADD, NR1-3 paleo. record | 0.28 | Yes |
| 13 | 345+345-Add, W. Florida margin | 0.23 | No |
| 14 | 338, NE Aust., Marion Plateau | 0.10 | No |

See OHP Minutes for a more complete statement of drilling readiness for each proposal to justify the yes/maybe/no indications given above.

Two recommendations regarding priorities 2 and 3 were made:

- Given the scheduling of NAAG I as Leg 151 (summer 1993), OHP again recommends that PCOM set up a DPG to meet early in 1993 and again almost immediately after this leg ends to finalize a program for a second leg that can be considered at the fall 1993 OHP and PCOM meetings for drilling in summer 1995. This gives more scientists the opportunity to have input into the planning process and will result in even higher scientific returns than the already highly-regarded plans.
- Given the strong interest in drilling in the Caribbean region in several highly-ranked proposals, OHP recommends that PCOM establish a DPG to synthesize objectives for drilling legs, resulting in definition of common sites of interest and drilling strategy to achieve those objectives. The DPG should have members with expertise in Neogene, Paleogene and Cretaceous paleoceanography, as well as members with expertise in tectonic reconstructions of the circum-Caribbean region and in seismic stratigraphy. The DPG should include scientists from countries bordering the Caribbean in this planning stage for scientific drilling.

## Non-engineering needs

OHP's prioritized list for non-engineering needs is:

1) computing improvements to facilitate core-to-core and core-to-log correlation;
2) core barrel magnetometer;
3) high-resolution magnetic susceptibility logging tool;
4) micropaleontological reference collections, with strong emphasis on collection maintenance and completeness;
5) MST upgrade for natural gamma and possibly spectral gamma core logging;
6) resistivity equipment for discrete core measurements;
7) carbonate autosampler and replacement coulometer;
8) MST color scanning capabilities (items to be acquired in incremental progression as described in OHP Minutes);
9) software for synthetic seismograms;
9) high-resolution geochemical logging tool;
11) sidewall sampling capabilities; and
12) Stratal geometry seismic software packages.

## Leg 151 Planning

OHP endorsed the following motion with regard to North Atlantic-Arctic Gateways, Leg I (Leg 151) drilling:

1. OHP strongly advises that a teamed *Oden* (or similar ice-breaker)-*JOIDES Resolution* operation be scheduled for Leg 151; this operation may only be necessary for part of Leg 151 drilling.

2. This operation should be allowed to penetrate into partially ice-covered areas, as described in the Liljeström report to NADP (Nansen Arctic Drilling Program). OHP foresees that this will imply the capability to reach all Yermak Plateau Sites mentioned in the NAAG-DPG report.

3. OHP advises that Sites YERM 1 and ARC 2A be included as chief objectives of Yermak Plateau drilling.

## Deep drilling

OHP formulated a target description for TEDCOM of an OHP deep drilling objective: Late Jurassic-Cretaceous sediments of the Somali Basin, water depth 5 km, penetration up to 4 km.

## Other Business

OHP reviewed the status of the OHP White Paper, panel membership and panel expertise.

The next OHP meeting is tentatively scheduled for 30 September-2 October 1992 in Marseille, with Edith Vincent as host.

# Sedimentary and Geochemical Processes Panel

SGPP met in Miami, Florida, on 6-8 March 1992.

## Prioritized List of Non-Engineering Equipment Needs

SGPP's discussion of "non-engineering" equipment needs included two basic categories of equipment items: a) previously-identified instruments/tools which still require engineering effort (items 1-3 below); and b) shipboard laboratory needs (items 4-6 below).

I. Items Needing Further Engineering Development and Shipboard Testing.

1) *Pressure Core Sampler:* PCS was run 12 times during Leg 141 (Chile Triple Junction) with moderate success. SGPP is encouraged by these results and requests that a second, if not even a third, system be authorized and constructed to be available for Leg 146 (Cascadia), the next opportunity for deployment and continued testing of this essential tool.

2) *Vibra-Percussive Corer:* SGPP requests that redesigning and testing of this instrument, which was last deployed during Leg 133, be expedited. It is anticipated that during Leg 150 (Middle Atlantic Transect) extensive unconsolidated sands will be encountered and it is essential that every effort be made to recover this material without extensive loss or damage to cores.

II. Items for Downhole Measurements and Sampling

3) In-situ *Pore Fluid Sampling Tool:* SGPP acknowledges the establishment of the JOIDES Steering Group for *In-situ* Pore Fluid Sampling and supports generation of a RFP for a feasibility study of a downhole device, such as the Top Hat, with appropriate packer for multiple *in-situ* sampling of free-flowing water in lithified formations and measurement of pore-water pressure and permeability.

III. Items for Shipboard Laboratory

4) *Whole core X-Radiography:* SGPP recommends purchase of a shipboard whole core X-radiography or CatScan system to be incorporated with the multi-sensor track (MST) for viewing sedimentary and structural features in cores prior to cutting.

5) *X-Ray Laboratory Procedures:* SGPP requests that an outside advisory committee be established to review procedures used in the Shipboard X-ray Laboratory (XRD and XRF) in order to improve acquisition and subsequent usefulness of the data generated onboard *JOIDES Resolution*. It is suggested that new procedures manuals for both the X-ray and Chemistry laboratories may be required.

IV. Computing Improvements

6) *Data Retrieval:* SGPP suggests that software needs to be developed to facilitate retrieval and use of data on CD-ROMs compiled from earlier DSDP volumes.

## Recommendations for Leg 146, Cascadia Margin

Based on results of deployment of the Pressure Core Sampler (PCS) during Leg 141 (Chile Triple Junction) and evaluation of data, SGPP recommends that: 1) two complete, totally independent PCS systems be assembled and sent onboard *JOIDES Resolution* for operation during Leg 146, Cascadia margin. PCS is apparently such a sophisticated instrument that it can best be prepared prior to deployment only by a well-trained expert. SGPP further recommends that: 2) Mr. Tom Pettigrew, ODP TAMU engineer with the greatest PCS expertise, be invited to participate on Leg 146 to insure successful testing and operation of PCS.

## Review and Global Ranking of Proposals

In preparation for the spring global ranking of all "active" ODP proposals, SGPP reviewed 7 new proposals and 6 revisions or addenda to previously reviewed proposals. Afterwards, a list of 44 "active" ODP proposals was compiled based on their having a high thematic interest. All of these proposals were briefly reviewed by the original watchdogs and a decision made as to whether to include each in the voting for global ranking. Under all circumstances, proponents were requested to leave the room during the discussion of their proposals. The list was pared down to 25 proposals, among which 13 considered drillable in FY94 were identified.

Global ranking was done in a two-step process because of the relatively large number of proposals being considered. A straw vote, with 25 points being given to the highest ranked proposal and 1 point to the lowest, was taken to further pare down the list of 25. Proponents were excluded from voting on their proposals. Scores were assigned by normalizing rank to number of votes cast. The top 16 proposals from this straw vote, listed below, were then considered in the final global ranking pool. Voting procedures were as described for the straw vote.

### SGPP Spring Global Ranking 1992

| Ref. No. | Proposal | Ready for FY94 drilling? | Score | Ranking |
|---|---|---|---|---|
| — | Generic Gas Hydrates (inc. 355-Rev2) | No | 14.2 | 1 |
| 414 | N. Barbados Ridge Accretionary Prism | Yes | 12.8 | 2 |
| 405 | Amazon Fan | Yes | 11.5 | 3 |
| 391 | Med. Sapropels | Yes | 10.9 | 4 |
| 059-Rev3 | Madeira Abyssal Plain | Yes | 10.7 | 5 |
| 409 | Santa Barbara Basin | Yes | 8.9 | 6 |
| 330 | Mediterranean Ridge | Yes | 7.7 | 7 |
| 388 | Ceara Rise | Yes | 7.5 | 8 |
| 354-Rev | Benguela Current | Yes | 7.2 | 9 |
| DPG | Sedimented Ridges II | No | 7.1 | 10 |
| 404 | N. Atl. Sediment Drifts | Yes | 6.5 | 11 |
| 361 | TAG Hydrothermalism | No | 6.2 | 12 |
| 412 | Bahamas S.L. Transect | No | 6.1 | 13 |
| DPG | Cascadia II | No | 5.9 | 14 |
| 337 | New Zealand Sea Level | No | 5.8 | 15 |
| 360 | Valu Fa Sulfides | No | 5.2 | 16 |

## Reexamining SGPP'S Deep Drilling Input

SGPP wishes to restate a strong interest in locating a deep hole in the Somali Basin and awaits submission of a new drilling proposal by the 1 August 1992 deadline. SGPP supports generation of a RFP by ODP-TAMU to hire consultants to determine the feasibility of deep drilling.

## Co-Chief Nominations

SGPP regrets that the nomination and appointment of Co-Chiefs have occurred without first securing panel recommendations, particularly to legs of high thematic interest to the respective panels. SGPP believes panel advice is an important component of this decision-making process and should be taken into consideration by PCOM when making their nominations for Co-Chiefs. Thus, SGPP makes the following recommendation:

Along with ranking of proposals in the Fall Prospectus, thematic panels should be requested to forward to PCOM names of individuals to be nominated as potential Co-Chiefs for the few highest-ranked proposals of each thematic panel.

SGPP has no recommendations for Leg 151 (North Atlantic-Arctic Gateways), but SGPP strongly recommends that Co-Chief scientists for Leg 152 (NARM volcanic I—East Greenland Margin) consist of an igneous petrologist/geochemist and a marine geophysicist, as both areas of expertise are essential for the success of that leg.

### Proactive vs. Reactive Role

In order to proceed toward a more proactive advisory role in the planning stages of ODP, SGPP has initiated two new items to be placed on its agenda when deemed appropriate. The first item concerns the invitation of key shipboard geochemists, who have participated in the most recent legs, to attend SGPP meetings and report on technological and geochemical results of downhole fluid sampling. Such reports can inform SGPP directly of scientific progress being made towards achieving goals set out in SGPP's White Paper and assist SGPP in making recommendations to PCOM. Invitations to shipboard scientists need not be limited to geochemists. Second, to promote a more proactive SGPP role in the development of proposals addressing questions of thematic interest, a period of time was devoted during this meeting to discussion of selected scientific topics addressable by drilling. Three topics of long-standing interest to SGPP were put on the agenda, i.e., gas hydrates, sapropels—significance and origin, and bottom currents and contourites. The discussions, led by invited guests or selected panel members or liaisons, were welcomed and proved quite profitable, particularly for increasing the learning curves of new panel members. SGPP plans to continue these discussions at future meetings.

### Next Meeting

The next SGPP meeting will be hosted by J. Mienert and K. Emeis in Kiel, Germany, on 26-28 September 1992.

## Tectonics Panel

TECP met in Las Vegas, Nevada, on 23-25 March 1992.

### Prioritization of Desired Non-Engineering Equipment

Results of TECP's vote on the priority of non-engineering equipment needs were as follows:

1) fluid sampling strategy: pore pressure, permeability, and fluid sampling;
2) new computer system—hardware and software;
3) a) downhole and shipboard equipment to enhance core-log integration;
   b) hard-rock side-corer;
   c) micropaleontology reference slide set(s).

### Offset Drilling

TECP is concerned that apparently members of OD-WG: 1) find TECP's expectations for site-survey information and pre-drilling analysis to be too stringent or impossible to attain, and 2) feel that TECP does not appreciate the importance of small-scale structures that may be recovered by drilling long sections of individual rock units. TECP also notes with concern the shift from offset drilling as originally conceived to an emphasis on drilling "long sections" of various rock units, apparently with little regard for tectonic setting.

### Deep Drilling

TECP reaffirms its support for deep drilling and for the need for efforts to increase efficiency of drilling, enhance core recovery, and increase ultimate likelihood of success at deep sites such as those proposed for the North Atlantic Rifted Margins. ODP already has an ongoing experiment in deep drilling—Hole 504B, now at 2000 m after 7 legs and roughly $40 M. TECP expressed the general opinion that the way to explore the feasibility of deep drilling is to try it. Deep drilling on conjugate rifted margins remains a high priority objective of TECP.

### Watchdog Reports

Watchdog reports and their subjects included: Transform Margins—A. Robertson; Plate history, sea-level change, magnetic questions—T. Atwater; Young Rifted Margins—D. Sawyer; Old Rifted Margins—H.-C. Larsen; Mid-ocean Ridges—J. Karson; Marginal Basins—Y. Ogawa; Convergent Margins—C. Moore; Collisional Margins—P. Symonds; and Stress and Mid-Plate Deformation—M. Zoback. TECP finds these reports are highly useful in updating the panel and focusing its discussions.

### Global Rankings

| Rank | Proposal | Score |
|---|---|---|
| 1 | NARM-DPG Non-volcanic, leg 2 | 7.18 |
| 2 | 346, African Equatorial Margin | 5.31 |
| 3 | NARM-DPG Volcanic, leg 2 | 4.64 |
| 4 | Alboran Sea (Comas/Watts combined) | 4.46 |
| 5 | 265, W. Woodlark Basin | 3.77 |
| 6 | 410, Deepening Hole 504B | 3.31 |
| 7 | 400, Costa Rica Accretionary Prism | 3.00 |
| 8 | Mediterranean Ridges I (shallow) | 2.54 |
| 9 | 414, Barbados Accretionary Prism | 2.23 |
| 10 | 369, MARK | 2.17 |
| 11 | Mediterranean Ridge II (deep) | 2.08 |
| 12 | 333, Cayman Trough | 1.92 |
| 13 | NARM-DPG Non-volcanic, leg 3 | 1.91 |
| 14 | 411/415, Carib. Basalt-K/T boundary combined | 1.77 |
| 15 | 375, Hess Deep, leg 2 (tectonic) | 1.54 |
| 16 | 376, Vema Fracture Zone | 1.46 |
| 17 | Chile Triple Junction, leg 2 | 1.38 |
| 18 | 363, Grand Banks, Newfoundland | 1.31 |
| 19 | 361, TAG | 1.08 |
| 20 | 403 Rev, K/T Boundary, Alvarez | 0.92 |
| 21 | 368, Return to Hole 801C | 0.77 |

### Recording and Archiving of Structural Data on *JOIDES Resolution*

TECP believes that it is important that structural information on cores be collected as an integral part of routine core description, as appropriate. Accordingly TECP recommends that: 1) standardization of shipboard structural Visual Core Description (VCD) form and spreadsheet should be carried out immediately; 2) integration of spreadsheet data with the computer database should not be difficult and should be effected as soon as possible; and 3) development of a Macintosh-based "structural barrel sheet" application, modeled after the "VCD" application currently in development, should be carried out as soon as possible.

