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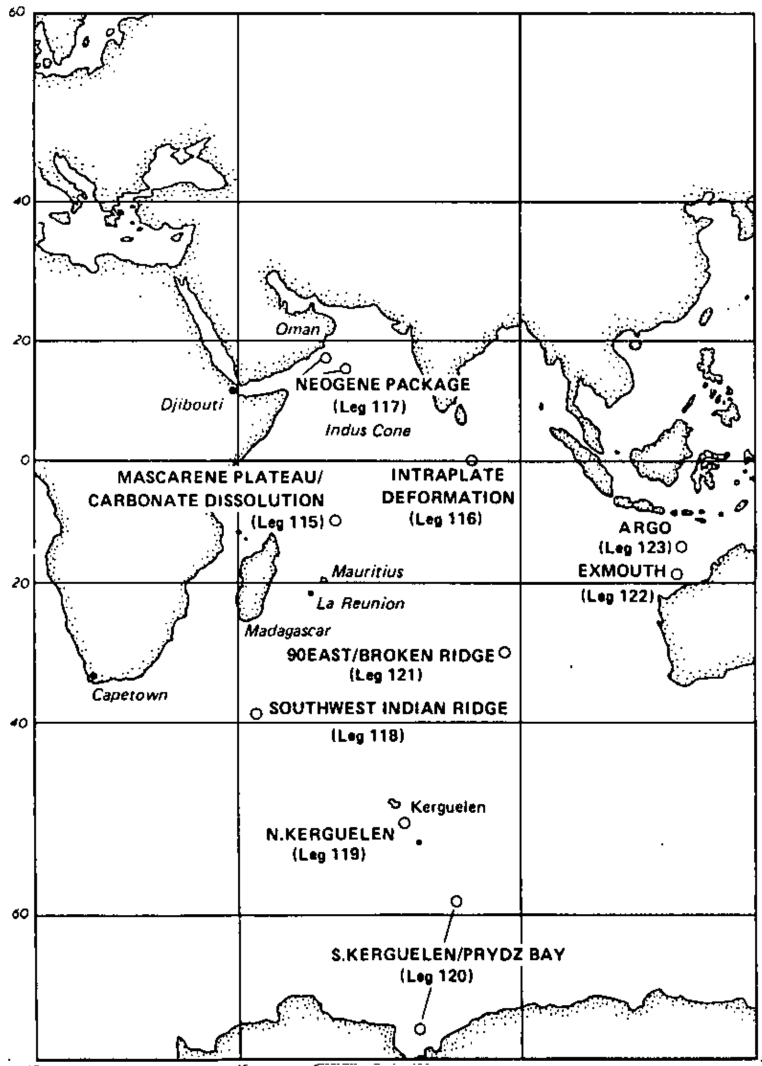

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FOCUS

Oregon State University is the site of the third JOIDES Planning Office; our charge is to continue with the coordination of the planning process for the new "thematically-driven" phase of ocean drilling which involve both a new ship, the JOIDES RESOLUTION, and a new advisory structure. As the Ocean Drilling Program is benefiting from experience gained during the Deep Sea Drilling Program, the planning structure too is being refined from the successes and short-comings of previous committee and panel structures.

At the January PCOM meeting, the "trial-by-fire" for our office, we saw the thematic and regional panels' advice come together to produce a scientifically exciting Indian Ocean program. The schedule for the JOIDES RESOLUTION for Legs 115 through 123 is now in a near-final form. Site surveys have largely been completed and drilling programs for each leg are defined.

To get to this point the Planning Committee and the JOIDES panels have wrestled with a planning structure based both on thematic issues and regional priorities. In the past year, the thematic and regional panels have combined their interests through critically timed meetings and at the Panel Chairmen's meeting, to provide PCOM with the necessary information to define a long-range drilling schedule. For immediate planning, the thematic panels exchanged their perspective on global problems that could be addressed in the Indian Ocean with the regional panel providing its perspective and an evaluation of the supporting data set for each program. This same interaction between thematic and regional panels allowed PCOM to also define a core program in the Western Pacific during its January meeting. The four programs ranked high by both the thematic and regional panels will form a basis for drilling plans through the early 1990s.

The next challenge for the panel structure will come as we develop the rest of the Pacific program. The Central and Eastern Pacific regional panel has already been asked to identify those programs that logistically mesh with a drilling schedule in the western Pacific. Hopefully thematic issues will be defined and regional studies will be scheduled and completed well before the drill ship enters the eastern Pacific and we have a number of important thematic issues to insert into a drilling program.

Our ultimate objective is to continue developing the planning process so that we can have a focused, thematically-driven program. Success will depend on both the planning structure and the earth science community which is faced with the reality that the drilling ship is a limited resource and that our primary goal is to drill the best science possible. Unfortunately, there are opposing forces which have made a number of people observe that the drilling program has not grown beyond a "...global wandering of the drillship for miscellaneous problem solving...".

The original COSOD objectives have guided the Ocean Drilling Program through its first few years. But it is clear that at least one COSOD concept, the double circumnavigation of the globe, may be problematic for achieving an understanding of fundamental processes in the world's oceans. As a paleoceanographer, I can sympathize with a more "global" perspective, but if we wish to understand fundamental processes in passive margin evolution, convergent margin tectonics or the formation of the earth's crust, maybe wondering around the world is not the best strategy. In the western Pacific we already have many more well-documented programs that, unless we want to spend the rest of the century in the Pacific, cannot all be drilled during the three years we plan to stay in the Pacific before continuing the circumnavigation.

I hope COSOD-II will address this issue of circumnavigation. More importantly, COSOD-II should address the broader issues of how to execute a focused, thematically-driven program which will truly provide the necessary data to achieve the scientific goals set out in its final report.

Nick Pisias

Nicklas G. Pisias
Planning Committee Chairman

COSOD II

The Second Conference on Scientific Ocean Drilling (COSOD II) will be hosted in Strasbourg, France, on 6-8 July 1987, by the European Science Foundation. During these three days, 350 scientists from the world scientific community at large will try to focus on the most significant problems which might be investigated by scientific ocean drilling in the 1990s. "The prime objective of COSOD II", as defined by the Planning Committee of JOIDES, "is to make recommendations for future scientific and technological objectives for the Ocean Drilling Program, bearing in mind the scientific and technical progress of the ODP to date. As part of this charge, special attention will be given to the development of scientific programs within the ODP".

Why did the Executive Committee of JOIDES decide to convene such a conference? After all, gathering 350 international scientists in Strasbourg is expensive. Why did JOIDES not simply rely on the expertise of its own advisory structure? The answer, of course, is that COSOD II is a consultation by JOIDES of the world scientific community. The mandate of the Conference in Strasbourg is not to draft a detailed drilling plan for the 1990s. This will eventually be done by experts in scientific ocean drilling, including those who participate in the present JOIDES advisory structure. Rather, the scientists in Strasbourg will try to identify the most significant scientific problems within the earth sciences to which scientific drilling might contribute solutions. One of the outcomes of such an exercise would be to evaluate the relative importance of ocean drilling as a scientific tool with respect to other exploration technologies and to propose scientific programs which might combine drilling with these other technologies. It will of course be very important for the participants to be aware of possible technological developments for the 1990s such as riser capabilities, independent less expensive HPC drilling platforms, improved logging, hydrothermal drilling at greater than 300°C and more efficient drilling and coring within very young oceanic basalts, cherts, talus-type deposits, and other problematic lithologies.

It is clearly impossible to discuss the possible contribution of ocean drilling to solid earth sciences in the 1990s without reference to present accomplishments of the Ocean Drilling Program. Thus it will be necessary to evaluate how the top-priority program recommendations made by COSOD I for 1981-1991 compare with existing problems in the solid earth ocean sciences and how successful ODP has been in implementing these recommendations.

The preparation for COSOD II was entrusted to a Steering Committee of twelve members who met in Strasbourg from 30 September to 2 October 1986. The Committee decided that the best format for the Conference would consist of five parallel workshops, each run as a Penrose-type conference. The focus will be on significant scientific problems and, for this reason, the workshops will be established along thematic rather than disciplinary lines. The five topics chosen are:

1. Global environmental changes
2. Mantle-crust interactions
3. Fluid circulation and global chemical budgets
4. Brittle and ductile deformation of the lithosphere
5. Evolution and extinction of oceanic biota.