### Possible Red Sea Activity

There was general agreement that any Red Sea Working Group or RFP should include TECP representation.

### Membership

TECP currently is short one U.S. member, and two other U.S.members, D. Sawyer, M. Purdy, and H.-C. Larsen are rotating off. TECP is concerned about maintaining proper balance, particularly in view of the loss of its expertise in rifted margins and seismology, and the onset of drilling activity in the Atlantic Ocean and possibly offset drilling.

### Next Meeting

Tentatively -Iceland, H.-C. Larsen will arrange for field trip and host(s). Tentative Date: September 22-27.

# Downhole Measurements Panel

DMP met in Kailua-Kona, Hawaii, on 28-30 January 1992.

- Key thrusts of this meeting were the question of third-party tools and how the guidelines are to be enforced, the public information brochure for ODP downhole measurements, and the issue of log data processing, acquisition and distribution.
- Enforcement of the guidelines for the development of third-party tools requires a redrafting of these guidelines into a format that is suitable for stand-alone distribution within the ODP community. It is envisaged that this format will be that of a public information brochure. The redraft should retain the essence of the existing guidelines but should make, *inter alia*, the following additional points.
  - (i) A distinction should be drawn between tools that are developed specifically for ODP and those that are being developed for other purposes, but that ODP might wish to use.
  - (ii) ODP development tools must be deployed in test mode, i.e., by their very definition they are not ODP mature tools, and the scientific success of a leg should not be contingent upon proper functioning of such a tool.
  - (iii) There should be a cut-off date (perhaps 6 months before a tool is scheduled for deployment) by which time the tool must have satisfied all relevant development criteria, as contained in the guidelines. Otherwise, the tool should be withdrawn.
  - (iv) The public information literature should include a *pro-forma* letter of accedence for completion, signing and submission to ODP by the Principal Investigator before a development tool is accepted for test scheduling.
  - (v) The public information brochure must include the names of key contacts within the permanent ODP structure.
  - (vi) Funding should be adequate to allow the appropriate ODP contractor to carry out necessary day-to-day monitoring of tool development.

  In view of the urgency of this matter, the brochure should be targeted for completion no later than August 1992.
- DMP agreed on a detailed breakdown of the proposed publicity booklet on ODP downhole measurements. This breakdown encompasses a discussion of the rationale for and principles of downhole measurements, illustrations of the application of downhole measurements to eleven recognized branches of earth science, and an overview of the relationship of downhole measurement data to core and geophysical information.
- A Publications Subcommittee has been formed to progress the public information documents on third party tools and ODP downhole measurements. This subcommittee comprises DMP Chair, ODP-LDGO and ODP-TAMU Liaisons to DMP, and the ODP-TAMU Public Information Coordinator. The subcommittee met in College Station on 12 February 1992.
- DMP endorses the long-term scientific vision of the logging contractor in terms of an on-line data archive for logs, onshore processing where not possible on board ship, and greater involvement in ODP logging science by the scientific community at large.
- In view of the growth in demand on ODP-LDGO for log data, it is important that appropriate manpower be dedicated to data dissemination. In the longer term, computer access to a central archive of log data would facilitate acquisition of these data by the community at large. Steps should be taken to explore this possibility with a view to its potential adoption in the future. DMP views the greater dissemination of log data as an important ongoing responsibility of the logging contractor.
- Excellent progress is being made in developing all three top priorities identified by DMP and LITHP for high-temperature downhole tools. They are temperature and resistivity tools, and a borehole fluid sampler.
- The logging contractor is encouraged to pursue acquisition of a high-spatial-resolution magnetic susceptibility tool, especially in view of the strong implications for studies of paleoclimate.
- The steering group for *in-situ* pore-fluid sampling, approved by PCOM in December 1991, could not be activated in time for this DMP meeting. [The meeting was held on 2 April 1992 at ODP-TAMU, College Station.] This would be the only time that the group would meet outside DMP meetings.
- DMP encourages the proposal to drill closely-spaced boreholes in the ocean lithosphere to investigate scaling of heterogeneity. Appropriate technological input should be sought at an early stage of the planning process.
- R. Wilkens is rotating off DMP: replacement nomination(s) are being collated.
- The next DMP meeting is scheduled to take place in Windischeschenbach, Germany, during the period 2-4 June 1992.

# Shipboard Measurements Panel

Meeting in Honolulu, Hawaii, on 20-22 March 1992, SMP was able to visit *JOIDES Resolution* at its port call in Honolulu and thus focus its discussions on individual laboratories. SMP was impressed with the new core laboratory layout. SMP congratulates the technical and science staff for a job very well done. The new configuration provides much better core flow and space for future acquisition of systems, such as the split-core MST. In addition to its review of individual laboratories, SMP discussed the implementation plan for core-log data integration, the ODP DataNet proposal, new technologies (CatScan and infrared spectroscopy), methods for sediment analyses using the XRF, and recommendations of the Data Handling Working Group. SMP also reviewed the equipment priority list, making some changes.

SMP found the ship visit to be very productive. There is no substitute for 'hands-on' and much information was exchanged between the technical staff and SMP members. SMP recommendations are listed below grouped in categories of: laboratory specific recommendations; recommendations related to safety; recommendations on core-log data integration; the recommendation on ODP DataNet Services; and recommendations specific to upcoming legs. Finally, this summary list includes the revised SMP equipment priority list.

## Laboratory Recommendations

SMP recommends that the cryogenic software be completed for use on Leg 145.

SMP restates the need that technical staff must have shorebased training prior to sailing and should remain in a specific laboratory for at least 8 legs.

SMP recommends that sailing petrologists should be told that only tungsten-carbide grinding vessels are available on the ship, but that they are welcome to bring other types of vessels for use during their leg.

SMP recommends that programming software (preferably C) be added to the list of supported software for Macintosh computers.

SMP recommends acquisition of the Minolta color measurement instrument for quantitative measurement of L*a*b and Munsell color on core samples.

SMP recommends that a few samples are sent to Corelabs for infrared mineral analyses to evaluate the IR method.

SMP recommends acquisition of a workstation for digital seismic data acquisition and processing.

## Safety Recommendation

SMP recommends that assessment of AC fields as a potential human health hazard take place as soon as possible or, at the latest, during the next port call for Leg 144.

## Upcoming Legs

SMP recommends adoption of procedures for XRD sediment analyses for legs 143 and 144 as proposed by M. Rhodes, which include using standard procedures for trace elements and using fused samples for major element analyses with matrix corrections. Use of pressed powders should not occur until the methods have been investigated and appropriate software developed.

SMP was dismayed to learn that the pore pressure component of the WSTP had been removed for reasons that are not acceptable (calibration problems). This is the only standard tool which measures pore pressure, and all components of the tool are essential to the success of Leg 146 (Cascadia). SMP recommends immediate action to re-install the pore pressure transducer into the WSTP and calibrate the tool so that it is reliable and ready for Leg 146.

## Core-Log Data Integration

SMP reviewed the TOTCO system, which is supposed to provide real-time drilling parameters. However, none of these parameters are available in real-time. SMP agrees that these data are important for core-log data integration because some of these data are required for use with the SCM (sonic core monitor), which is a key component for data integration.

SMP recommends that development of a real-time drilling parameters data acquisition system should be put back on the list of engineering developments.

SMP recommends acquisition of the Corpac software as the shipboard core-log data correlation tool. Current available versions of Corpac require provision of a manual and some modifications to meet the specific requirements of shipboard data correlation. SMP agrees that these modifications should be performed by the author of the software, with support from ODP. Once this software is acquired, a minimum of one technical staff member must have formal training using this software tool for each leg. Training at an appropriate level must also be provided for the sailing core-log data correlation specialist.

## Data Handling Working Group

SMP endorses recommendations of the DH-WG report. SMP wishes to emphasize to PCOM that this initiative represents a significant, additional level of effort and cannot be completed by the SCience Operator under the current budget level. SMP is concerned that this activity will be looked upon as something that can be completely contracted out. Although SMP agrees that significant parts of this activity can be performed outside of the existing contractor(s) through subcontracts, the computing system is a central activity of ODP and therefore must remain the responsibility of the lead contractor. SMP recommends the following:

The area of shipboard computing as a facility for data handling is a central activity of ODP. As such, recommendations of the JOIDES DH-WG should be implemented under the direction of the Science Operator, advised by a specialist JOIDES steering group for development of the new computing system. The JOIDES Computing Steering Group, in conjunction with the Science Operator, will serve as a technical forum for monitoring and reviewing software developments, especially those arising through external subcontract and other third-party inputs from the ODP community.

## ODP DataNet Services

SMP supports the overall direction of the proposal for DataNet Services. Specifically, SMP agrees that real-time shipboard data processing capacity has in some labs reached its limit (e.g., downhole measurements), thus requiring some level of shorebased support. SMP envisions that there will be an increasing need for shorebased data processing support, particularly for cases where operational decisions are required, and to handle large shipboard-measured datasets (e.g., images or VSP). Although these needs can conceptually be met with a system such as DataNet, SMP emphasizes the requirement that any and all shorebased processing 'nodes' must be set up as a service to shipboard science operations. The concept of an on-line database for readily accessing ODP and other related data is excellent. The database specifically proposed (GeoBase) is not truly a database, but a database browser specific for geographic information. The 'proposal' does not address the real requirement of a functional relational database, which is an essential requirement for both shipboard and shorebased science. SMP encourages submission of a more detailed proposal for review.

### SMP Equipment Priority List

SMP again reviewed shipboard equipment needs. Current equipment requirements, in priority order, are as follows:

- Core-log data integration needs:
  a) natural gamma and MST upgrade;
  b) computer workstation;
  c) resistivity equipment for discrete core measurement.
- Color measurement instrument.
- Bar code system.
- Carbonate autosampler.
- Seismic workstation.
- Auto titration.
- Seismic towing system.

# Site Survey Panel

SSP met at Lamont-Doherty Geological Observatory on 1-3 April 1992. The main charge for the spring 1992 meeting was:

1) Detailed assessment of submitted data for FY93 North Atlantic drilling;
2) Initial assessment of proposals for potential FY94 drilling, taking account of the spring 1992 thematic panel global rankings.

### Site Survey Data Assessments

Discussions at LDGO and assessment of data packages submitted and of ranked proposals resulted in the following consensus items:

*SSP Consensus 1: At* this spring 1992 meeting, SSP will consider initial assessments of the top 25 "drillable" proposals from the thematic panels' global rankings of March 1992.

*SSP Consensus 2:* Drilling into tectonic windows is a new strategy, and the community is still in the process of learning what kinds of survey data are useful or vital. SSP invites continued input from the Offset Drilling Working Group, and from proponents, surveyors and Co-Chiefs involved in early offset drilling legs. SSP anticipates continued problems over requests to drill deep holes (>5OOm) at sites where there are no subbottom data; proponents are urged to explore all possible techniques for obtaining clues to subbottom structure and igneous stratigraphy prior to drilling.

*SSP Consensus 3:* For *Leg 145 N.W. Pacific Neogene,* SSP reiterates its recommendation that Co-Chief Scientists ensure that high quality seismic lines are run over NW-1A, 3A and 4A drill sites by *JOIDES Resolution* prior to drilling.

*SSP Consensus 4:* There was no visit to *Hess Deep* on Leg 140, but the full data package that was compiled pre-cruise by co-chief Henry Dick should be submitted to the Data Bank as part of the package for *Leg 147* and potential future Hess Deep legs.

*SSP Consensus 5:* For *Leg 149 NARM Non-Volcanic Margins I,* most data are in the Data Bank. However, SSP notes two deficiencies in the data submitted (i.e., 3.5 kHz profiles and core data) that are known to exist. Because these data relate to setting of cones for re-entry, proponents are asked to submit 3.5 kHz profiles, or equivalent, and core data as soon as possible. Proponents are also asked to provide details on how they estimated sound velocities at each projected site.

*SSP Consensus 6:* The proponents of *Leg 150 New Jersey Margin Sea Level* are urged to examine the industry sparker/boomer lines for indications of shallow gas pockets before the next PCOM meeting. SSP should consider amending the guidelines to require sparker/boomer data for drilling in extremely shallow water. The proponents are reminded of the need to submit the remaining "required" data types (3.5 kHz and seismic velocities), as well as any available data of the "desirable" types, to the Data Bank before 1 August 1992.

*SSP Consensus 7:* Much of the required data for *Leg 151 NAAG I* drilling, including alternate sites, is now in the Data Bank. The SSP minutes record where proponents are asked to submit minor items of site specific data. SSP make the following specific recommendations:

1) NAAG proponents should reconsider placement of drill sites at or near Yermak Plateau in the light of new Arctic IV data.
2) New *Polarstern* data for YERM-2, YERM-3 and FRAM-1A and 1B sites should be processed to clarify whether BSRs exist.
3) The possibility of BSRs is flagged for PPSP attention and ODP-TAMU is alerted to the potential of strong currents at a number of these sites.

*SSP Consensus 8:* Most survey data have been lodged in the Data Bank for *Leg 152 NARM Volcanic Margins I* drilling on the East Greenland Margin. SSP provided advice on leg lines to be collected on the upcoming Larsen cruise and requests that collection of 3.5 kHz and core data important to operational considerations be pursued by proponents (White cruise, summer 1993?) A compilation of sonobuoy velocity data relating to TD estimates is requested. ODP-TAMU is again alerted to the importance of obtaining water current data.

*SSP Consensus 9:* SSP thanks proponents for the excellent MCS data recently submitted to the Data Bank in support of *Alboran Sea* drilling, and encourages deposition of additional "required" and "desirable" data types as soon as the merger of *proposals 323-Rev* and *399* is completed. SSP is concerned about the possible presence of Messinian evaporites, which could pose a safety problem; SSP considers that the burden of proof remains on proponents to make a case that drilling in the deep Alboran Basin has a reasonable chance of reaching proposed early and middle Miocene objectives without being stalled by Messinian evaporites.

*SSP Consensus 10:* Proponents of *Mediterranean Ridge proposal 330* have revised their drilling strategy into shallow and deep objectives. SSP considers that update by August of data in the Data Bank from previous Mediterranean drilling legs will probably result in a sufficient package for shallow drilling objectives. Yet-to-be-acquired MCS data will be required in support of any new deep objective proposal.

*SSP Consensus 11:* Almost all data are collected and available in support of *Equatorial Atlantic proposal 346-Rev2* and processing will be complete by summer 1992. SSP recommends that PPSP take an opportunity to pre-review this data package with proponent J. Mascle at its London meeting, which could ascertain whether heat-flow data is a requirement.

*SSP Consensus 12:* SSP reiterates its contention that there exists already a substantial database on *TAG* that could be compiled as an initial site survey package in support of *proposal 361-Rev*. Proponents are urged to begin lodging these data with the Data Bank, even though some key data are still to be collected on cruises proposed for 1993.

*SSP Consensus 13:* A sufficient data set for the proposed eight shallow APC/XCB sites on *Ceara Rise* is likely to be available after September 1992, although existing data in *proposal 388* are poor. SSP will be thus unable to comment further in August, but can arrange for a review of the new data by an SSP member, probably in November.

*SSP Consensus 14:* Based on the proposal only, it seems that all necessary site survey data are available to support *Continental Margin Instability proposal 059-Rev*. SSP awaits deposition of this data package at the Data Bank for further review in August.

*SSP Consensus 15:* SSP awaits submission by the August 1 deadline of data in support of specific drill sites for *Mediterranean sapropels proposal 391*. It notes that there is a reasonable chance that sufficient data may already exist in Europe and in the Data Bank from previous Mediterranean drilling.

*SSP Consensus 16:* SSP awaits a compiled package of existing *MARK proposal 369-Rev* data to be deposited in the Data Bank, but notes that other data to image the deeper structure may still be required to meet the objectives posed.

*SSP Consensus 17:* SSP urges that a preliminary package of existing *Vema F.Z. proposal 376-Rev* data should be lodged with the Data Bank, but notes that potentially critical sidescan data will not become available until a cruise in 1993.

*SSP Consensus 18:* Most of the necessary data probably exist or will be collected in 1992 for *NAAG II* additional Arctic gateways drilling and may be ready for assessment in Spring 1993, but not for August assessment. Proponents are urged to begin submitting data identified as existing, but still outstanding, to the Data Bank.

*SSP Consensus 19:* SSP was generally impressed with data submitted to the Data Bank in support of *Newfoundland Basin drilling (NARM-DPG)*. They flagged minor deficiencies (lack of sediment core and water current data) that may be required for operations. SSP recommends that PPSP carry out a pre-review of these sites and NB-1 in particular. The Panel provided proponent Srivastava with advice on the design of tracks for a summer 1992 survey cruise and PPSP's input should also be sought before that cruise.

*SSP Consensus 20:* Most data required in support of proposed *Voring Plateau (NARM-DPG)* drilling appear to exist and may reside in the Data Bank. Proponents are urgently requested to update this data package by August 1. No data have been submitted for *SE Greenland volcanic margin* sites. No problems are anticipated gathering data for EG66-2, but EG66-1 may be problematic (possibly to operations) because of its thick sediment cover and present lack of 3.5 kHz and core data.

*SSP Consensus 21:* There are adequate data with which to frame *Western North Atlantic Drifts proposal 404* and to locate optimal core locations, but the requisite data search has yet to be done. Identification of optimal drill site locations on high-resolution SCS and 3.5 kHz records requires special expertise that may be best supplied by a third proponent; the proponents are encouraged to enlist the contribution of such a person.

*SSP Consensus 22:* SSP is impressed by the apparently extensive dataset that exists in support of shallow drilling on the *Amazon Fan*. SSP recommends that proponents not only complete their processing of existing 40 cu. in. airgun records in support of *proposal 405*, but also investigate whether further SCS data can be collected on the upcoming Mountain Ceara Rise cruise in September 1992. SSP is concerned about sites AF-4 and 5, aiming to penetrate a major debris flow unit, which have only single crossing lines, along with a group of relatively deep sites (AF-7-11) which again have no crossing lines.

*SSP Consensus 23:* The quality of seismic data offered for sites in *North Atlantic Climate Variability proposal 406* is at present insufficient for the drilling proposed, but satisfactory data can probably be compiled from old DSDP surveys or from IOSDL (UK) files. Proponents are urged to carry out this compilation prior to the August 1 deadline.

*SSP Consensus 24:* Geophysical data outlined in the proposal for studies of *Benguela Current* and *Angola/Namibia upwelling system (354-Rev)* are apparently insufficient in terms of SSP's guidelines, although SSP notes that there is potential for more compilation of existing data from South Africa and institutions outside Europe. SSP recommends that proponents plan upcoming site-survey activities to satisfy its guidelines and notes that abundant SCS and 3.5 kHz or Parasound lines will be required to select sites which are unaffected by erosion and mass wasting.

*SSP Consensus 25:* For *North Barbados Ridge Proposal 414*, SSP notes that two proposed sites to penetrate the décollement are at the locations of ODP Leg 110 sites 671 and 672, and thus there are no further survey requirements. One site, NBR-3, is also planned to penetrate the décollement, but further survey data in support of this site are likely to be required for August 1. A 3-D seismic cruise scheduled for June 1992 (Shipley, UTIG) will probably fill any required data gaps.

*SSP Consensus 26:* SSP will contact the two sets of proponents involved in *K/T boundary proposals 403 and 415* directly and urge that they consolidate their proposals into one submission for purposes of compiling the site survey data package. SSP underscores the need to reduce as much as possible the chance that the K/T boundary event is missing at any site.

*SSP Consensus 27:* The status of survey data for *Sedimented Ridges II (SR-DPG)* drilling is unchanged since previous SSP assessment. SSP is still recommending that additional heat flow and near-bottom sidescan data be collected in Escanaba Trough, but most other site-survey requirements have already been met.

*SSP Consensus 28:* SSP eagerly awaits results of the upcoming Dorman deep source/deep receiver refraction experiment, both to evaluate the potential for future *Hess Deep II* scientific drilling and to evaluate the utility of this technique as a site-survey tool for tectonic windows. SSP endorses the MCS, Parasound, magnetics and gravity surveys proposed for *R/V Sonne* in fall of 1992, and encourages deployment of OBSs for seismic refraction measurements during this experiment, if at all possible.

*SSP Consensus 29:* For *California Margin proposal 386-Rev*, most required data appear to exist and SSP notes that three sites are projected reoccupations of old DSDP sites. SSP looks forward to reviewing the full data package compilation at its August meeting, and urges proponents to investigate, in time for the August 1 deadline, availability of crossing SCS lines.

*SSP Consensus 30:* A nearly complete data set appears to exist for *Middle America Trench Proposal 400*, including 3-D MCS and swath mapping data. SSP urges proponents to obtain heatflow data which may be required for safety evaluation and in support of fluid flow objectives.

*SSP Consensus 31:* There are no site-survey requirements for further drilling at *Hole 504B*.

*SSP Consensus 32:* SSP considers that more effort is required in compiling the survey data package for *Santa Barbara Basin one-site proposal 409*, particularly since there may be operational and safety problems. Proponents are urged to submit the data to the Data Bank as soon as possible and note that 3.5 kHz lines may be required for safety review.

### Other Business

SSP refrained from making any revisions of its Survey Guidelines to take account of Tectonic Window and BSR drilling at this time, judging any modifications to its February '92 (*JOIDES Journal*) set to be premature, since more information is required in a number of areas

The next meeting of SSP is planned to take place at LDGO on 4-6 August, immediately after the August 1 deadline for submission of data in support of proposals for FY94 drilling. Proposals which successfully pass these assessments will become candidates for the FY94 Prospectus, contents to be decided upon by PCOM at its mid-August meeting.

# Information Handling Panel

IHP met in College Station, Texas, on 1-3 April 1992.

### Recommendations to PCOM

1) IHP endorses the recommendations embodied in the Data Handling Working Group (DH-WG) report and urges PCOM to take immediate action on this matter. As noted in the report [printed in this issue], computing and database resources presently installed on *JOIDES Resolution* urgently require renewal in order to keep pace with rapid advances in sophisticated data-processing techniques.
2) IHP urges PCOM to continue to support efforts of ODP-TAMU, NGDC, and ODP-LDGO in producing data, indexes and other information on CD-ROMs. Appearance of the new ODP CD-ROM set in March '92 emphasizes that this new medium is a convenient and cost-effective way of ensuring that ODP results are widely available to the user community.
3) Scientific productivity of the Shipboard Party could be increased if electronic communication with *JOIDES Resolution* were improved. IHP urges PCOM to support such an upgrade, which is also a feature of the LDGO DataNet Proposal.

### Suggestions to the Science Operator (ODP-TAMU)

1) Usefulness of the BugWare package for collection of biostratigraphy data should be investigated and, if satisfactory, implemented as the standard paleontology data acquisition package on *JOIDES Resolution*.
2) The users' guide to computers on *JOIDES Resolution* needs to be modified to include information on how software developed by scientists can be made available for use by participants on future legs. An effort to catalog such software should start as soon as possible.
3) IHP recommends that a lead stratigrapher (not necessarily a paleontologist) be identified on each leg. This scientist would be charged with identifying and correcting deficiencies in biostratigraphic coverage for the leg in Proceedings volumes.
4) IHP suggests that a revised 'Handbook for the Shipboard Stratigraphers' be issued, which would include specific suggestions for the shipboard stratigrapher, perhaps with these important pages printed on a different colored paper.
5) The ODP-TAMU database group should prepare a brief synoptic table indicating the status of ODP datasets (which legs have been added, where additional checks are required, etc). This information should be provided to IHP, prior to the panel meeting, every six months.
6) Interstitial water samples should continue to be archived at ODP-TAMU, as recommended by SMP. Scientists should be actively discouraged from taking 'home' all the available water from samples taken during a leg. Some should be retained for future work.
7) ODP-LDGO should continue attempts to publish logging data on CD-ROMs that will be inserted in the back of ODP volumes. Such CD-ROMS might also contain long data tables.
8) IHP asks if details of the RFP dealing with routine indexing of ODP volumes could be examined by the indexing subcommittee before it is issued.
9) IHP asks ODP-TAMU and NGDC to evaluate the electronic index demonstration (Microsoft's Viewer software) to see to what degree the software meets the needs of ODP, and to prepare a report for the next meeting of IHP.
10) ODP-TAMU should pursue production of the cumulative index in electronic form and a RFP for this should be issued this Summer (1992) following the guidelines presented elsewhere (in IHP Minutes).
11) IHP recommends that all data collected on board *JOIDES Resolution* be archived by ODP-TAMU. This includes data generated by 'visiting' experiments as well as permanent instruments. All should be copied to ODP-TAMU at the ends of legs, and the ODP-TAMU database group should archive all of this information.

# Letter to the JOIDES Office

## Discussion on Proposal Presentation & Review Processes in ODP

Michael A. Etheridge

### Introduction

This brief paper had its origins in discussion at the March 1990 meeting of the Tectonics Panel (TECP) of ODP, and was triggered by concern over perceived inadequacies in supposedly mature proposals. In particular, it was considered by some panel members that the rigor and level of effort applied to the more advanced stages of proposal generation, especially drill-site selection and well prognosis, was inadequate when compared to the cost of drilling. In this discussion, concern was primarily directed at the time and resources available to proponents to enable them to prepare adequate proposals, rather than at the scientific efforts of the proponents themselves.

Ensuing general discussion of the proposal generation and review process raised a number of issues which it was felt could usefully be addressed at more length and in the wider ODP forum. The issues were raised not to question the proposal-driven philosophy that has been pursued by DSDP and ODP since its inception, but to recognize that the average drilling leg costs about US$5 million and that the ODP community has a substantial responsibility to ensure that every project, and indeed drill-site, is chosen with all due care and all possible information.

- Should more stringent standards be demanded of proponents in the preparation of proposals, especially at the more mature stages when specific drill-sites are nominated and site surveys carried out? In particular, could the well prognosis standards that are routine throughout the petroleum industry be usefully applied to ODP projects, at least as far as is practicable given the limits on data quality and quantity in the frontier areas targeted by ODP?
- Should the ODP panels be more proactive in the generation and modification of proposals? In particular, should they:
  - identify discipline areas inadequately covered by proposals and require proponents to add the necessary expertise to their teams;
  - require proponents of related proposals to coordinate and if necessary combine their proposals and especially to pool their talents to ensure broad discipline coverage;
  - specify information targets required of highly-ranked proposals at each stage of the review process;
  - provide more funding for proponents in the mature proposal stages to ensure that site selection and justification is done as thoroughly as possible, as befits the expenditure of a single drilling leg?

### Proposal Preparation and Presentation

There are a number of separate issues relevant to proposal preparation and presentation. My personal view is that the overall quality of proposals is not high, particularly considering the cost of a drilling leg, and that ODP should actively pursue higher standards at all stages of the proposal process. Some specific issues and suggestions follow.

- Proposals are commonly too narrowly focussed. They are generally initiated by a small group of scientists with a narrow range of interests to tackle a fairly specific problem. While that approach has merit, there are very few proposed drill locations that are not amenable to a multidisciplinary attack on a range of problems. For example, most of the proposals, and indeed completed projects, to drill on or near mid-ocean ridges and nearby fracture zones are dominated by petrologic/geochemical interests. The best of such proposals are then ranked highly by the Lithosphere Panel (LITHP) and virtually ignored by the other panels. Because of the need to maintain a discipline balance in ODP, and indeed because of their inherent scientific merit, some of the projects are approved and drilled. There is nothing basically wrong with this approach except for lost opportunities to tackle other problems of interest in the vicinity. At its last meeting, TECP recommended that the structural aspects of a number of sites proposed for primarily petrological drilling be addressed in greater detail.