Descriptions of each thematic workshop are appended to this article.

The Steering Committee did realize that scientists presently involved in ODP might have felt more comfortable with five disciplinary workshops exhaustively covering the fields related to ocean drilling. However, it deliberately chose to focus instead on scientific problems, hoping that the topics chosen cover a sufficiently broad range of exciting problems to be of interest to the world scientific community.

Notice that there is no technological workshop. This of course does not imply that future technological evolution is not important for these debates. On the contrary, it is so important that it was felt that the corresponding technological information should be made available to each workshop. Accordingly, technological white papers have been requested from JOIDES concerning the following topics:

1. Use of risers for scientific drilling (with a feasibility of leasing existing platforms)
2. Use of an independent, smaller HPC platform
3. Bare rock drilling
4. Hot rock drilling
5. Logging
6. Drilling in difficult formations (e.g. cherts)

The Steering Committee felt that a significant development in the drilling program might come by diversifying drilling platforms, as indicated by items 1 and 2 above. having a single platform introduces very severe constraints in the present drilling program and greater flexibility in this domain would obviously be welcome.

To prepare for the Conference, the Steering Committee established five working groups, each covering one of the five topics. Each working group will investigate the scope of its respective topic and prepare a position paper focusing on important scientific debates which can be addressed by scientific ocean drilling, bearing in mind future technological developments, possible diversification of drilling platforms and liaison with other scientific programs. It is hoped that the position paper will be drafted in time for mailing to the workshop participants prior to COSOD II.

It will also be the responsibility of the working groups to organize the reports at the corresponding conference workshops and to incorporate the conclusions of the discussions into the final reports which will be used by the Steering Committee for its recommendations to JOIDES.

A directory of Steering Committee and Working Group participants follows.

How will 350 scientists participating in COSOD II be selected? Quotas have been established which provide for 150 U.S. scientists, 30 from each of the six other ODP members and 20 for nations outside ODP. These will be selected from scientists who have applied to participate in the Conference; each applicant must list two workshops, in order of preference, to which his or her scientific expertise could contribute. The selection for workshop participants will be made with the guidance of the chairman of the corresponding working group and the Steering Committee members (who will keep track of the proper ODP member balances). Roughly speaking, one would expect six scientists from each non-U.S. member, 30 scientists from the U.S. and four scientists from non-member nations, for an average of 70 scientists in each workshop. It is hoped that this rather complex selection process will insure both worldwide scientific expertise and proper participation of all ODP members.

Who will pay for the participation of scientists to the Conference? Selected scientists should seek support from their national funding agencies which, for ODP member countries, will have been kept informed about the whole selection process through their corresponding Steering Committee members.

The five working groups have now been selected and are starting to work on their position papers. In addition, it is hoped that the scientific communities in each member country of ODP will independently begin to reflect on possible contributions of their representatives to COSOD II. The game is wide open and the ball is now in the court of the world scientific community. We, on the Steering Committee, all hope that it will bounce back to Strasbourg and look forward to three days of exciting and intense debates there.

XAVIER LE PICHON
Chairman, COSOD II Steering Committee

Global Environmental Changes

This workshop will focus on evidence for rhythms, cycles, and long-term changes recorded in marine sediments. Discussions are solicited for such topics as Milankovitch cycles, sea-level change, ocean circulation, dissolution anoxia events, long-term chemical evolution, and how these phenomena can be further addressed by ocean drilling.

Questions addressed in this workshop will include: What improvements in stratigraphic resolution can be achieved using Milankovitch cycles back through the Cenozoic and Mesozoic? How do solar insolation changes drive global climate? Through CO_2 changes in deep water? Through changes in the mode of deep water formation?

What are the known and what are the elusive linkages, fluxes, feedbacks and chemical/sediment/isotope budgets?

What are the special conditions which lead to distinctive modes of climate and sedimentation such as the icehouse, greenhouse, widespread phosphates, cherts and sapropels?

What are the optimum sampling and logging tools, ocean platforms, analytical facilities and program strategies?

Mantle-Crust Interactions

The basalts and associated rocks of the seafloor provide a window through which the processes of mantle-crust interaction can be understood. Melting in the mantle is a central process in the development of the ocean crust, volcanic arcs, mid-plate seamounts and the underlying upper mantle. The melting process is effected by mantle heterogeneity, contamination by subducted crust, varying volatile contents and mantle convection. This signal is then modified during segregation of melt, its vertical migration and metasomatic interactions with the overlying mantle.

At shallow levels, fractionation and interaction with crystalline crust may occur either in closed or open magma chambers. Tectonic processes may act to segment the magmatic systems and to separate contrasting provinces. Rates of tectonic processes may also be important in controlling mantle-crust interactions. Major topographic anomalies along plate boundaries are surficial expressions of deep-seated mantle processes, perhaps reflecting convection at different scales. Products in mantle-melt evolution include deposits of chromite and platinum group elements.

We wish to design a drilling program which will contribute in a major way to the testing of existing models and to the better definition of these processes.

Fluid Circulation and Global Chemical Budgets

The focus of this working group will be thermally, tectonically, and density-driven fluid circulations. Environments to be included are spreading centers, ridge flanks, mid-plate regions, subduction zones, arcs and passive margins.

The working group should consider implications for heat budget, chemical fluxes (inorganic and organic), mineralization, diagenesis, benthic biology, and structural geology. Emphasis should be given on how physical properties control and are altered by fluid circulation.

Brittle and Ductile Deformation of the Lithosphere

The deformation of the lithosphere over its whole thickness, whether along divergent or convergent boundaries, is poorly understood although exciting new models have been proposed. The possibility that faults or decollements play a significant role to great depths within the lithosphere seems to be borne out by deep seismic reflection imaging.

The task of this working group is to examine how deep drilling, in combination with other techniques, including deep seismic reflection imaging, can provide information on the way in which the oceanic and continental lithosphere are deformed at plate boundaries.

Significant problems that might be considered include simple shear extension and tectonic denudation of the lower crust and/or upper mantle, asymmetric conjugate passive continental margins, the nature and origin of exotic terranes, terrane accretion and collision, tectonic delamination and flake tectonics, tectonics of mid-ocean ridge crests and deformation history in transform faults.

Careful attention should be given to the necessary drilling and associated tools, and to liaison with existing programs dealing with similar objectives.

Evolution and Extinction of Oceanic Biota

This working group will deal with the stratigraphic record in the world ocean as it reflects the history of marine organic communities through time. This history includes the sudden appearance of new major groups, marked changes in the diversity of the biota, and global extinction events.

Internal and external processes and discrete events are forcing factors that may disturb the equilibrium of the planktonic and benthic faunal, floral and bacterial populations. Various processes and events that have been proposed to account for marked biotic events include periodic or random meteorite impact events, development of widespread oceanic anoxia, temperature and salinity variations, sea-level changes, glacial events, variations in insolation, changes in the polarity and intensity of the magnetic field and volcanic activity.

Given the capability of drilling platforms to sample a continuous stratigraphic record from a wide variety of paleoenvironments, we have the opportunity to build a global database needed to test the present generation of hypotheses and develop new hypotheses. Although the record in the present-day oceanic basins extends only back to middle Jurassic time, studies of outcrops have shown that much of the Phanerozoic stratal sequence is the product of similar processes and events that mark the Mesozoic to recent time span.

The question before the scientific community is: can we relate the history of biotic events to internal oceanic physical and chemical processes, and to external factors as these are reflected in the sedimentary record?