  Suggestion—*That ODP actively encourage proponents and potential proponents to build multidisciplinary teams to develop proposals with a view to tackling the whole range of relevant problems in a region. That panels be asked to recommend additional problems outside the main discipline area(s) of proposals that could be tackled as part of a coherent drill program.*
- Proposals that make it through the first stages of panel review, largely because of the inherent scientific merit of the proposal and its relevance to high priority themes, usually proceed to a site survey stage. At this stage, specific drill sites are chosen generally on the basis of a site survey program carried out by the proponents. The site survey program almost always involves the acquisition, processing and interpretation of specially commissioned multichannel seismic profiles. At this stage, the proposal is considered mature, and individual drill-sites have to be described on a *pro forma* designed by JOIDES. In my limited experience, it is at this stage that even some of the highest ranked proposals fail to make convincing cases for their specific drill sites and are carried forward largely on the basis of the general scientific aims of the project. Very few of the proposals include detailed interpretations of the site survey data, especially in the form of convincing geological cross-sections and thorough well prognoses of the type that are commonplace in the petroleum industry.

  Suggestion—*That the drill site pro forma be extended to include the requirement for a true-scale geological cross-section of the relevant seismic line(s), a thorough well prognosis for each site and more space for explanation of geological objectives. That migrated, and in structurally complex areas preferably depth converted, seismic sections be required, and the cross-sections should be at least grossly structurally balanced. It may be useful to seek advice from the petroleum industry in establishing these standards.*
- The generation of a mature proposal with all of the attendant

pre-drill information requirements, usually involving at least one pre-drill cruise to acquire seismic, dredge and other data, is time-consuming and costly. However, proponents are expected to carry out much of it without adequate support, and certainly in addition to their normal duties. I realize that some of the member countries have funding mechanisms to support the pre-drill activities, but it has been clear in some proposals that the principal barrier to the production of a first class proposal supported by what I would consider to be the appropriate level of data and interpretation has been competing demands for the proponents' time.

Suggestion—*That ODP and/or its member counties commit additional funds earmarked for pre-drill work, principally at the mature stages of proposal development. I realize that detailed planning groups (DPGs) and working groups (WGs) fulfill some of this requirement, but there is also a need to provide salary funds for proponents and/or research assistants to free them for the level of pre-drill investigation demanded by such an expensive program.*

## The Panel Review Process

I have been impressed by the general professionalism and expertise of TECP and I understand that similar standards apply in the other panels. However, I consider that the review process suffers from the same basic problem that plagues the proposal generation process - it is carried out by busy people who have full-time jobs elsewhere. I have had to resign from the Australian ODP scientific committee and from TECP because I cannot find even the small amount of time required. I estimate that even mature proposals nearing final decision stages will have received less than half a day of panel time throughout, although I realize that there is additional work behind the scenes in many cases. This is par for the course for peer review systems in general, although I strongly suspect that a $100,000 NSF proposal receives just as thorough and probably more critical scrutiny than a proposal to spend upwards of $5 million on an ODP leg. I know that this is so in the Australian grants system.

The obvious solutions to this problem, expanding the review process and preferably paying fees to reviewers to ensure a thorough job, are almost certainly impractical. However, I suggest that the panels could make more use of their valuable time and expertise by being somewhat more proactive in the review process. The COSOD documents, panel white papers and the establishment of DPGs/WGs are evidence that the panels and other arms of ODP already take an active part in the definition of the scientific agenda. Nonetheless, the identification of specific drill targets is largely proposal driven and relies heavily on the identification of specific drillable problems by individuals or small groups. The areas in which I suggest the panels could become more proactive are as follows.

- The identification of discipline areas not adequately covered by proposals. This could be backed up by a requirement for proponents to involve the appropriate expertise and broaden the proposal. Such action will generally come from panels which are not the prime panel for a particular proposal, and indeed some of this type of activity already goes on. While proponents may not take kindly to being told to include additional scientists in their proposals, ODP is too big and too important to allow egos to constrain its scientific vision. Broader-based proposals and project teams could be encouraged by giving some degree of priority to those which are of interest to, say, at least three panels.
- Panels could require proponents of proposals with similar scientific objectives in the same global region to combine their resources and talents to produce a coherent and hopefully better resourced and justified proposal. Again, some initiatives of this type are being taken by panels, but there does seem to be some reluctance to 'interfere' in the proposal-driven philosophy of ODP. In my view, ODP is too costly and scientifically important to do other than ensure that it is driven by the best available science.

*Mike Etheridge is with the Bureau of Mineral Resources, GPO Box 378, Canberra ACT 2601, Australia. He was a member of TECP during 1989-1990.*

# Comment by the JOIDES Office

The JOIDES Office acknowledges the excellent summary of the current state of ODP proposal review process and planning of drilling legs received from M.A. Etheridge. Several of Etheridge's suggestions are being encouraged and actively pursued by the JOIDES advisory structure. Particularly, JOIDES panels are now more proactive, by: 1) ensuring appropriate expertise on their panels; 2) requesting proponents for similar drilling objectives, or those favoring different drilling objectives in the same region, to submit combined proposals; and 3) initiating proposals in areas of high thematic interest where they do not exist (both by encouraging prospective proponents and in some cases by initiating proposal generation within the panel itself).

PCOM also strongly encourages interaction among panels (including service panels), through joint meetings and designated panel liaisons, to take advantage of opportunities for multidisciplinary programs. However, experience has shown that few programs are suitable for multidisciplinary objectives, because carefully chosen sites for one major objectives are usually of low interest or even useless for another objective in the same region. In fact, the conscious change from a regionally-oriented ODP to a thematically-driven program, which has taken place over the past 5 years, promotes attacks on specific thematic problems at specifically designed sites.

ODP site survey and data processing standards are established and monitored by the Site Survey Panel (see site survey requirement matrix in the Proposal Submission Guidelines, *JOIDES Journal*, February 1992) and the Pollution Prevention and Safety Panel. Application of petroleum industry "well prognosis standards" to ODP drilling might be impractical because of the generally different drilling environments of ODP (e.g., > 200 m water depth, non-prospective targets, etc). In petroleum industry terms, most ODP sites are "wildcats". However, specification of required information at appropriate stages of planning (e.g., true-scale, structurally balanced geologic cross-sections) can certainly be stressed, especially in view of helping PCOM base its decision on compliance with such requirements. The main problem here, as correctly pointed out by Etheridge, is how to ... and effort necessary from ...

for planning (i.e., after thematic panels have first expressed interest), when absolutely no guarantee can be given that the program will ever be drilled. Proponents like to see a commitment from the JOIDES advisory structure in order to apply for site survey funds successfully, while JOIDES needs site data in order to make such commitments.

From this situation follows the suggestion (by Etheridge as well as others) to provide funding for proponents in the "mature" stages of planning (however, note that "mature" generally means that data necessary for drilling are already available). Such internal site survey funding is at present constrained by the already tight ODP budget (50-75% of available program funds support operations of the drillship itself) and the present unwillingness of partner nations to increase their contributions. It would also require even longer-term (less responsive?) planning of legs (~3-5 years instead of ~1.5-3 years?), which means that any such program would need consistent support over a period exceeding the current period of service of any JOIDES panel member (3-4 years). Thus, a drilling program that includes funding for preliminary site surveys would probably need a budgetary and planning structure different from the present ODP.

In conclusion, we completely agree with Etheridge's point that ODP is too big and too important to bow to the ambitions of individual scientists, and too expensive for inadequate planning and preparation for drilling. Fortunately, ODP's most important asset is a broad, enthusiastic scientific community and a large, international advisory and planning structure that has proven flexible to changes suggested by members like Etheridge.

# Comment by Gene Pollard ODP/Texas A&M University

If I review the overall quality of ODP drill site proposals from my equivalent offshore oil field exploratory drilling background, I can be very sympathetic to the opinions expressed in M.A. Etheridge's letter to the JOIDES office on proposal presentation and review. I often feel that inadequate offset hole correlation work (or extrapolation from holes in similar geological provinces) has been done (even allowing for the great distances between holes and the frontier geological nature of the project). From my limited experience on the Offset Drilling Working Group, PPSP meetings and information that has come to the ship on 7 legs, it seems to me that proponents are lucky to be able to scrape together enough time and information to target a general area and problem; furthermore, proponents seem unable to garner the money and time to do additional site specific multichannel seismic work, submersible dives, sea beam mapping, dredge hauling or the interpretation required.

Oil and gas drilling prognosis are specifically directed at extrapolating offset well information to use mud weight for pressure control and to set casing strings for safety and maximum efficiency. The information in an oil and gas drilling prognosis usually includes data from nearby offset holes such as: composite lithology, electric logs, seismic interpretation, mud program/weights, core lab data and a discussion of hole/drilling problems. The proposed hole would have an extrapolated composite lithology, proposed casing and mud program, seismic data with depths to reflectors, estimated depths of hole/drilling problems and a detail of the logging and sampling program. ODP does not have the incentive of pressure control (if the PPSP does a good job). A true scale geological cross-section with depths noted and extrapolated lithologies would assist the operations department in estimating times, ordering special tools and equipment and anticipating potential drilling problems; however, operations still has to be prepared for each and every contingency anyway.

Perhaps an equally valid question is "would additional extrapolated information on a remote frontier site actually improve site selection (for operational and geological purposes) given the gross reconnaissance nature of much of ODP's drilling?". It is normal on each leg to change sites to avoid or take advantage of unexpected conditions encountered by the bit, and no amount of pre-study can change that. That is why proof by the bit is still crucial at this stage in ocean exploration.

# Proposal News

## JOIDES Proposal Submission Guidelines

**See February 1992 issue of the *JOIDES Journal***

**Deadlines for proposal submission: 1 January and 1 August**

Thematic panels review proposals twice a year, once in March and once around October. The two deadlines of 1 January and 1 August refer to the days when proposals are forwarded to the thematic panels for review at their spring and fall meetings, respectively. Any proposal received after a deadline will be forwarded to the panels for their next meeting.

**Proposals must be submitted to the JOIDES Office.**

Proposals submitted directly to thematic panels are not reviewed.

## Global Ranking 1992

During March 1992, each JOIDES thematic panel, after careful consideration of all active drilling proposals and themes of high panel interest, ranked ~15 programs, rank no. 1 being the highest priority (see table compiling the rankings, page 37). The mandate for global ranking states that all proposals, regardless of whether they are on the near-term ship track or not, must be considered for global ranking. Generic programs, i.e., scientific objectives of high thematic panel interest for which no proposal exists at present, are also included in this ranking.

The annual global ranking mainly served two purposes: 1.) defining the 4-year ship track (i.e., making amendments, if necessary, to FY 1992/93 as specified in the Program Plan, adjusting the track for FY 1994, and projecting the track for FY 1995); and 2.) providing a basis for generation of the FY 1994 Prospectus.

For the new 4-year ship track, see PCOM motions earlier in this issue. Regarding the FY 1994 Prospectus, PCOM has defined a selection of "highly ranked" proposals out of the global ranking list, which consists of the top 5-6 programs of each panel, excluding proposals that are not within the general ship track set by PCOM for FY 1994, and/or those not considered ready for drilling by thematic panels (total number of proposals: 21). Highly-ranked proposals are monitored by PCOM and Site Survey Panel (SSP) "watchdogs", and proponents have been informed. A further sub-selection of these proposals will presumably be included in the FY 1994 Prospectus (Atlantic Ocean and adjacent seas), to be produced in August and reviewed again during the fall 1992 thematic panel meetings. PCOM, at its December 1992 Annual Meeting, will schedule all or most of the ~6 legs for FY 1994 drilling from the FY 1994 Prospectus.

Another purpose of the global ranking procedure is to identify high-priority themes which are not represented by proposals at present. Because global rankings provide long-term signals for planning, programs that are far from being ready for drilling may appear at the top of global ranking lists. Thematic panels are taking an increasingly proactive role in soliciting proposals both within and outside the panels themselves for such high-priority "generic programs".

## Presently Active Proposals

A list of all presently active ODP proposals is printed on pages 38-39. Active proposals are those which have been submitted or updated within the period including three full calendar years before the present calendar year and the present year (i.e., since January 1, 1989 for 1992 activities, to roll to January 1, 1990 for 1993 activities, etc.). Only "active" proposals are considered for planning in general, and for global ranking at the thematic panels' spring meetings in particular. At present, there are 97 active proposals in the system (from a total of 604 received since the beginning of ODP). They include reviewed proposals, some of which have been globally ranked, and proposals "in review" (i.e., submitted or updated since February 1992; to be reviewed at panels' fall meetings).

## Policy on Submission of Site Survey Data

All data submitted by proponents to the ODP Site Survey Data Bank at Lamont-Doherty Geological Observatory are considered proprietary to the ODP, unless they are freely available from other data repositories (e.g., NGDC). Data are made available to panels and individuals in the JOIDES community on a need-to-know basis only. Members of the Site Survey Panel and the Pollution Prevention and Safety Panel are given access to any pertinent site survey data deemed necessary to carry out their mandated tasks. In addition, site survey data are provided to the Science Operator and to members of the Shipboard Scientific Parties. Requests for data in support of pre-cruise planning or post-cruise studies will be honored; all data requests not considered essential to ODP operations will be denied.

After each drilling leg, these restrictions remain in effect unless explicit permission is given by proponents to relax them. All post-cruise data requests not originating from a Shipboard Scientific Party member will be honored only after the original proponent has been consulted. These restrictions do not hold for the vast library of freely available "background" digital geophysical data held at the Site Survey Data Bank, and all JOIDES scientists seeking data for ODP purposes are encouraged to continue the practice of requesting data from the Data Bank in support of their drilling or site survey proposals.

# JOIDES Global Ranking 1992

Compiled from thematic panels' ranking lists

| Rank | LITHP | OHP | SGPP | TECP |
|---|---|---|---|---|
| 1 | 410----<br>Deepening 504B | 388---- (NAP)<br>Ceara Rise | * GENERIC<br>* Gas hydrates | NARM-DPG (NAP)<br>Non-volc. margins II |
| 2 | 387-Rev/Leg147<br>Hess Deep II | NAAG-DPG (NAP)<br>NAAG II | 414----<br>N Barbados Ridge | 346-Rev2 (NAP)<br>E eq. Atl. transform |
| 3 | 369-Rev/Add (NAP)<br>MARK lithosphere | 415----/403-Rev<br>KT-boundary | 405----<br>Amazon fan | NARM-DPG (NAP)<br>Volcanic margins II |
| 4 | 361-Rev (NAP)<br>TAG hydro | 354-Rev<br>Benguela Current | 391---- (NAP)<br>Med. sapropels | 323-Rev/399---- (NAP)<br>Alboran Sea |
| 5 | TIE} GENERIC<br>\| Return to 735B | * 253-Rev<br>* Pac. black shales | 059-Rev3<br>MAP/Sed. instability | * 265----/265-Add<br>* Woodlark Basin |
| 6 | \| SR-DPG<br>TIE} Sed. Ridges II | 386-Rev<br>California Current | 409----<br>Santa Barbara Basin | 410----<br>Deepening 504B |
| 7 | * EPR-DPG<br>* E Pac. Rise II | 404----/406----<br>NW Atl. drifts/climate | 330----/Add (NAP)<br>Med. Ridge | 400----<br>Costa Rica acc. wedge |
| 8 | 376-Rev (NAP)<br>Vema FZ: Layer 2/3 | * 412----<br>* Bahamas transect | 388---- (NAP)<br>Ceara Rise | 330----/Add (NAP)<br>Med. Ridge I (shallow) |
| 9 | NARM-DPG (NAP)<br>Volcanic margins II | Bering (CEPAC/391)<br>Bering Sea history | 354-Rev<br>Benguela Current | 414----<br>N Barbados Ridge |
| 10 | GENERIC<br>Galapagos hydro. | * 337----<br>* New Zealand sea level | * SR-DPG<br>* Sed. Ridges II | 369-Rev (NAP)<br>MARK lithosphere |
| 11 | TIE} 407----<br>\| 15°20'N MAR | * 347----<br>* South-eq. Atl. paleo. | 404----<br>NW Atl. sed. drifts | 330----/Add (NAP)<br>Med. Ridge II (deep) |
| 12 | \| * 413----<br>TIE} * Reykjanes Ridge | 363-Add<br>Grand Banks paleo. | * 361-Rev (NAP)<br>* TAG hydro. | 333----<br>Cayman Trough |
| 13 | 325----<br>Endeavour Ridge | * 345----<br>* W Florida sea level | * 412----<br>* Bahamas sea level | NARM-DPG (NAP)<br>Non-volc. margins III |
| 14 | 368----<br>Hole 801C return | * 338----<br>* Marion Pl. sea level | * Cascadia-DPG<br>* Cascadia margin II | * 411----/415----<br>* Carib./KT-boundary |
| 15 | * 374----<br>* Oceanographer FZ | | * 337----<br>* New Zealand sea level | * 375----/results Leg147<br>* Hess Deep II |
| 16 | | | * 360----<br>* Valu Fa hydro. | 376-Rev<br>Vema FZ: layer 2/3 |
| 17 | | | | * 362-Rev3/Leg 141<br>* CTJ II |
| 18 | | | | 363----<br>GB-Iberia plume volc. |
| 19 | | | | 361-Rev (NAP)<br>TAG hydro. |
| 20 | | | | 403-Rev<br>KT bound., G/Mexico |
| 21 | | | | 368----<br>Hole 801C return |

* Proposals not considered drillable in FY 1994 at the time of the meetings

NAP: North Atlantic Prospectus 1991

# Active ODP proposals, 1 June 1992

JOIDES Office, UTIG

(Sorted by "Ref. No")

| Ref.No | Received | Key Title | Contact | Re-viewed | * Globally Ranked | Drilled or Scheduled |
|---|---|---|---|---|---|---|
| 059-Rev3 | 01/30/92 | MAP/Sed. instability | Weaver, P.P.E. | | 1992, 1991 | |
| 142-Rev | 04/05/89 | Ontong Java Plateau | Mayer, L. | | 1991 | Leg 130 |
| 253-Rev | 06/19/91 | Pac. black shales | Sliter, W.V. | | 1992, 1991, 1990 | |
| 265---- | 12/04/86 | Woodlark Basin | Scott, S.D. | | 1992, 1991 | |
| 265-Add | 06/04/90 | Woodlark Basin | Scott, S.D. | | 1992, 1991 | |
| 271-Rev2 | 09/22/89 | California Current | Barron, J.A. | | 1990 | |
| 319---- | 02/21/89 | Extinct hydroth. | Jonasson, I.R. | • | | |
| 322---- | 03/28/89 | Ontong Java Kimberl. | Nixon, P.H. | • | | |
| 323-Rev | 02/11/91 | Alboran Sea/gateway | Comas, M.C. | | 1992, 1991, 1990 | |
| 324---- | 04/20/89 | Med tectonic evol. | Cita-Sironi, M.B. | • | | |
| 325---- | 05/09/89 | Endeavour Ridge | Johnson, H.P. | | 1992, 1991, 1990 | |
| 326---- | 05/11/89 | NW Africa margin | Hinz, K. | • | | |
| 327---- | 05/24/89 | Argentine cont. rise | Hinz, K. | | 1991 | |
| 329-Rev | 07/14/89 | Formation of Atlantic | Herbin, J.P. | • | | |
| 330---- | 07/17/89 | Med. Ridge | Cita-Sironi, M.B. | | 1992, 1991 | |
| 330-Add2 | 09/10/91 | Med. Ridge | Cita-Sironi, M.B. | | 1992, 1991 | |
| 331---- | 07/25/89 | Aegir Ridge | Whitmarsh, R.B. | • | | |
| 332-Rev3 | 02/04/92 | Florida Escarpment | Paull, C.K. | • | | |
| 333---- | 07/27/89 | Cayman Trough | Mann, P. | | 1992, 1991, 1990 | |
| 333-Add | 02/04/92 | Cayman Trough | Mann, P. | • | 1992, 1991, 1990 | |
| 337---- | 07/31/89 | New Zealand sea level | Carter, R.M. | | 1992, 1991, 1990 | |
| 338---- | 08/03/89 | Marion Pl. sea level | Pigram, C.J. | | 1992 | |
| 340---- | 08/07/89 | N Australian margin | Symonds, P. | | 1991, 1990 | |
| 341---- | 08/08/89 | E Canada Wisc. climate | Syvitski, J.P.M. | • | | |
| 343---- | 08/08/89 | Caribbean crust | Mauffret, A. | | 1991, 1990 | |
| 344---- | 08/08/89 | NW Atl JMQZ | Sheridan, R.E. | • | | |
| 345---- | 08/11/89 | West Florida sea level | Joyce, J.E. | | 1992, 1991, 1990 | |
| 345-Add | 10/05/90 | W Florida sea level | Joyce, J.E. | | 1992, 1991, 1990 | |
| 346-Rev2 | 08/14/91 | E eq. Atl. transform | Mascle, J. | | 1992, 1991, 1990 | |
| 347---- | 08/15/89 | South-eq. Atl. paleo. | Wefer, G. | | 1992, 1991, 1990 | |
| 351---- | 09/06/89 | Bransfield Strait | Storey, B.C. | • | | |
| 352---- | 09/13/89 | Mathematician Ridge | Stakes, D.S. | • | | |
| 353-Rev | 09/13/89 | Antarctic Peninsula | Barker, P.F. | • | | |
| 354-Rev | 01/30/92 | Benguela Current | Wefer, G. | | 1992, 1991 | |
| 355-Rev2 | 08/30/90 | Gas hydrate | Von Huene, R. | | 1991 | |
| 356-Rev | 05/01/91 | NGS Paleo. | Smolka, P.P. | • | | |
| 360---- | 12/06/89 | Valu Fa hydro. | Von Stackelberg, U. | | 1992, 1991, 1990 | |
| 361-Rev | 03/01/91 | TAG hydro. | Thompson, G. | | 1992, 1991, 1990 | |
| 361-Add | 10/25/91 | TAG hydro. | Thompson, G. | | 1992, 1991, 1990 | |
| 362-Rev3 | 11/08/90 | Chile Triple Junction | Cande, S.C. | | 1992, 1991, 1990 | Leg 141 |
| 363---- | 01/18/90 | GB-Iberia plume volc. | Tucholke, B.E. | | 1992, 1991 | |
| 363-Add | 02/18/91 | Grand Banks paleo. | Tucholke, B.E. | | 1992, 1991 | |
| 364---- | 01/22/90 | Sardinian-African Str. | Torelli, L. | • | | |
| 365-Add2 | 03/20/92 | N Atl. geothermal | Louden, K.E. | IR | | |
| 367---- | 02/07/90 | S Australia margin | James, N.P. | | 1991 | |
| 368---- | 02/12/90 | Hole 801C return | Larson, R.L. | | 1992, 1991, 1990 | |
| 369-Rev | 09/09/91 | MARK lithosphere | Casey, J.F. | | 1992, 1991, 1990 | |
| 369-Add | 09/16/91 | MARK lithosphere | Mevel, C. | | 1992, 1991, 1990 | |
| 370---- | 02/22/90 | MAR magmatism | Dick, H.J.B. | • | | |
| 372---- | 02/26/90 | N Atl. paleo. | Zahn, R. | | 1991 | |

IR In review (for fall 1992 meetings)

* No. of globally ranked programs for 1990, 1991 and 1992, resp.:
LITHP 15, 20, 15; OHP 12, 12, 14; SGPP 14, 20, 16; TECP 15, 20, 21.

JOIDES Office, UTIG

## Active ODP proposals, 1 June 1992

(Sorted by "Ref. No")

| Ref.No | Received | Key Title | Contact | Re-viewed | * Globally Ranked | Drilled or Scheduled |
|---|---|---|---|---|---|---|
| 373---- | 03/01/90 | Site 505 Return | Zoback, M.D. | | 1991, 1990 | |
| 374---- | 03/06/90 | Oceanographer FZ | Dick, H.J.B. | | 1992, 1991 | |
| 376-Rev | 09/16/91 | Vema FZ: layer 2/3 | Mevel, C. | | 1992, 1991, 1990 | |
| 378-Rev | 03/12/90 | Barbados acc. prism | Westbrook, G.K. | | 1991, 1990 | |
| 379---- | 03/12/90 | Med. drilling | Mascle, J. | | 1991 | |
| 380-Rev2 | 09/12/91 | VICAP, Gran Canaria | Bednarz, U. | | 1991 | |
| 381---- | 03/19/90 | Argentina shelf/slope | Huber, B.T. | • | | |
| 383---- | 05/22/90 | Aegean Sea | Kastens, K.A. | • | | |
| 384-Rev | 07/18/90 | Caribbean crust | Mauffret, A. | • | | |
| 386-Rev | 08/10/90 | California Current | Lyle, M. | | 1992, 1991 | |
| 386-Rev2 | 02/10/92 | California margin | Lyle, M. | IR | 1992, 1991 | |
| 387-Rev | 09/04/90 | Hess Deep | Gillis, K. | | 1992, 1991, 1990 | Leg 147 |
| 388---- | 10/01/90 | Ceara Rise | Curry, W.B. | | 1992, 1991 | |
| 388-Add | 09/06/91 | Ceara Rise | Curry, W.B. | | 1992, 1991 | |
| 389---- | 10/29/90 | SW Atl. traverse | Malmgren, B.A. | • | | |
| 390---- | 11/12/90 | Shirshov Ridge | Milanovsky, V.E. | | 1992, 1991 | |
| 391---- | 01/02/91 | Med. sapropels | Zahn, R. | | 1992, 1991 | |
| 391-Add | 09/12/91 | Med. sapropels | Zahn, R. | | 1992, 1991 | |
| 392---- | 01/29/91 | Labrador Sea volc. | Larsen, H.C. | | 1991 | |
| 394---- | 02/04/91 | N Atl. volc. margins | Kiørboe, L.V. | | 1991 | |
| 395---- | 02/11/91 | Volc. passive m. comp. | Boldreel, L.O. | | 1991 | |
| 397---- | 02/20/91 | N Atl. multiple rifting | Gudlaugsson, S.T. | • | | |
| 398---- | 02/22/91 | Grand Banks paleo. | Piper, D.J.W. | • | | |
| 399---- | 05/03/91 | Alboran Sea evolution | Watts, A.B. | | 1992 | |
| 400---- | 09/03/91 | Costa Rica acc. wedge | Silver, E.A. | | 1992 | |
| 401---- | 09/05/91 | Jurassic Golf of Mexico | Buffler, R.T. | • | | |
| 402---- | 09/09/91 | MAR basalts | Sobolev, A.V. | • | | |
| 403-Rev | 02/03/92 | KT bound., G/Mexico | Alvarez, W. | | 1992 | |
| 404---- | 09/11/91 | NW Atl. sed. drifts | Keigwin, L.D. | | 1992 | |
| 405---- | 09/12/91 | Amazon fan | Flood, R.D. | | 1992 | |
| 406---- | 09/16/91 | N Atl. climatic var. | Oppo, D. | | 1992 | |
| 407---- | 09/16/91 | 15°20'N shallow mantle | Dick, H.J.B. | | 1992 | |
| 408---- | 09/16/91 | N Nicaragua Rise | Droxler, A.W. | • | | |
| 409---- | 10/04/91 | Santa Barbara Basin | Kennett, J.P. | | 1992 | |
| 410---- | 12/02/91 | Deepening 504B | Erzinger, J. | | 1992 | |
| 411---- | 12/09/91 | Caribbean Basalt Prov. | Donnelly, T.W. | | 1992 | |
| 412---- | 01/28/92 | Bahamas transect | Eberli, G.P. | | 1992 | |
| 413---- | 02/03/92 | Reykjanes Ridge | Murton, B.J. | | 1992 | |
| 414---- | 02/03/92 | N Barbados Ridge | Moore, J.C. | | 1992 | |
| 415---- | 02/03/92 | K/T-boundary, Caribb. | Sigurdsson, H. | | 1992 | |
| 416---- | 03/11/92 | Svalbard margin | Solheim, A. | IR | | |
| Bering | 09/07/90 | Bering Sea history | CEPAC | | 1992, 1991, 1990 | |
| Cascadia | 08/14/90 | Cascadia margin | Cathles, L.M. | | 1992, 1991, 1990 | Leg 146 |
| EPR | 01/09/91 | East Pacific Rise | Davis, E.E. | | 1992, 1991, 1990 | Legs 142/147 |
| NAAG | 04/11/91 | N Atl./Arctic gateways | Ruddiman, W.F. | | 1992, 1991, 1990 | Leg 151 |
| NARM | 09/10/91 | N Atl. rifted margins | Larsen, H.C. | | 1992, 1991, 1990 | Legs 149/152 |
| SR | 10/30/89 | Sedimented Ridges | Detrick, R.S. | | 1992, 1991, 1990 | Leg 139 |

IR In review (for fall 1992 meetings)

* No. of globally ranked programs for 1990, 1991 and 1992, resp.:
LITHP 15, 20, 15; OHP 12, 12, 14; SGPP 14, 20, 16; TECP 15, 20, 21.