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JOIDES RESOLUTION OPERATIONS SCHEDULE

Legs 114 - 120

LEG	AREA	DEPARTS LOCATION	DEPARTS DATE	ARRIVES DESTINATION	ARRIVES DATE	IN PORT
114	Subantarctic	Falkland Islands	16 March	Mauritius	14 May	14-18 May
115	Mascarene Plateau Carbonate Dissolution Profile	Mauritius	19 May	Colombo	29 June	29 June - 3 July
116	Intraplate Deformation and N90°E Ridge	Colombo	4 July	Karachi	21 August	21-25 August
117	Neogene Package	Karachi	26 August	Mauritius	16 October	16-20 October
118	Southwest Indian Ridge	Mauritius	21 October	Mauritius	2 December	2-6 December
119	Kerguelen (north)	Mauritius	7 December	Mauritius	6 February	6-10 February
120	Kerguelen (south)	Mauritius	11 February	Freemantle	11 April	11-15 April

Revised 1/23/87

SCIENTIFIC OBJECTIVES OF LEG 114

Several fundamental questions remain regarding the evolution of global climatic, glacial, and oceanographic systems since the Late Mesozoic. The major driving forces for changes in these systems have been in the high southern latitudes where a number of tectonic events have led to the thermal isolation of Antarctica, the initiation and growth of the Antarctic ice sheets, and the development of modern abyssal circulation. Prior to the development of shallow and deep teleconnective passageways in the circum-Antarctic, northward transport of cold surface and deep polar waters was restricted. The increase of thermal gradients in the southern hemisphere is linked to the development of the circum-Antarctic circulation system (Kennett, 1978), first by the onset of deep water flow through the Tasman Seaway between Australia and Antarctica in the late Eocene, and followed by the opening of the Drake Passage between South America and West Antarctica during the Oligocene (Barker and Burrell, 1977, 1982; LaBrecque and Rabinowitz, 1977; OMD Region 13 Synthesis, 1986). The result of a fully developed circum-Antarctic current was thermal isolation of the Antarctic continent by decoupling of the warm subtropical gyre system from the Antarctic margins. This led to the growth and expansion of the ice sheets on Antarctica and the development of the cryosphere. Prior to the development of these passageways, the steepening of Paleogene thermal gradients may have occurred at different rates within the Pacific, Indian Ocean, and Atlantic Basins.

Proposed sites for ODP Legs 113 and 114 should provide a late Mesozoic through Cenozoic record from the Antarctic continental margin (72°S latitude) to the northern Subantarctic (46°S latitude), over a wide range of paleo- and present water depths. A number of these sites are situated on basement highs where lengthy Upper Cretaceous to Neogene records of carbonate-bearing pelagic sections will be recovered. The combined records from these sites are expected to provide the first detailed history of Antarctic glacial conditions, the development of polar water masses, and their relationship to global climatic and oceanographic evolution.

The drilling program for ODP Leg 114 will investigate the development and influence of teleconnective passageways to oceanic circulation within the Atlantic sector of the Southern Ocean (Figure 1). This general objective involves the interrelationship of the paleoceanographic record and the Mesozoic and Cenozoic regional history. Three sites (SA-5, SA-6 and SA-8) have primary tectonic objectives regarding the evolution of the Malvinas Plate, the Islas Orcadas and Meteor Rises and the interbasin gateway between the South Atlantic and Weddell Basins (LaBrecque and Hayes, 1979; OMD Region 13 Synthesis, 1986). The prime deep water site (SA-3) and the two contingency sites (SA-2 and SA-7) will provide record of a deep water passageway between the Weddell Basin and South Atlantic from the early Paleogene to the late Paleogene. Site SA-2 will provide information on the Late Cretaceous deep water

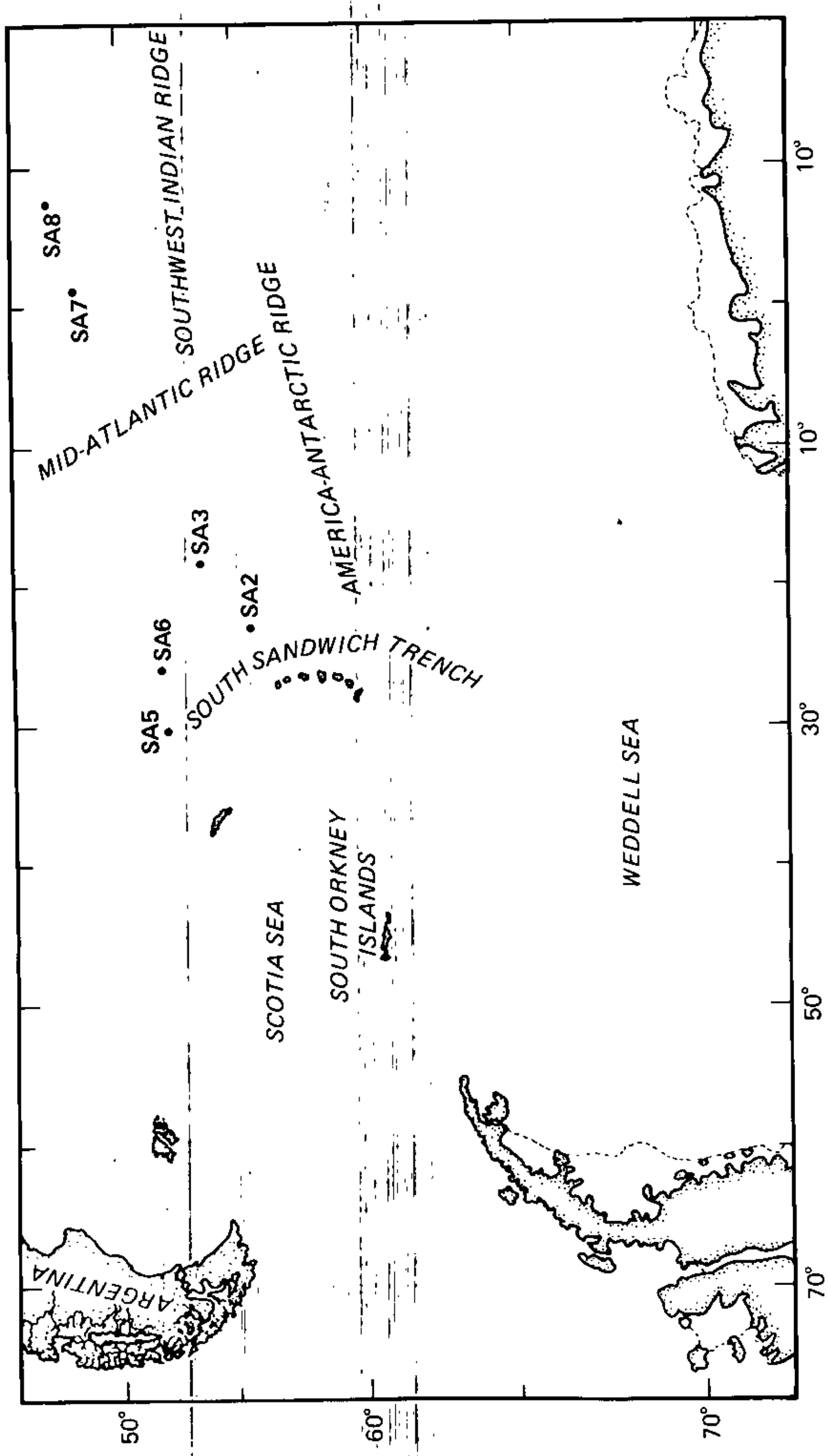

Figure 1. Proposed site locations for ODP Leg 114

environment prior to the development of the gateway relief. Elucidating the climatic and glacial history of Antarctica requires obtaining a more detailed stratigraphic representation from several regions around the Antarctic continent. Prior to the Neogene, conditions along the continental margins must have differed from basin to basin owing to the absence of the Antarctic circumpolar current, the difference in timing of the opening of the tectonic portals, and the probable absence of the West Antarctic ice sheet. ODP Legs 113 and 114 will provide the first complete transect of sites through the Antarctic-Subantarctic regions of a single sector of the Southern Ocean. The results from these legs, when combined with future results from the 1988 drilling in the Kerguelen Plateau region of the Indian Ocean and possibly additional drilling in the Pacific sector of the Southern Ocean, will document the complete history of circum-Antarctic climatic and glacial history.

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PRELIMINARY SCIENTIFIC OBJECTIVES
LEGS 115 - 120

LEG 115: MASCARENE PLATEAU - CARBONATE DISSOLUTION PROFILE

The Mascarene Plateau is part of a major aseismic ridge system connecting, with the Chagos-Laccadive Ridge, young volcanic activity in the vicinity of Reunion Island with the massive accumulation of old (60-65 Ma), continental flood basalts in the Deccan Traps of India. This lineament, which parallels the Ninetyeast Ridge, records the northward motion of the Indian subcontinent away from a mantle-fixed hot spot centered near Reunion. This area also provides a continuous Neogene carbonate record.