# Bulletin Board

## ANNOUNCEMENTS

### JOI/USSAC OCEAN DRILLING GRADUATE FELLOWSHIPS

JOI/US Science Advisory Committee is seeking doctoral candidates of unusual promise and ability who are enrolled in U.S. institutions to conduct research compatible with that of the Ocean Drilling Program. Both two-year and one-year fellowships are available. The award is $20,000 per year to be used for stipend, tuition, benefits, research costs and incidental travel, if any. Applicants are encouraged to propose innovative and imaginative projects. Applications are available from the JOI office and should be submitted according to the following schedule:

Shorebased Work (regardless of leg) 12/1/92

These legs will be staffed in the next few months. Students interested in participating as shipboard scientists must apply to the ODP Manager of Science Operations at Texas A&M University. An application form is available in the JOI/USSAC application packet.

For more information and to receive an application packet, contact:

JOI/USSAC Ocean Drilling Fellowship Program
Joint Oceanographic Institutions, Inc.
1755 Massachusetts Ave., NW, Suite 800
Washington, DC 20036-2102.
For additional information,call:
Robin Smith, 202-232-3900.

### RESULTS OF DRILLING IN WESTERN PACIFIC ACTIVE MARGINS AND MARGINAL BASINS

**A JOI-USSAC Sponsored ODP Results Symposium**

**Asilomar Conference Center, Monterey CA**

**January 18-21, 1993**

The goal of the symposium is to assemble scientists from all nations to develop an inter-leg synthesis of, and to prepare summary papers on, the results of ODP legs 124-128, 131, 132, 134, and 135, and to discuss future drilling objectives in the light of these results. Highlighted themes will include:

Arc-forearc processes
Rifting and basin evolution
Collision-accretion processes

The meeting will be limited to a maximum of 72 participants, of which about one third will be invited US scientists supported by JOI-USSAC, one third will be invited non-US scientists supported by their national organizations, and one third will be other interested persons. For more details contact:

Dr. Brian Taylor
Department of Geology & Geophysics, University of Hawaii, 2525 Correa Road, Honolulu, HI 96822
Fax: (808) 956-2538, Tel: (808) 956-6649
Internet: taylor@kiawe.soest.hawaii.edu
Omnet: B. Taylor

**Registration deadline is 1 September 1992**

## GEOLOGY OF THE OCEANS

### *Proceedings*

Copies of the volume containing the Proceedings of the International Conference *Geology of the Oceans* held in Terrasini (Palermo), May 14-16, 1990, are now available from the ISCO Secretariat.

The volume has been printed by SGI (Società Geologica Italiana) with the support of ESF (European Science Foundation) and contains 19 papers from Italian, European and Russian scientists on various subjects concerning deep sea drilling and ODP.

To obtain a copy of the volume ($25 US per single volume), please contact:

ESCO Secretariat, Department of Earth Sciences, Via Mangiagalli, 34
I-20133 MILANO, ITALY
Tel: +39 (2) 23698240. Fax: +39 (2) 70638261

CONTENTS



## IN SEARCH OF THE LOST OCEAN

### *Geological and cultural images of Nepal*

This video highlights the high mountain trekking and geological discoveries of the 1991 "Lost Ocean Expedition". Geologists from Canada, Germany, Italy, Japan, Norway and U.S.A. followed the Kali Gandaki river northward through the deepest valley on earth into the remote Mustang District of northern Nepal. Their objective was to find types of rocks and fossils that carried evidence for the Tethys Ocean and the break-up, 150 m.y. ago, of the supercontinent of Gondwana. This landmass of India, Australia, Antarctica and Africa, all welded together, faced the giant Tethys Ocean to the north. The continental drift of India and Nepal, and its collision with central Asia led to the disappearance of Tethys and the emergence and uplift of the Himalayan mountain chain.

The discoveries of the expedition provide new pieces in the puzzle of plate tectonics and the origin of the Himalayas. The film also features authentic Nepali music and blends beautiful cultural and geological images of a unique country and its mountain people in a story of "The Lost Ocean".

Video: 28 minutes (Umatic or VHS format)
Producer: Felix Gradstein, Canada
Co-producers: Inger Lise Kristiansen, Norway, and Massimo Sarti, Italy
Technical realization: Ivan Ardizzoni, Antenna Verde Studios, Ferrara, Italy
Distributed by: Ms. Grazia, c/o Imp. Sarti, 115 Corso Porta Reno, 1-44100 Ferrara, Italy (Fax: 39 532 760020)

The producing team of In Search of the Lost Ocean gratefully acknowledges the participation of the expedition members, the people of Nepal, the Sherpa Society (Nepal), geoscientists of the Sahni and Wadia Institutes (India), Gary Grant and Gary Cook (Canada), Morten Johnsen (Norway), Richard Zorewsky (Canada), Jean-Yves Royer (France), Lisa Gahagan (PLATES Project, University of Texas Institute for Geophysics, USA), Laura Tizzano (Italy).

## CENOZOIC GLACIATION: THE MARINE RECORD ESTABLISHED BY OCEAN DRILLING

### *A SUPPLEMENT TO UNDERGRADUATE CURRICULA*

Eugene Domack and Cynthia Domack, Hamilton College

A new course supplement, Cenozoic Glaciation: The Marine Record Established by Ocean Drilling, will be available for use in the fall 1991 semester. The booklet, sponsored by JOI/USSAC, covers the results of five ODP high-latitude legs: two in the northern hemisphere (legs 104 and 105) and three in the southern hemisphere (legs 113, 119 and 120). Cenozoic Glaciation is intended for use as a supplement to regular class materials in courses such as oceanography, glacial geology, marine geology, and sedimentology, and is designed specifically for undergraduates. A coordinated color poster illustrating the core intervals described in the text is included.

Copies of the booklet and poster are available from JOI.

If you would like a sample copy, contact Mary Reagan, Joint Oceanographic Institutions, Inc., 1755 Massachusetts Ave., NW, Suite 800, Washington, DC 20036-2102; (202) 232-3900.

Available from: Karen Riedel, ODP, Public Relations, Texas A&M University, 1000 Discovery Drive, College Station, TX 77840.

### Coring Poster

ODP has a poster: "Scientific Coring Beneath the Sea," available for distribution. The poster features individual coring systems developed for scientific ocean drilling including the rotary core bit, advanced piston coring and extended core barrel. Eric Schulte of Engineering and Drilling Operations designed and produced the poster.

### Brochures

Updated ODP brochures in English, French, Spanish, and German are now available. A brochure featuring engineering developments is also available.

### Reprints

Reprints of the 1990 Offshore Technology Conference paper, *"The Ocean Drilling Program: After five years of field operations,"* is available from Karen Riedel. The paper, written by P.D. Rabinowitz, L.E. Garrison, et al., features the significant results of Legs 100-124. The paper also describes in detail Legs 124E-135. An ODP Operations Summary outlines the data from each cruise including number of sites, number of holes and percent recovery.

### ODP Long Range Plan

The ODP Long Range Plan portfolio is available from the JOI office. If you would like to receive a copy, contact:
Jenny Granger, JOI, Inc.
1755 Massachusetts Ave., NW, Suite 800
Washington, DC 20036-2102
Phone: 202-232-3900, FAX: 202-232-8203

### Report on National Workshop on Gas Hydrates

Workshop held in April 1991, organized by : US Navy, Naval Research Laboratory; USGS; US Dept. of Energy, Morgantown Energy Technology Center.

Report available from: National Technical Information Service, US Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

## ODP Open Discussion via Bitnet

The ODP BITNET LISTSERVER is an open discussion service to which individuals subscribe *via* Bitnet. It permits exchange of information among all subscribers. Currently, the list administrator sends a report of the previous week's shipboard scientific and operations activities to all subscribers. Site summaries are distributed as soon as they are received at ODP from the ship, usually the day after a site is completed. Periodically, an updated cruise schedule and brief descriptions of upcoming cruises are sent out. Any subscriber may send files to the list for distribution. A file sent *via* Bitnet to the list address (ODP-L@TAMVM1) will be distributed automatically to all subscribers.

Anyone with a Bitnet computer link can subscribe. At present there are subscribers in the U.S., Canada, Europe, Australia and Japan. There is no charge for subscribing to the listserver.

To subscribe, send a brief Bitnet command to LISTSERV@TAMVM1 consisting of the words "SUBSCRIBE ODP-L YOUR_NAME" (where YOUR_NAME really is your first and last names). For example, people on VAX/VMS systems using the JNET networking software will send a command that looks like this: $SEND LISTSERV@TAMVM1 "SUBSCRIBE ODP-L YOUR_NAME" but it may be different according to the command language your computer system uses. If you have any questions, your own friendly local system manager should be able to help. As a last resort, you may send a message to Joan Perry (PERRY@TAMODP or perry@odpvax.tamu.edu) requesting that you be added to the ODP-L subscription list.

## Funding for Site Survey Augmentation

JOI/U.S. Science Support Program has Site Survey Augmentation funds available to supplement drilling site data sets that are in all phases of planning. This program element includes support for:

- acquiring and/or processing data for sites being considered by JOIDES;
- mini-workshops that would bring together scientists to coordinate site-specific data for integration into a mature drilling proposal;
- "augmentation" surveys on ships of opportunity that would significantly enrich drilling-related science and/or acquire needed site survey data;
- U.S. scientists to participate in non-U.S. site surveys.

Site Survey Augmentation proposals may be submitted at any time. Priority will be given to augmentation of sites and/or themes that are high priority within JOIDES. As with all JOI/USSSP activities, it is important to clearly state how the work would contribute to U.S. plans or goals related to the Ocean Drilling Program. Note that the Site Survey Augmentation funds cannot be used to supplement NSF/ODP funded work.

Contact Ellen Kappel , JOI office, for further information and proposal guidelines: (202) 232-3900.

## Micropaleontological Reference Centers

Located at eight sites on four continents, the Micropaleontological Reference Centers (MRC) provide scientists around the world an opportunity to examine, describe, and photograph microfossils of various geological ages and provenance. The collections contain specimens from four fossil groups—foraminifers, calcareous nannofossils, radiolarians, and diatoms—selected from sediment samples obtained from the Deep Sea Drilling Project (DSDP). The processing of samples from DSDP legs 1 through 82 has been overseen by John Saunders, Supervisor of the Western Europe Center, and William Riedel, Supervisor of the facility on the US West Coast. These samples have been prepared, divided into eight identical splits, and distributed to each MRC. Future plans include the addition of samples from the later legs of DSDP, and from the Ocean Drilling Program (ODP) as well.

All fossil material maintained by MRCs remains the property of the US National Science Foundation and is held by the MRCs on semipermanent loan.

The establishment of identical paleontological reference collections around the world will help researchers to unify studies on Pelagic biostratigraphy and paleoenvironments, and to stabilize taxonomy of planktonic microfossils. Researchers visiting these centers may observe the quality of preservation and the richness of a large number of Microfossils, enabling them to plan their own requests for either ODP or DSDP deep-sea samples more carefully. Visitors to MRCs also may compare actual, prepared faunas and floras (equivalent to type material) with figures and descriptions published in DSDP *Initial Reports* or ODP *Proceedings* volumes.

### Facilities at MRCs

All MRCs maintain complete, identical collections of microfossil specimens. In addition, the following materials and equipment are available for visitor use:

- secure storage and display areas
- binocular microscope and work space
- reference set of DSDP *Initial Reports* and ODP *Proceedings* volumes
- lithologic smear slides accompanying each fossil sample
- microfiche listings of samples available.

For more information about MRCs, or to schedule a visit, contact the supervisor on site.

### Locations of MRCs

**US East Coast**
Lamont-Doherty Geological Observatory
Palisades, NY 10964
Supervisor: Ms. Rusty Lotti
Phone: (914) 359-2900
Telex: 7105762653 LAMONTGEO

**US National Museum**
US National Museum of Natural History
Dept. of Paleobiology
Smithsonian Institution
Washington, D.C. 20560
Supervisor: Dr. Brian Huber
Phone: (202) 786-2658
Telex: 264729
Fax: (202) 786-2832

**US Gulf Coast**
Texas A&M University
Dept. of Oceanography
College Station, TX 77843
Supervisor: Dr. Stefan Gartner
Phone: (409) 845-8479

**US West Coast**
Scripps Institution of Oceanography
La Jolla, CA 92093
Supervisor: Dr. William Riedel
Phone: (619) 534-4386
Telex: 910337127 IUC WWD SIOSDG

**Western Europe**
Natural History Museum
CH-4001 Basel
Switzerland
Supervisor: Mr. John Saunders
Phone: 061-29-55-64

**USSR**
Institute of the Lithosphere
Staromonet 22
Moscow 109180, USSR
Supervisor: Dr. Ivan Basov
Phone: 231-48-36

**Japan**
National Science Museum
Dept. of Geology
3-23-1 Hyakunin-cho
Shinjuku-ku
Tokyo, 160, Japan
Supervisor: Dr. Y. Tanimura
Phone: 03-364-2311
Telemail: 03-364-2316

**New Zealand**
DSIR Geology & Geophysics
PO Box 30 368
Lower Hutt, New Zealand
Supervisor: Dr. C.P. Strong
Phone: (04) 569-9059
Fax: (04) 569-5016

## JOI/USSAC Workshop Reports and other ODP-Related Reports

Joint Oceanographic Institutions, Inc.
1755 Massachusetts Ave. NW, Suite 800, Washington, D.C. 20036-2102, Tel (202) 232-3900

*Scientific Seamount Drilling*, A.B. Watts and R. Batiza, conveners.

*Vertical Seismic Profiling (VSP) and the Ocean Drilling Program (ODP)*, J. Mutter and A. Bach, conveners.

*Dating Young MORB?*, R. Batiza, R. Duncan and D. Janecky, conveners.

*Downhole Seismometers in the Deep Ocean*, G.M. Purdy and A. Dziewonski, conveners.

*Science Opportunities Created By Wireline Reentry of Deep-Sea Boreholes*, M.G. Langseth and F.N. Spiess, conveners.

*Wellbore Sampling*, R.K. Traeger and B.W. Harding, conveners

*South Atlantic and Adjacent Southern Ocean Drilling*, J.A. Austin, Jr., convener.

*Measurements of Physical Properties and Mechanical State in the Ocean Drilling Program*, D.K. Karig and M.H. Salisbury, conveners.

*Paleomagnetic Objectives for the Ocean Drilling Program*, K.L. Verosub, M. Steiner and N. Opdyke, conveners.

*Cretaceous Black Shales*, M.A. Arthur and P.A. Meyers, conveners.

*Caribbean Geological Evolution*, R.C. Speed, convener.

*Drilling the Oceanic Lower Crust and Mantle*, H.J.B. Dick, convener.

*Role of ODP Drilling in the Investigation of Global Changes in Sea Level*, J.S. Watkins and G.S. Mountain, conveners.

*Ocean Drilling and Tectonic Frames of Reference*, R. Carlson, W. Sager and D. Jurdy, conveners.

*ODP Shipboard Integration of Core and Log Data*, K. Moran and P. Worthington, conveners.

*Drilling of the Gulf of California*, B. Simoneit and J.P. Dauphin, Conveners.

*East Pacific Rise Petrology Data Base (Vols. I-III)*, C. Langmuir, compiler.

*Report of the Second Conference on Scientific Ocean Drilling (COSOD II)*, JOIDES, sponsor.

*Geochemistry Progress and Opportunities*, M. Kastner and G. Brass, Conveners.

*Proceedings of a Workshop on the Physical Properties of Volcanic Seafloor*, G.M. Purdy and G.J. Fryer, Conveners.

*Data Synthesis on Rejuvenescent Mid-Plate Volcanism in the Pacific Basin*, compiled by S.O. Schlanger, R.G. Gordon, E. Okal, and R. Batiza (available in flat ASCII format on Mac or IBM disks, or Sun tapes[150MB 1/4 in. cartridge or 9-track TAR]).

*Large Igneous Provinces*, M. Coffin, convener.

*Cretaceous Resources, Events and Rhythms*, M.A. Arthur, convener.

# ODP BIBLIOGRAPHY AND DATABASES

## ODP Science Operator

Texas A&M University, 1000 Discovery Drive, College Station, Texas 77845-9547

### *Cumulative Index to 96 DSDP Volumes Now Available*

A cumulative index to all 96 volumes of the Initial Reports of the Deep Sea Drilling Project is now available from ODP/TAMU. The index is presented in two formats: an electronic version on CD-ROM, and a printed version. Both are packaged together in a sturdy slipcase.

The index is in three parts: (1) a subject index, (2) a paleontological index, and (3) a site index. The three parts reflect the interwoven nature of the marine geoscience subdisciplines.

The electronic version of the index is the more complete of the two, containing up to eight hierarchies of entries. The 1072-page printed index volume contains three hierarchies of entries and was condensed from the electronic version. Both versions of the index were prepared by Wm. J. Richardson Associates, Inc.

The CD-ROM containing the electronic index was manufactured under the auspices of the Marine Geology and Geophysics Division of the National Geophysical Data Center, National Oceanic and Atmospheric Administration, and U.S. Department of Commerce. In addition to the three-part index, the CD-ROM contains (1) a bibliography of authors and titles, (2) citations to DSDP exclusive of the Initial Reports, (3) proposals to DSDP, (4) site-summary information, (5) an inventory of DSDP underway geophysical data, (6) an inventory of downhole-logging data, and (7) data-documentation files.

Many persons contributed to the indexing project, including those at Scripps Institution of Oceanography and Texas A&M University. The U.S. National Science Foundation funded preparation and publication.

Index sets (US$50), Proceedings (US$45 each, plus postage), Prospectuses and Preliminary Reports (free) can be obtained from:

Publications Distribution Center
Ocean Drilling Program
1000 Discovery Drive
College Station, Texas 77845-9547
U.S.A.
Phone, (409) 845-2016; Fax, (409) 845-4857;
Bitnet: FABIOLA@TAMODP

### *Proceedings of the Ocean Drilling Program, Initial Reports and Scientific Results*

| | Initial Reports Vol. | Initial Reports Published | Scientific Results Vol. | Scientific Results Publ. |
|---|---|---|---|---|
| Leg 101 | 101/102 | Dec 86 | 101/102 | Dec 88 |
| Leg 102 | 101/102 | Dec 86 | 101/102 | Dec 88 |
| Leg 103 | 103 | Apr 87 | 103 | Dec 88 |
| Leg 104 | 104 | July 87 | 104 | Oct 89 |
| Leg 105 | 105 | Aug 87 | 105 | Oct 89 |
| Leg 106 | 106/109/111 | Feb 88 | 106/109 | Jan 90 |
| Leg 107 | 107 | Oct 87 | 107 | Feb 90 |
| Leg 108 | 108 | Jan 88 | 108 | Dec 89 |
| Leg 109 | 106/109/111 | Feb 88 | 106/109 | Jan 90 |
| Leg 110 | 110 | Apr 88 | 110 | May 90 |
| Leg 111 | 106/109/111 | Feb 88 | 111 | Dec 89 |
| Leg 112 | 112 | Aug 88 | 112 | May 90 |
| Leg 113 | 113 | Sept 88 | 113 | Aug 90 |
| Leg 114 | 114 | Nov 88 | 114 | Feb 91 |
| Leg 115 | 115 | Nov 88 | 115 | Sept 90 |
| Leg 116 | 116 | Jan 89 | 116 | Sept 90 |
| Leg 117 | 117 | June 89 | 117 | Feb 91 |
| Leg118 | 118 | May 89 | 118 | July 91 |
| Leg 119 | 119 | Sept 89 | 119 | Sept 91 |
| Leg 120 | 120 | Nov 89 | 120 | May 92 |
| Leg 121 | 121 | Nov 89 | 121 | Nov 91 |
| Leg 122 | 122 | Jan 90 | 122 | Dec 91 |
| Leg 123 | 123 | June 90 | 123 | May 92 |
| Leg 124 | 124 | June 90 | 124 | Sept 91 |
| Leg 125 | 125 | Aug 90 | | |
| Leg 126 | 126 | Aug 90 | | |
| Leg 127 | 127 | Sept 90 | | |
| Leg 128 | 128 | Sept 90 | | |
| Leg 129 | 129 | Dec 90 | | |
| Leg 130 | 130 | Mar 91 | | |
| Leg 131 | 131/132 | June 91 | | |
| Leg 132 | 131/132 | June 91 | | |
| Leg 133 | 133 | Sept 91 | | |
| Leg 134 | 134 | Mar 92 | | |
| Leg 135 | 135 | May92 | | |
| Legs136/137 | 136/137 | Jan 92 | | |

### *Scientific Prospectuses and Preliminary Reports*

| | Prospectuses Vol. | Prospectuses Published | Prelimin. Rpts. Vol. | Prelimin. Rpts. Published |
|---|---|---|---|---|
| Leg 138 | 38 | Jan 91 | 38 | Sept 91 |
| Leg 139 | 39 | Mar 91 | 39 | Nov 91 |
| Leg 140 | 40 | June 91 | 40 | Jan 92 |
| Leg 141 | 41 | Aug 91 | 41 | Mar 92 |
| Legs143/144 | 43/44 | Jan 92 | | |
| Leg 145 | 45 | Apr 92 | | |

### *Engineering Prospectuses and Preliminary Reports*

| | Prospectus Vol. | Prospectus Published | Prelimin. Rpts. Vol. | Prelimin. Rpts. Published |
|---|---|---|---|---|
| Leg 142 | 3 | Nov 91 | | |

### *Technical Notes*

No. 1: Preliminary time estimates for coring operations (Revised Dec 86)
No. 3: Shipboard Scientist's Handbook (Revised 1990)
No. 6: Organic Geochemistry aboard *JOIDES Resolution*- An Assay (Sept 86)
No. 7: Shipboard Organic Geochemistry on *JOIDES Resolution* (Sept 86)
No. 8: Handbook for Shipboard Sedimentologists (Aug 88)
No. 9: Deep Sea Drilling Project data file documents (Jan 88)
No. 10: A Guide to ODP Tools for Downhole Measurement (June 88)
No. 11: Introduction to the Ocean Drilling Program (Dec 88)
No. 12: Handbook for Shipboard Paleontologists (June 89)
No. 14: A Guide to Formation Testing using ODP Drillstring Packers (1990)
No. 15: Chemical Methods for Interstitial Water Analysis on *JOIDES Resolution*
No. 16: Hydrogen Sulfide-High Temperature Drilling Contingency Plan (1991)

Publications Office, Fabiola Byrne
Phone: (409) 845-2016; Fax: (409) 845-4857
Bitnet: FABIOLA@TAMODP

### *Other Items Available*

Brochure: The Data Base Collection of the ODP - Database Information

Ocean Drilling Program brochure (English, French, Spanish, German or Japanese)

ODP Sample Distribution Policy

Micropaleontology Reference Center brochure

Instructions for Contributors to ODP *Proceedings* (Revised Oct 90)

ODP Engineering and Drilling Operations (New)

Multilingual brochure with a synopsis of ODP (English, French, Spanish, German and Japanese)

ODP Posters (Ship and coring systems posters)

ODP After Five Years of Field Operations (Reprinted from the 1990 Offshore Technology Conference proceedings)

Brochure: On Board *JOIDES Resolution*

Public Information Office, Karen Riedel
Phone: (409) 845-9322; Fax: (409) 845-0876
Bitnet: KAREN@TAMODP

### *Sample Distribution*

The materials from Legs 135 through 139 are now available for sampling by the general scientific community. This means that the twelve-month moratorium on cruise-related sample distribution is complete for Ocean Drilling Program legs 101-139. Scientists who request samples from these cruises are no longer required to contribute to *ODP Proceedings* volumes, but must publish in the open literature.

All sample requests received at ODP are entered into the Sample Investigations Database. Anyone may request a search. Some common types of searches include: on-going research from particular holes or legs, current research in a specified field of interest, or publications resulting from DSDP or ODP samples. For details contact:

Assistant Curator, Chris Mato
Phone: (409) 845-4819, Fax: (409) 845-4857
Bitnet: CHRIS@TAMODP

The Assistant Curator takes an average of two weeks to review each request.

| Repository | No. Weeks Processing | Total No. Samples |
|---|---|---|
| East Coast | 10 | 7,492 |
| Gulf Coast | 6 | 6,466 |
| West Coast | 5 | 3,162 |

### *ODP Data Available*

ODP data currently available include all DSDP data files (Legs 1-96), geological and geophysical data from ODP Legs 101-137, and all DSDP/ODP core photos (Legs 1-137). More data are available as paper and microfilm copies of original data collected aboard the *JOIDES Resolution*. Underway geo-physical 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 Macintosh- or PC-formatted disks, magnetic tape, hard-copy printouts, or through BITNET or internet.

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 No. 9, "Deep Sea Drilling Project Data File Documents," which includes all DSDP data file documents.

Data Librarian
Phone: (409) 845-8495, Fax: (409) 845-0876
BITNET: DATABASE@TAMODP
Internet: database@nelson.tamu.edu

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 the National Geophysical Data Center (NGDC)

Computerized data from the DSDP are now available through NGDC in compact-disc read-only-memory (CD-ROM) format. The DSDP CD-ROM data set consists of two CD-ROMs and custom, menu-driven, access software developed by NGDC with support from JOI/USSSP. 500 complimentary copies of the DSDP CD-ROMs are being offered to U.S. researchers in academia and government, courtesy of JOI/USSSP. An additional 200 copies of the set are available on a cost recovery basis.

Volume I of the 2-disc set contains all computerized sediment/hardrock files, the Cumulative Index (Paleontology, Subject, and Site), bibliographic information, age and fossil codes dictionaries, an index of DSDP microfilm, sediment chemistry reference tables, and copies of DSDP documentation for each data and reference file.

Volume II contains all digital downhole logging data from the DSDP, including some data digitized for the CD-ROM set by the Woods Hole Oceanographic Institution under contract to JOI/USSSP. All of the data are in the Schlumberger Log Information Standard (LIS) format, some ASCII and Gearhart-Owen data have been translated to LIS by WHOI for the CD-ROM. All DSDP underway and geophysical data are on disc 2, including bathymetry, magnetics, and navigation in the MGD77 format (no data for Legs 1-3; navigation only for Legs 4, 5, 10, 11; SEG-Y single channel seismic data not included). Volume II also contains the DSDP Core Sample Inventory and color/monochrome shaded relief images from several ocean views.

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: $90/2-disc CD-ROM data set, $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 handling fee 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, as are inventory searches of correlative (non-DSDP) geological and geophysical data available from NGDC. For details contact:

Marine Geology and Geophysics Division, NOAA/NGDC, E/GC3, Dept. 334, 325 Broadway, Boulder, CO 80303; Tel (303) 497-6339; Fax 303-497-6513); Internet cjm@ngdc1.colorado.edu.