The major drilling objectives of this leg are:

* to establish the Cenozoic motion of the Indian Plate in the hot spot reference frame

* to determine the geochemical character of basement rocks to examine mantle melting processes and source variability over a hot spot

* to study the evolution of the Neogene carbonate system in response to changing climatic conditions, glaciation, and deep circulation

* to document the evolution of deep and shallow water circulation in the Indian Ocean

LEG 116: INTRAPLATE DEFORMATION

A remarkable example of intraplate deformation is found in the central Indian Ocean Basin, in the distal part of the Bengal Fan. Oceanic crust and overlying sediments are deformed into long wavelength (about 200 km) undulations and are disrupted by closely-spaced (about 5-10 km) faults showing a reverse sense of motion. Gravity anomalies suggest that the surface of oceanic MOHO is deformed into undulations similar to those observed in the surface of the crust. This is also the site of intraplate earthquakes, whose foci lie beneath the oceanic crust, and of abnormally high heat flow suggestive of upward flow of water. The style of deformation and focal mechanisms suggest that the Indo-Australian plate is deforming under N-S compression, probably dating from late Miocene time, as determined from a regional unconformity probably of that age correlated from earlier DSDP drilling farther to the north in the Bengal Fan.

Drilling objectives include determination of:

* age of onset of the deformation and subsequent history of movement of individual fault blocks

* the relationship of the fault zones to the upward water flow

* the tectonic history of uplift of the Himalayas and deposition of the Bengal fan

For logistical reasons, the North Ninetyeast Ridge site (90ER-1) will be included with this leg.

LEG 117: NEOGENE PACKAGE

"Neogene Package" is a reference term for a collection of shallow penetration APC/XCB drilling sites in the Arabian Sea arranged in a transect from the Oman Margin across the Owen Ridge to the Indus Fan. The proposed sites will address various aspects of the Neogene climate and paleoceanography of the region. For example, meteorological records and climatic studies indicate that the annual monsoonal cycle in this region is influenced by seasonal changes of insolation over the Asian continent. A sedimentary record of monsoon strengths as shown in shallow cores should thus reflect changes in the size and elevation of the Asian continent and the seasonal distribution of solar radiation, as well as changes in the sea surface temperature of the Indian Ocean. A complete sequence through Pleistocene and older sediments might show a rhythmic variation related to the revolution of global climates.

LEG 118: SOUTHWEST INDIAN RIDGE

The Southwest Indian Ridge is a very slow-spreading ridge (0.86 cm/yr half rate) extensively offset by large relief fracture zones. The area proposed for drilling is southeast of Madagascar in the Atlantis II Fracture Zone which intersects the Southwest Indian Ridge. The prime objective is to obtain core samples and logs from a single bare-rock site drilled as deeply as possible into the axis of the median ridge in the center of the Atlantis II transform valley. This ridge is hypothesized to be a hydrated (serpentinized) mantle diapir and to mark the principal zone of transform fault deformation. The recovered samples will test the serpentine diapir hypothesis, potentially allowing study of mantle petrology and its alteration characteristics, as well as the deformation characteristics of a zone of primary fault motion. The logging program will emphasize the standard Schlumberger logging tools and the borehole televiewer with temperature and packer measurements as secondary programs. Backup sites for this leg include single-bit pogo-stick drilling across the sediment-filled transform floor, and drilling in the capture nodal basin north of the transform fault segment.

LEG 119: KERGUELEN (North)

Although the Kerguelen Plateau is the world's largest mid-ocean plateau, little is known of its structure or origin. In addition, the subsidence history of this linear structure is critical for understanding the movement of water between the Atlantic and Pacific oceans. Recovery of a complete stratigraphic record from the Upper Cretaceous to the present will address these problems:

* the nature and age of the different sedimentary sequences and the age of the oldest clastic deposits

* shift of the polar front through time

* age of the major discordance which dates the time of rifting between Kerguelen-Heard Plateau and Broken Ridge

* pre-rifting and post-rifting subsidence history of the ridge

* nature and age of the basement in the northern and southern part of the ridge

LEG 120: KERGUELEN (South)

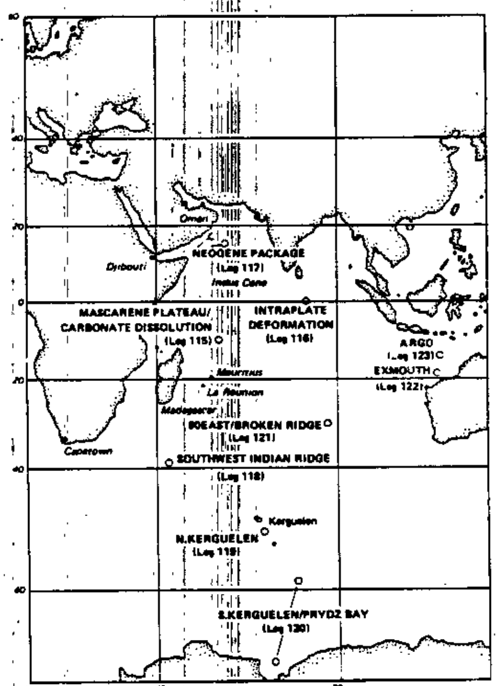
In addition to the objectives mentioned in conjunction with North Kerguelen drilling, additional sites from Prydz Bay (east of the Amery Ice

Shelf) have been proposed for drilling on this leg. A selection of sites will be chosen that is best able to:

* provide information about the Cretaceous to Recent climatic and glacial history of Antarctica

* yield ages for the glacial erosional events, which led to the lowering of the Antarctic Continental Shelf

* demonstrate the breakup history and environment of Antarctica and India and the subsequent margin evolution



SUMMARY OF LEG 111 RESULTS

INTRODUCTION

During Leg 111 of the Ocean Drilling Program (ODP), the JOIDES RESOLUTION returned to Site 504 in the eastern equatorial Pacific (Figure 1). The primary purpose of Leg 111 was to deepen and log Hole 504B, which had been cored and logged during parts of four legs of the Deep Sea Drilling Project (DSDP). Before Leg 111 returned to it, Hole 504B extended 1075.5 m through the pillow lavas of oceanic Layers 2A and 2B and into the sheeted dikes of Layer 2C -- a basement penetration nearly twice that of the second-deepest 583 m in Hole 332B in the Atlantic. Leg 111 focused on coring and logging the sheeted dike complex, which has been sampled in situ only in Hole 504B, where it is on the order of one kilometer thick.

Sampling from deep within the oceanic crust has long been a major goal of the JOIDES Ocean Crust and Lithosphere Panels: to document the lithostratigraphy, alteration history, and geophysical properties of the crust, and to test the analogy drawn between ophiolites and oceanic crust. This goal went mostly unfulfilled during DSDP, partly because of the technical problems of achieving deep penetration, and because of the great commitment of time and effort required. Hole 504B was a unique exception; Legs 69, 70, and 83 cased through 274.5 m of sediment and cored 1075.5 m of pillow lavas and sheeted dikes, to a total depth of 1350 meters below the sea floor (mbsf) (CRRUST, 1982; Cann, Langseth, Honnorez, Von Herzen, White, et al., 1983; Anderson, Honnorez, et al., 1982; Anderson, Honnorez, Becker, et al., 1985). To date, the lithostratigraphy sampled in Hole 504B is the best direct, if limited, verification of the ophiolite model of the oceanic crust; however, the deepest 3-4 km of oceanic crust have never been sampled in situ.

The second, equal-priority, goal of Leg 111 was to spend 5 days coring the 200 to 300 m of sediments near Site 504 with the advanced piston corer (APC) and extended core barrel (XCB). It was important to sample these sediments for two separate purposes: high-resolution studies of Plio-Pleistocene biostratigraphy and paleoceanography of the eastern equatorial Pacific, and geochemical studies of the advection of pore waters in the sediments and its effect on sediment diagenesis. Two sites within 3 km of Site 504 were cored to achieve these purposes: Site 677 in a local heat flow minimum, where the sedimentary record was expected to be best preserved, and Site 678 in a sharp local maximum of heat flow, where advective processes were expected to be important.

SITE 504

Leg 111 spent 42.9 days at Hole 504B, including nearly 29 days for coring operations and slightly more than 14 days for logging and experiments. Leg 111 deepened Hole 504B by 212.3 m, to a total depth of 1562.3 mbsf or 1287.8 m into basement (Figure 2). Coring was very difficult in the sheeted dikes that were encountered, and a total of 26.42 m of core was recovered, for an overall recovery of 12.6%. Hole 504B claimed parts of three coring assemblies and two logging tools; much of the leg was

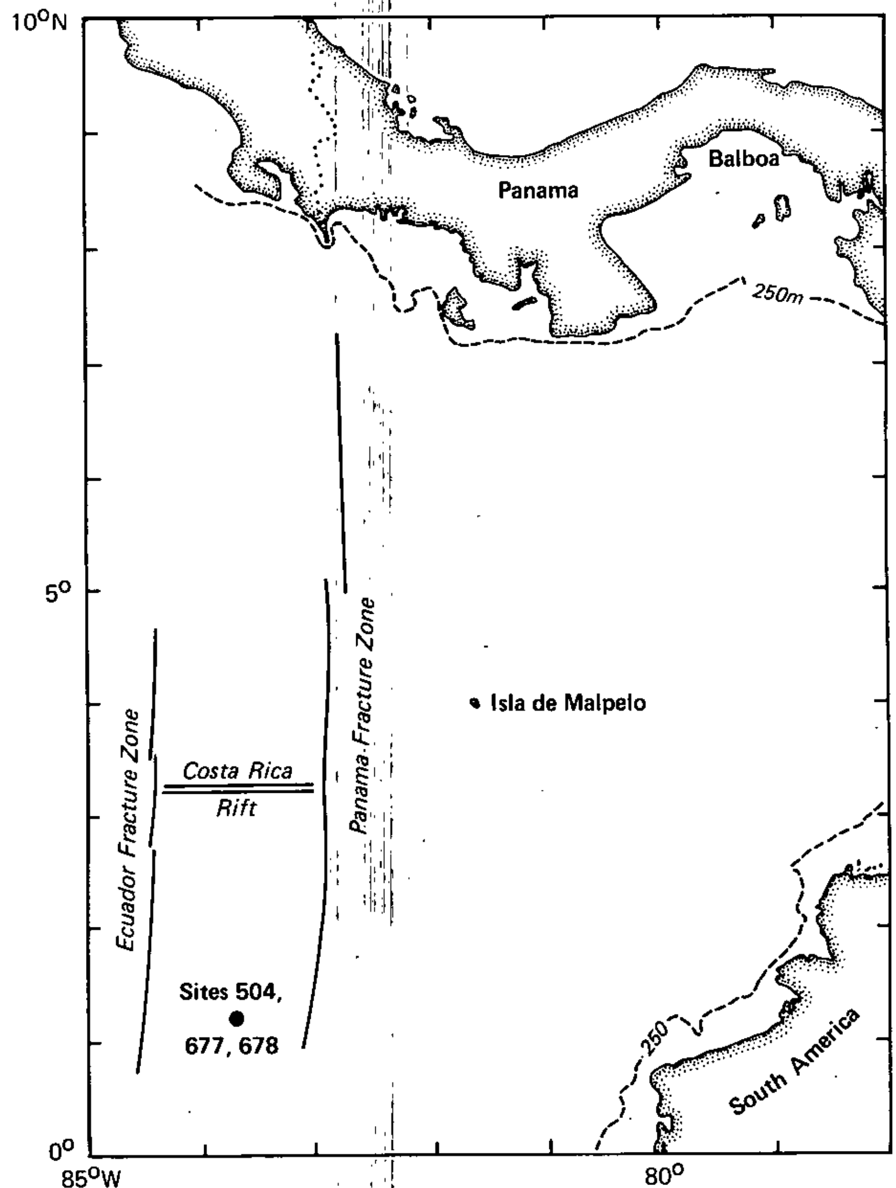


Figure 1. Location of Site 504 in the eastern equatorial Pacific.

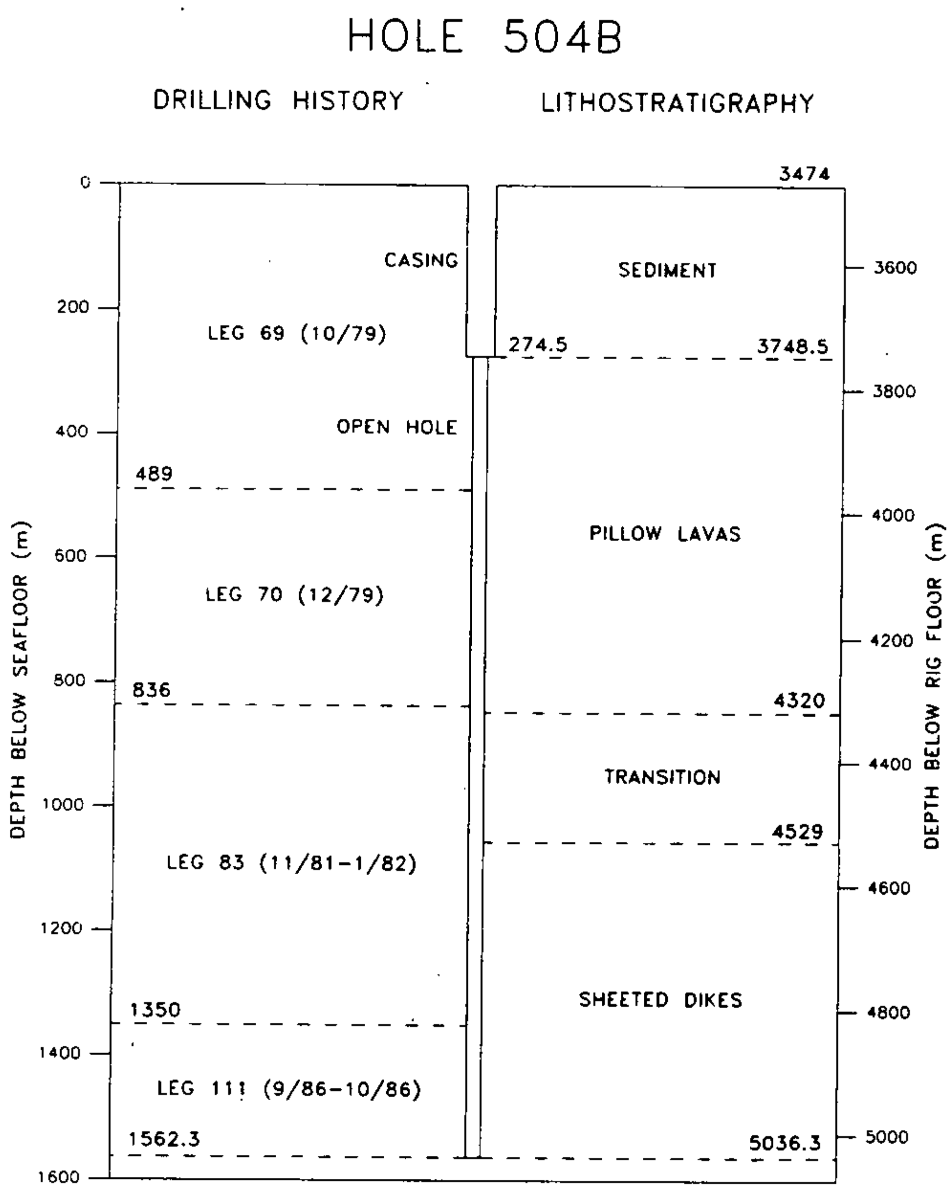


Figure 2. Schematic of Hole 504B drilling history and lithostratigraphy through the end of Leg 111.

spent in attempts to fish and mill junk from the bottom of the hole.

Although the coring results were disappointing, the logging and experiments were quite successful; they provided much of the continuous detail that was necessary to interpret the little core that was recovered. Logging had been scheduled in two phases, the first at the beginning of the leg before any coring, and the second at the end of the leg after the hole had been cored as deep as possible. Coring operations, however, were suspended earlier than scheduled when the second of two consecutive steel rotary bits disintegrated. The second set of logs and experiments was run when the hole had been advanced only 197.5 m beyond its depth at the beginning of the leg.

<u>Temperature and Permeability Measurements</u>:

Before Leg 111 began coring, undisturbed borehole temperatures were continuously logged from seafloor to 1300 mbsf and back up to seafloor. The highest measured temperature was 148.9°C at 1300 mbsf, indicating a temperature of about 152°C at 1350 mbsf, then the total depth of the hole. This was about 10°C less than had been predicted from temperatures measured on earlier legs. The measured gradient extrapolates to an estimated crustal temperature of 165°C at the total depth of 1562.3 m reached by subsequent Leg 111 coring.