**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 attenuation 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. | |
| **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 signal 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. | | |

## ODP Site Survey Data Bank

Lamont-Doherty Geological Observatory, Palisades, NY 10964.

The JOIDES/ODP Data Bank received the following data between 1 January 1992 and 30 April 1992. For additional information on the ODP Data Bank, please contact Mr. Carl Brenner.

- From J. Mascle (U. of Paris, France): selected MCS and SCS profiles documenting sites from equatorial Atlantic transform margin proposal (No. 346).
- From R. Whitmarsh (IOS, UK): basement contour map and *Charles Darwin* track chart, in support of proposed Iberian Abyssal Plain drillsites (NARM-DPG).
- From H.-C. Larsen (Geological Survey of Greenland, Denmark): SCS and MCS profiles, with corresponding navigation, bathymetric, magnetic, sonobuoy, isopach and depth-to-basement charts, in support of proposed southeast Greenland drillsites (NARM-DPG).
- From K. Gillis (WHOI): schematic cross sections of dive transects in the Hess Deep area.
- From J. Haggerty (University of Tulsa): SCS profiles from *Kana Keoki 81-06-26*, documenting proposed Harrie Guyot drillsite.
- From G. Mountain (LDGO): cruise report, SCS and MCS lines from *Ewing 9009*, along with preliminary Hydrosweep map showing site locations for proposed New Jersey margin sea-level drilling.
- From M. Comas (Instituto Andaluz de Geologia Mediterranea, Spain): MCS profiles, with corresponding navigation and well log summaries, documenting proposed Alboran Margin drillsites.
- From V. Kulm (OSU): additional processings and displays of Oregon margin MCS profiles for Leg 146 (Cascadia).
- From G. Moore (University of Hawaii): assorted SeaBeam bathymetric base maps of Oregon margin.
- From R. van Waasbergen (SIO): SeaBeam bathymetric maps and processed SCS profiles for Allison, Huevo, MIT and Seiko guyots, to document proposed leg 143/144 (Atolls & Guyots) drillsites.
- From Y. Kristoffersen (University of Bergen, Norway): MCS profiles, with corresponding navigation, from *Sverdrup* and *Haakon Mosby* cruises in Yermak Plateau, Fram Strait and North Iceland Plateau areas, along with SCS and Norwegian field report from ice drift station FRAM IV.
- From R. Henrich (GEOMAR, Germany): MCS profiles from *R/V Poseidon* cruise in Iceland-Faeroe Ridge area, parasound profiles from *R/V Polarstern* cruises in east Greenland and Yermak Plateau areas.
- From P. Mudie (AGC, Canada): X-rays of box cores taken at, or in the vicinity of proposed Yermak Plateau drillsites.
- From G. Boillot (Université Pierre et Marie Curie, France): MCS lines LG4, LG6 and LG12 from *R/V Lusigal* site survey cruise in support of Iberian Abyssal Plain drilling.
- From J. Mascle (Université Pierre et Marie Curie, France): MCS lines MT2, MT5 and MT16, from *R/V Nadir* site survey cruise in support of equatorial Atlantic transform margin proposal (No. 346).
- From H.-C. Larsen (Greenland Geological Survey, Denmark): MCS lines GGU82-12 and 82-13, in support of North Atlantic Arctic Gateways (NAAG-DPG) site EGM-4.
- From C. Brenner (LDGO): *R/V Conrad* MCS line 209, in support of NAAG-DPG sites ICEP-2, ICEP-3 and ICEP-4.

## 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 outside 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 123 through 141 are listed below.

**Leg 123:**
Dr. Felix Gradstein* (Bedford Institute of Oceanography, Canada), Chairman
Dr. John Ludden* (Univ. of Montreal, Canada)
Dr. Andrew Adamson** (ODP-TAMU)
Dr. Wylie Poag*** (USGS, WHOI)

**Leg 124:**
Dr. Eli Silver* (UC Santa Cruz),
Dr. Claude Rangin* (Univ. Pierre et Marie Curie)
Dr. Marta Von Breymann** (ODP-TAMU)
Dr. Martin Fisk*** (OSU)

**Leg 125:**
Dr. Patricia Fryer* (Univ. Hawaii)
Dr. Julian Pearce* (Univ. Newcastle-Upon-Tyne, U.K.)
Dr. Laura Stokking** (ODP-TAMU)
Dr. Patrick*** (Cottesloe, Western Australia)

**Leg 126:**
Dr. Brian Taylor* (Univ. Hawaii), chairman
Dr. Kantaro Fujioka* (Univ. Tokyo, Japan)
Dr. Thomas Janecek** (ODP-TAMU)
Dr. Charles Langmuir*** (LDGO)

**Legs 127/128, Book I:**
Dr. Kenneth Pisciotto*(El Cerrito, CA)
Dr. James Ingle* (Stanford Univ.), chair
Dr. Marta von Breymann** (GEOMAR, Kiel, Germany)
Dr. John Barron***(USGS, Menlo Park, CA)

**Legs127/128, Book II:**
Dr. Kensaku Tamaki* (Univ. Tokyo, Japan), chairman
Dr. Kiyoshi Suyehiro* (Univ. of Tokyo, Japan)
Dr. James Allan** (ODP-TAMU)
Dr. Michael McWilliams*** (Stanford Univ.)

**Leg 129:**
Dr. Roger Larson* (Univ. of Rhode Island), chair
Dr. Yves Lancelot* (Laboratoire de Geologie du Quaternaire, Marseille, France)
Dr. Andrew Fisher** (ODP-TAMU)
Dr. Edward L. Winterer*** (Scripps Inst. of Oceanog., UCSD)

**Leg 130:**
Dr. Loren Kroenke* (Univ. Hawaii)
Dr. Wolfgang Berger* (Scripps Inst. of Oceanog., UCSD)
Dr. Thomas Janecek** (ODP-TAMU)
Dr. William Sliter*** (USGS, Menlo Park, CA)

**Leg 131:**
Dr. Asahiko Taira* (Univ. Tokyo, Japan)
Dr. Ian Hill* (Univ. of Leicester, U.K.), chair
Dr. John Firth** (ODP-TAMU)
Dr. Peter Vrolijk*** (Exxon, Houston, TX)

**Leg 132 (Engineering II):**
Dr. James Natland* (Univ. Miami)
Dr. Frank Rack** (ODP-TAMU)

**Leg 133:**
Dr. Peter Davies* (Univ. Sydney, Australia)
Dr. Judith McKenzie* (ETH, Zurich, Switzerland)
Dr. Amanda Palmer-Julson** (ODP-TAMU)
Dr. Rick Sarg*** (Midland, TX)

**Leg 134:**
Dr. Gary Greene* (USGS, Menlo Park, CA)
Dr. Jean-Yves Collot* (Laboratoire de Geodynamique, Villefranche, France)
Dr. Laura Stokking** (ODP-TAMU)
Dr. Tony Crawford*** (Univ. of Tasmania, Australia)

**Leg 135:**
Dr. Lindsay Parson* (Inst. Oceanog. Sciences, UK)
Dr. James Hawkins* (Scripps Inst. Oceanog., UCSD), chair
Dr. James Allan** (ODP-TAMU)
Dr. Phil Weaver*** Sedimentology (Inst. Oceanog. Sciences, UK)
Dr. Johanna Resig*** Paleontology (Univ. Hawaii)

**Leg 136:**
Dr. Roy Wilkens* (Univ. Hawaii
Dr. Adam Dziewonski* (Harvard Univ.)
Dr. John Firth** (ODP-TAMU)
Dr. John Bender*** (Univ. N. Carolina)

**Leg 137/140:**
Dr. Keir Becker* (Univ. Miami)
Dr. Jörg Erzinger* (Univ. Giessen, Germany), chair
Dr. Henry Dick* (WHOI)
Dr. Laura Stokking (ODP-TAMU)

**Leg 138:**
Dr. Larry Mayer* (Univ. New Brunswick, Canada)
Dr. Nick Pisias* (Oregon State Univ.), chair
Dr. Thomas Janecek** (ODP-TAMU)
Dr. Tjeerd van Andel*** (Univ. Cambridge, UK)

**Leg 139:**
Dr. Earl Davis* (Pacific Geosciences Centre, Sidney, BC, Canada)
Dr. Mike Mottl* (Univ. Hawaii)
Dr. Andrew Fisher** (ODP-TAMU)
Dr. John Slack*** (USGS, Reston, VA)

**Leg 140:**
(See Leg 137/140)

**Leg 141:**
Dr. Stephen Lewis* (USGS, Menlo Park, CA)
Dr. Jan Behrmann* (Univ. Giessen, Germany)
Dr. Robert Musgrave** (ODP-TAMU)

A chairman for each ERB, usually a Co-Chief Scientist, has

## ODP Wireline and Logging Services

Lamont-Doherty Geological Observatory, Palisades, NY 10964.

Wireline Logging Manual (New Edition, Sept 1990).

To obtain a copy, contact Dave Roach (Tel: (914) 359-2900, ext. 330. Fax: (914) 365-3182).

# ODP/JOIDES Directory

## Membership Listings

### Committees

| Member (Chair) | Alternate | Liaison to |
|---|---|---|
| **Executive Committee (EXCOM)** | | |
| • Bogdanov, N. | | |
| • Boillot, G. | | |
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| Caldwell, D.R. | Small, L. | |
| Dorman, C.E. | Gagosian, R.B. | |
| Duce, R.A. | | |
| • Dürbaum, H.J. | Beiersdorf, H. | |
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| • Kobayashi, K. | | |
| Leinen, M. | Schilling, J.G. | |
| <u>Maxwell, A.E.</u> | Davies, T.A. | |
| Merrell, W.J. | Rowe, G. | |
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| • Westgaard, L. | Perez-Estaun, A. | |
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## ODP/JOIDES Telex List: see February, 1992 issue

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The *JOIDES Journal* is edited by JOIDES Office staff. The JOIDES Office is located at the Institute for Geophysics, University of Texas, from October 1990 to September 1992. During this period the *JOIDES Journal* is edited by Craig S. Fulthorpe and Peter Blum.

The *JOIDES Journal* is printed and distributed by the Joint Oceanographic Insitutions (JOI), Inc., Washington, D.C., for the Ocean Drilling Program (ODP) under the sponsorship of the National Science Foundation and participating countries. The material is based upon research supported by the National Science Foundation under Prime Contract OCE 83-17349.

The purpose of the *JOIDES Journal* is to serve as a means of communication among the JOIDES advisory structure, the National Science Foundation, the Ocean Drilling Program, JOI subcontractors thereunder, and interested earth scientists.

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## Publication History

The *JOIDES Journal* is published in yearly volumes which normally consist of three issues published in February (No. 1), June (No. 2), and October (No. 3). Publication commenced in 1975 with Volume I and has continued since then.
In addition, there are occasional special issues of the *JOIDES Journal* which are listed below:

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, Suppl. One, June 1986 (Vol. XII)
Special Issue No. 5: Guidelines for Pollution Prevention and Safety, March 1986 (Vol. XII)
Special Issue No. 6: Guide to the Ocean Drilling Program, December 1988 (Vol. XIV)

# *JOIDES Resolution* Operations Schedule

| Leg | Program | Cruise Dates | Days Transit | Days On Site | Days Total | In Port[†] |
|---|---|---|---|---|---|---|
| 144 | Atolls & Guyots B | 25 May-20 July | 12 | 44 | 56 | Yokohama, 20-24 July |
| 145 | North Pacific Transect | 25 July-21 Sept. | 18 | 41 | 59 | Victoria, 21-25 Sept. |
| 146 | Cascadia | 26 Sept.-22 Nov. | 6 | 51 | 57 | San Diego, 22-26 Nov. |
| 147 | Hess Deep | 27 Nov. '92-22 Jan. 1993 | 14 | 42 | 56 | Panama, 22-25 Jan. 1993 |
| 148A | Hole 504B* | 26 Jan.-23 Feb. | 4 | 24 | 28 | Panama, 23 Feb. |
| 148B | Hole 504B* | 24 Feb.-15 March | 4 | 15 | 19 | Panama Canal, 15 March |
| 148C | Transit | 15 March-2 April | 18 | 0 | 18 | Lisbon, 2-6 April |
| 149 | Iberian Abyssal Plain | 7 April-29 May | 2 | 50 | 52 | Lisbon 29 May-2 June |
| 150 | New Jersey Sea Level | 3 June-29 July | 16 | 40 | 56 | St. Johns, 29 July-2 Aug. |
| 151 | Atlantic Arctic Gateway | 3 Aug.-28 Sept. | 14 | 42 | 56 | Reykjavik, 28 Sept.-2 Oct. |
| 152 | East Greenland Margin | 3 Oct.-28. Nov. | | | 56 | |

* Scientific Party on board for 148A&B. Sedco-Forex crews rotate on 23 February 1993.
† Although 5-day port calls are generally scheduled, the ship sails when ready.

# JOIDES Meeting Schedule

| Date | Place | Committee/Panel |
|---|---|---|
| **1992** | | |
| 15-18 June | Washington, DC | EXCOM |
| 22-23 June | College Station, Texas | DH-WG subcom. |
| 27-28 July* | Toronto, Ontario | DH-WG subcom. |
| 4-6 August | Palisades, NY | SSP |
| 11-13 August | Corner Brook, Newfoundland | PCOM |
| 9-11 September* | Marseilles, France | IHP |
| 12-13 September* | Pat Bay, British Columbia | SMP |
| 21-23 September* | Santa Fe, New Mexico | DMP |
| 22-27 September* | Iceland | TECP |
| 26-28 September* | Kiel, Germany | SGPP |
| 30 Sept.-2 Oct.* | Marseilles, France | OHP |
| 14-16 October* | Paris, France | LITHP |
| 22-23 October* | London, UK | PPSP |
| 1 December | Bermuda | PANCHM |
| 2-5 December | Bermuda | PCOM |
| **1993** | | |
| 27-28 January | Australia | EXCOM |
| January* | College Station, Texas | DMP |
| 26-28 April | Palisades, NY | PCOM |
| August | Australia | PCOM |

* Meeting not yet formally requested and/or approved


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