Deep in the hole, the temperature gradient is basically linear, but it decreases from 116°C/km in the pillow lavas to 61°C/km in the dikes. Short-wavelength variations in the thermal gradient correlate with the lithology, indicating that conductive heat transfer predominates. The change in gradient between pillow lavas and dikes suggests a puzzling reduction in heat flow, which is discussed below.

Slightly depressed temperatures in the upper 400 m indicate that ocean bottom water still flows down the casing into the upper 100-200 m of basement. The rate of downhole flow was estimated to be 1.1 m/hr or about 80 liters per hour, about 1% of the rate when the hole was first drilled, almost seven years earlier during Leg 69.

The bulk permeability of the sheeted dikes was measured twice after setting a drillstring packer, once at 936 mbsf when the hole was 1406 m deep, and a second time at 1236 mbsf when the hole was 1547.5 m deep. The permeability of the dikes was uniformly low, about 5-20 x 10^{-18} m^2. Somewhat unexpectedly, the dikes proved to be as permeable as the relatively impermeable, partially-sealed pillow lavas of Layer 2B. Thus the lower km of the hole, comprising sealed pillow lavas and sheeted dikes, is uniformly impermeable. The only permeable section of basement in Hole 504B is the upper 100-200 m, which is about three orders of magnitude more permeable than the lower km, and is the zone into which the downhole flow of ocean bottom water is directed (Figure 3).

The large decrease in the temperature gradient from pillow lavas to sheeted dikes suggests that the vertical heat flow is less in the dikes than in the pillow lavas. As the surface heat flow in the area varies about an average that is consistent with the value predicted for conductive cooling of 5.9-m.y.-old crust,

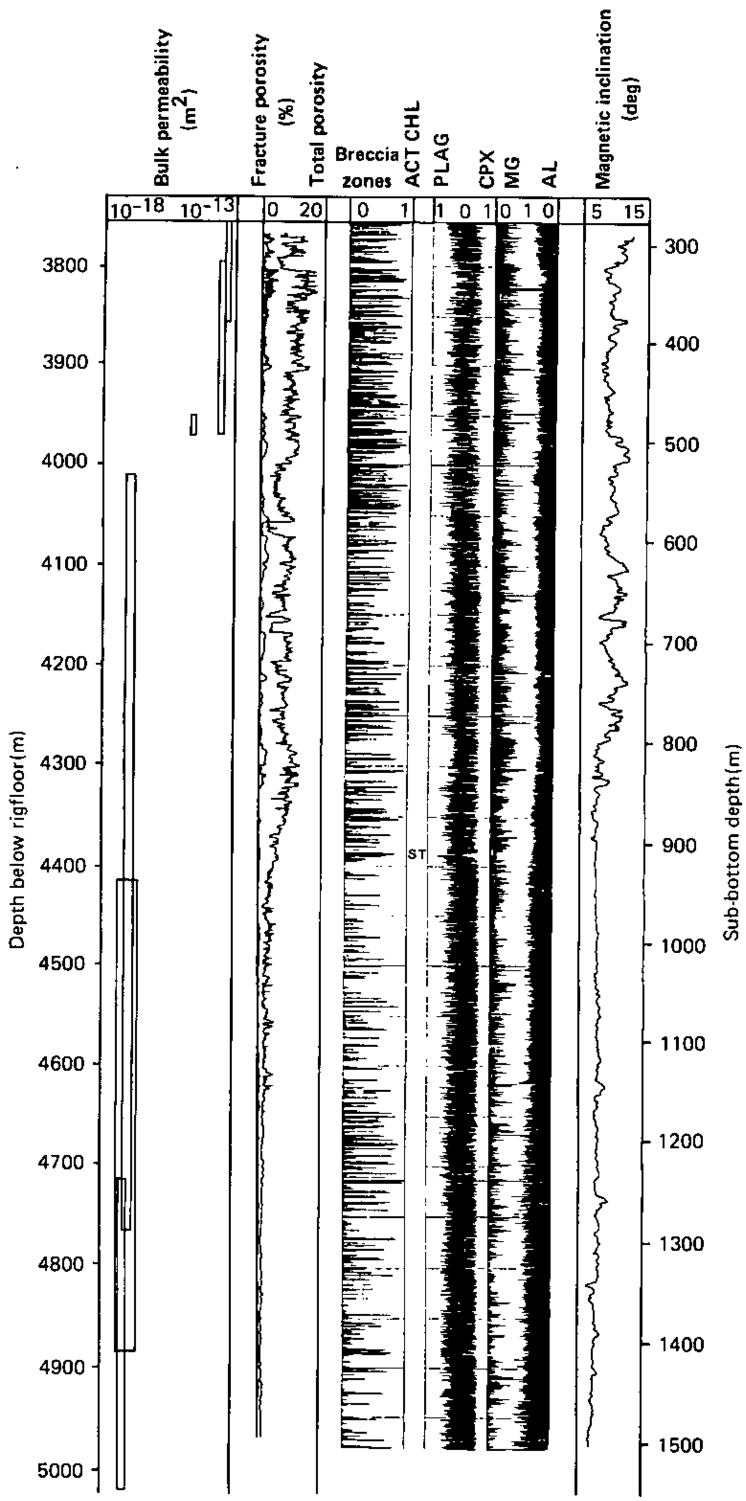

Bulk permeability (m2)
10-18 10-13
Fracture porosity (%)
Total porosity
0 20
Breccia zones
0 1
ACT CHL
PLAG
CPX
MG
AL
1 0 1 0 1 0
Magnetic inclination (deg)
5 15
ST
Depth below rigfloor (m)
3800
3900
4000
4100
4200
4300
4400
4500
4600
4700
4800
4900
5000
Sub-bottom depth (m)
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500

Figure 3.

the crustal gradient would be expected to approach the predicted gradient more closely with depth. Thermal conductivities in the dikes are about 20% higher than in the pillow lavas, which would account for only part of the reduction in gradient in the dikes. It is difficult to explain a reduction in heat flow with depth without invoking circulation of pore fluids, yet the measured permeabilities indicate that only the upper 100-200 m of basement is permeable enough to allow such circulation in the vicinity of the hole. The chemistry summarized below indicates that the borehole fluids convect within the hole, yet the temperature gradient shows only signs of conductive processes. More study is required to determine if slow convection within the borehole could produce the observed chemistry and reduce the overall temperature gradient without affecting the otherwise conductive character of the temperature profile.

Borehole Water Chemistry:

Prior to renewed drilling in Hole 504B, Leg 111 obtained four reliable samples of borehole waters, from depths of 466, 631, 766, and 1236 mbsf, at temperatures of 81, 101, 115, and 146 °C, respectively. These samples were collected 1233 days after the hole had been thoroughly flushed with surface seawater at the end of Leg 92, and were free of the bentonite mud contamination that affected Leg 92 samples.

The sampled borehole fluids show a strong vertical gradient in major chemical composition: Mg, SO_4, and (Na+K) decrease with depth, while Ca increases with depth. After a nitrate-based correction for seawater contamination, the concentrations of Mg, SO_4, (Na+K), Ca, and Cl in the borehole end-member of the deepest (146°C) sample are respectively 0.41, 0.00+, 0.97, 4.49, and 1.00 times the concentrations in the local ocean bottom water.

The changes in Ca and Mg from seawater values integrated over the entire depth of the hole were significantly less in samples from Leg 111 than in samples from Leg 83, despite the fact that there was a much longer time period since the last disturbance before Leg 111 than before Leg 83 (1233 versus 711 days). The Leg 111 samples fall on mixing lines between ocean bottom water and the borehole

Figure 3. Leg 111 geophysical measurements in Hole 504B. Left to right: bulk permeability measured by the packer experiment, fracture and total porosities determined from electrical resistivities, normative mineralogies and relative MgO and Al_2O_3 contents determined from spectral analysis of neutron activation logs, and magnetic inclination. Normative mineralogies were determined by recalculating elemental contents of Si, Al, Fe, Mg, and Ca into the normative components actinolite (ACT), chlorite (CHL), plagioclase (PLAG), clinopyroxene (CPX), olivine and smectite, assuming typical local compositions for the normative minerals. Normative plot units indicate the fraction (1 signifies 100 normative weight percent) of the rock formed by each normative component. Relative contents of MgO (MG) and Al_2O_3 (AL) are shown as counts, where 1 signifies the maximum observed. Average amount of MgO is 7 weight percent, and of Al_2O_3 is 22 weight percent. ST denotes the 18-m-thick stockwork-like unit.

end-member. These observations indicate that the chemical composition of the borehole water is controlled by vertical convection within the borehole and exchange of borehole water with the ocean bottom water that flows downhole and into the upper 100-200 m of basement. The combined effect of these two processes is to dilute the altered borehole water, changing its composition back toward that of seawater. The chemical data indicate that the convection of fluids within the borehole has apparently been more active since Leg 83 deepened the hole from 836 to 1350 mbsf.

As is mentioned above, drilling muds form an insignificant proportion of the borehole fluids. Shipboard XRD and chemical analyses indicated that iron oxide and hydroxide form more than 50% of the solids recovered in the borehole fluids, with the rest being mostly smectite and chlorite. An interesting Leg 111 finding is that the recovered solids contain remains of bacterial filaments similar in morphology to those of iron-oxidizing bacteria found in mounds rich in iron oxides on a seamount near the East Pacific Rise (Alt, 1986). It is likely that iron-oxidizing bacteria live in the upper basement section of Hole 504B, where convecting Fe^{2+}-rich borehole water mixes with oxygen-rich ocean bottom water.

Petrology and Geochemistry of Recovered Basalts:

The basalts recovered from Hole 504B during Leg 111 are all from massive dike units. Five chilled margins of diabase dikes were sampled. The basalts are aphyric to moderately- (+ highly-) phyric; aphyric basalts comprise about one-third of the total of 45 units described. Phases represented as phenocrysts include olivine, clinopyroxene, plagioclase, and rare chromian spinel. These occur together in a variety of assemblages including olivine + clinopyroxene and plagioclase + clinopyroxene, combinations not found in the basalts recovered during Leg 83. The following major crystallization sequence is postulated, based on petrographic observations and on preliminary experiments at one atmosphere carried out using Leg 83 basalts (Autio, 1985): spinel -- olivine -- olivine + plagioclase -- olivine + plagioclase + clinopyroxene -- olivine + plagioclase + clinopyroxene + Fe-Ti-oxides. The occurrence of olivine + clinopyroxene and plagioclase + clinopyroxene assemblages may be ascribed to either inadequate representation of samples by thin section and/or physical separation of phenocrysts during magma evolution and intrusion. However, the possibility that the Leg 111 basalts evolved in more than one way cannot be excluded at this stage.

Shipboard XRF analyses of 24 samples for major and trace elements indicate that the Leg 111 basalts are MgO-rich (>7.5 wt %), K_2O-poor (<0.02 wt %) olivine tholeiites. The Leg 111 basalts are similar to those recovered from the shallower basement section during previous legs. As has been noted on earlier legs, the basalts are extremely depleted in highly- to moderately-incompatible elements (Nb: 0.5-1.9 ppm; Zr: 38-58 ppm; Zr/Nb = 40-50).

Most of the rocks recovered during Leg 111 are only slightly altered (about 10-20% recrystallized), with olivine always totally replaced by talc + mixed-layer clays +

magnetite + sulfides or by chlorite + actinolite, pyroxene partly to totally replaced by actinolite + magnetite, and plagioclase replaced by chlorite + mixed-layer clays + albite + rare actinolite + zeolite.

However, variations in texture and flow of fluids along fractures produced locally more altered rocks (50-100% recrystallized). Veins and fractures are filled by secondary minerals in a consistent sequence: (1) chlorite + actinolite (+ spinel and pyrite); (2) quartz + sulfides and rare epidote; and (3) zeolite and prehnite. These stages may respectively represent (1) reaction with seawater at the spreading axis, (2) cross-cutting veins formed by evolved axial hydrothermal fluids, and (3) veins formed by off-axis, lower-temperature circulation (Alt et al., in press).

Despite the similarity of the Leg 111 and Leg 83 basalts, clinopyroxene is more extensively recrystallized than plagioclase in the Leg 111 samples, whereas the opposite is true in the Leg 83 dike samples. Moreover, in the Leg 111 section actinolite apparently increases with depth in proportion to the other secondary minerals. These observations suggest a possible increase in alteration temperature with depth, approaching the "lower actinolite facies" of Elthon (1981). However, the Leg 111 basalts are characterized by disequilibrium, reaching equilibrium only on a scale of a mm or less, so the use of a metamorphic facies concept must be further defined by chemical and isotopic studies.

<u>Logging Measurements and Vertical Seismic Profiles</u>:

During Leg 111, Hole 504B was logged with an exceptional suite of tools: Schlumberger ACT/GST neutron-activation/gamma-spectroscopy tool, Schlumberger DLL electrical resistivity tool, Schlumberger LDT/GPIT density/magnetometer tool, LDGO multi-channel sonic tool (MCS), and USGS borehole televiewer (BHTV). When calibrated against the properties of the recovered basalts, the logs yield a nearly continuous geophysical, geochemical, and lithological characterization of the basement, despite the relatively poor core recovery.

The ACT and LDT tools resolved the relative downhole abundances of the major elements Al, Ca, Fe, K, Mg, S, Si, U, and Th, and allowed the construction of a normative mineralogy log (Figure 3). The variation in log-determined geochemistry and mineralogy is a response to both the original chemistry of the phyric versus aphyric units and the presence of alteration products such as chlorite, actinolite, and clays. These logs show that the alteration products are tightly confined to fractures along boundaries between relatively unaltered extrusive or intrusive units of fairly homogeneous geochemistry. In particular, the basalts beneath the stockwork sampled at 910-930 mbsf during Leg 83 are more phyric and contain more Al than the basalts above the stockwork.

Both the MCS and the DLL clearly distinguished individual lithologic units. Deep in the dikes, compressional and shear velocities logged with the MCS reach 6.4 and 3.7 km/s, respectively, and electrical resistivity increases to over 1000 ohm-m. The BHTV revealed major breakouts in this otherwise massive section, and suggested that some of the drilling problems experienced here might have resulted from spalling of wall-rocks as stresses were relieved around the newly-drilled hole.

The DLL measures resistivities at two scales of penetration into the formation; comparison of the two measurements allows determination of both fracture and total apparent porosity. Total apparent porosity ranges from about 15% in the upper pillow lavas to less than 1% deep in the dikes, and apparent fracture porosity ranges from up to 5% in the pillow lavas to less than 0.5% in the dikes. The variation in the logged abundances of alteration products correlates with the apparent porosities calculated from resistivities, suggesting that some of the apparent porosity may represent original porosity that has been filled by alteration products. If this is the case, then the logged apparent porosities in the sealed pillow lavas of Layer 2B are probably too high, and there is probably a better correlation between permeability and true porosity than between permeability and apparent porosity.

The logged abundances of alteration minerals also correlate with changes in logged magnetic intensities. The logged magnetic inclination clearly changes at about 800 mbsf, from 15° in the pillow lavas above to 8° in the flows and dikes below. This observation is interpreted to indicate that the boundary between pillow lavas and dikes in Hole 504B is a relict of early listric faulting of the pillows over the dikes within the rift valley. Such a fault might have been the permeable conduit for circulating hydrothermal fluids that produced the heavily mineralized stockwork at the base of the pillow lavas.

A highly successful vertical seismic profile (VSP) experiment was conducted, shooting to a geophone clamped nearly every 10 m up the hole from 1535 mbsf. The results show two important reflectors that might be the contact between the dikes of Layer 2C and the underlying gabbros of Layer 3. These reflectors are about 100 and 450 m deeper than the present total depth of the hole, and are both within reach of the next full drilling leg to Hole 504B.

<u>Prospects for Future Drilling in Hole 504B:</u>

Leg 111 encountered very difficult drilling conditions in Hole 504B, probably because of a combination of several factors:

* an inability to completely flush cuttings from the very deep hole;

* the steady accumulation of steel junk in the hole;

* spalling of wall-rocks into the hole, around the coring assemblies;

* the dense, crystalline nature of the deepest dikes cored deeper than 1500 mbsf.

During Leg 111 drilling in Hole 504B, two steel rotary bits disintegrated after only 16-17 rotating hours each. Each of the these bits left all four of its roller cones in the hole, and a considerable amount of time and effort was devoted to fishing and milling this steel (as well as lost parts of two logging tools) from the hole. It was hoped that coring with a diamond bit would improve recovery, but a diamond bit could not be run until the hole was cleaned of all steel junk.

Unfortunately, when hole conditions finally allowed a diamond bit to be run near the end of Leg 111, part of this last coring BHA was left in the bottom of Hole 504B. A diamond core bit, float valve, lower support bearing, and inner core barrel were lost when the connection broke between the bit and the stabilized bit sub above. Leg 111 spent its last 5 days trying to fish the hole, and successfully recovered the inner core barrel and part of the lower support bearing. However, Leg 111 had neither the proper tools nor enough time to complete the hole-cleaning operation, and had to leave the hole to be cleaned on a later leg.

SITES 677 AND 678

The JOIDES RESOLUTION spent five days coring sedimentary sections in two holes at Site 677 and one hole at Site 678. Site 677 is located at a heat flow low 2750 m south-southwest of Hole 504B, and Site 678 is at a heat flow high 1360 m southeast of Hole 504B (Figure 1).

Two holes were drilled at Site 677, Hole 677A to basal sediments and altered basalt at 309.4 mbsf, and Hole 677B to 93.1 mbsf, offset 10-30 m from Hole 677A. The original drilling program at Site 677 had been to core two holes with the APC to refusal, then continue one of them to basement with the XCB. However, because time was short, the second hole, Hole 677B, was terminated when Pliocene sediment was first recovered, thus assuring a complete Pleistocene sedimentary section.

The time problem was more severe at Site 678, where Hole 678B was cored only at 0-7.5, 18.2-27.7, 95.5-105.0, and 169.5-171.8 mbsf, with intervening intervals being washed down. The last core recovered fragments of basal basalt. Hole 678A was abandoned after two successive failures to obtain a good mudline core.

Three major sedimentary units and a basal basalt unit are recognized at Site 677. Unit I consists of alternating clayey biogenic calcareous siliceous oozes and clayey biogenic siliceous calcareous oozes of early Pliocene to late Pleistocene age. Unit II is composed of siliceous nannofossil oozes and chalk of late Miocene to early Pliocene age. Unit III consists of cherty limestone and nannofossil chalk of late Miocene age, and Unit IV consists of iron oxide-and smectite-rich sediments intermixed with glassy basement basalts of late Miocene age. The sedimentary section at Site 678 may be divided into four similar units, although spot coring at this site makes precise comparison with Site 677 difficult.

The boundary between Pliocene and Pleistocene lies within Core 111-677A-9H (72.7-82.2 mbsf) and in Core 111-677B-9H (74.1-83.6 mbsf). The early/late Pliocene boundary is within Core 111-677A-17A. The Miocene/Pliocene boundary is placed in the middle of Core 111-677A-23X. The oldest sediment recovered in Hole 677A has an age of 5.6 to 5.9 Ma. The rate of sedimentation is surprisingly constant with a mean value of 42 m/m.y. over the last 5.6 m.y., although the first 0.3 m.y. of deposition had a much higher rate.

Unit IV in both Holes 677A and 678B consists of dark green and gray muds, intercalated with basalt pebbles and conglomerates, and calcite veins and aggregates. A 2 x 3 cm concretion of pyrite and marcasite was noted within the poorly indurated conglomerates from Hole 677A. Alteration of the basalts represents early diagenesis with very shallow burial, and possibly low pressure-low temperature hydrothermal processes. It is of special interest for interpretation of the pore water chemistry.

Pore waters were squeezed from the sediments including the smectite and iron oxide rich alteration products from the upper basement sections, at intervals of approximately 10 m in Holes 677A and 677B and at intervals of about 3 m in the spot cores of Hole 678B. The pore waters were analysed on board JOIDES RESOLUTION for major (Ca, Mg, SO_4, Cl) and minor (Si, NH_4, NO_2+NO_3, PO_4, H_2S) components. Except for the basal alteration products, sufficient amounts of pore waters could be squeezed from the sediments to provide split aliquots for shore-based analyses of stable isotopes of water, trace heavy metals, amino acids, and sugars.

In pore waters squeezed from sediments from Holes 677A and 677B, Ca and Mg maintain almost the same concentrations to about 110 mbsf as those in overlying ocean bottom water. Below that, to just above the smectite-rich alteration products, Ca slowly increases, while Mg decreases, respectively reaching concentrations approximately 2 and 0.7 times those in the ocean bottom water. However, Ca and Mg show drastic changes in concentration in the underlying basal alteration products of 14 m thickness; Ca increases to 7 times and Mg decreases to 0.2 times the concentrations in the ocean bottom water.

In the pore waters from the sediments of Hole 678B, Ca and Mg exhibit depth profiles that contrast sharply with those at the low heat flow site. Ca quickly rises to a concentration close to 5 times that in seawater in the topmost 40 m of sediment, and maintains that concentration down to the basement, where it again sharply increases to the same concentration as that encountered at basement in Hole 677A. Mg shows a correspondingly rapid decrease to nearly 0.15 of the ocean bottom seawater value within the upper 40 m of the Hole 678B sediments. In the basal altered basalt, almost the same concentration of Mg as in Hole 677A was found.

Profiles for NH_4, Si, and PO_4 are dominated by reactions in the sediments. All of these species except PO_4 show large gradients near basement at Site 677 and near the seafloor at Site 678, again showing the contrast between the sites. The alkalinity profile is also convex-upward at Site 678.

These observations clearly indicate that ocean bottom seawater flows down through the 300-m-thick sediment into basement at the low heat flow Site 677, whereas significantly altered seawater formed in basement upwells through the 180-m-thick sediment into overlying seawater at the high heat flow Site 678. The rate of these flows estimated from the depth-composition profiles is approximately a few mm/yr at both sites. However, the similarity in composition of pore water from the basal alteration products at both sites suggests that the advective flow rates in sediment are negligible compared to those in basement.

Several attempts were made to measure temperature-depth profiles at both sites, in order to verify advective flow rate of pore water obtained from the chemical gradients. However, battery failures resulted in only three acceptable temperature measurements in the upper 100 m at Site 677, from which the temperature at the sediment-basement contact is estimated to be roughly 60-70°C. The temperature profile at Site 678 could not be determined.

In spite of the limitations in time and problems with equipment, the coring and subsequent shipboard studies at Sites 677 and 678 unambiguously demonstrated that the ocean bottom water and sediment-covered basement still exchange materials and heat, though slowly, through localized advective discharge-recharge systems in the area of Sites 677/678, even though conductive heat loss predominates on a regional scale.

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SUMMARY OF LEG 112 RESULTS

Leg 112 drilling was planned to address both tectonic and paleoenvironmental objectives on the Peru continental margin (Figure 1). The timing and magnitude, both of the vertical movements of the leading edge of the continental block, and the truncation of this block and accreted sediment wedges, were the general tectonic objectives. The major paleoenvironmental objective was to learn about the evolution of the classical coastal upwelling regime and its response to global changes of climate and sea level. These objectives are intimately linked to each other in that the sedimentary sections in the forearc basins, which record coastal upwelling; have evolved through differential vertical tectonics of the individual basins. The drill sites that addressed the tectonic objectives were located to define the extent and age of the continental crust, its paleobathymetry, and the extent of accretion of oceanic sediments landward of the trench axis. The drill sites for the paleoenvironmental objectives were located beneath the strongest wind-driven upwelling areas of the Peru Current regime.

Following are the site summaries as sent from the ship by Co-Chief Scientists Erwin Suess and Roland von Huene at the end of each site. The Preliminary Report is being finalized, and will be distributed in February, 1987.

<u>SITE SUMMARY, SITE 679</u>
Latitude: 11°03.8′ S
Longitude: 78°16.3′ W
Water Depth: 451.2 m

Site 679 (PER-3) is positioned at the seaward edge of an outer shelf mud lens that forms under the influence of the Peru coastal upwelling system. Beneath this facies are sediments that extend seaward across the upper slope forearc basins to the outer continental margin. Coring at Site 679 thus sampled a record of coastal upwelling and of vertical tectonic motion associated with the Andean orogeny.

Five holes were drilled at Site 679. Hole 679A, an operational test necessitated by the shallow water depth, consisted of one core containing olive-green diatomaceous mud with abundant calcareous and phosphoritic interbeds. Hole 679B penetrated Quaternary olive-gray diatom-foram mud between 0-45 mbsf and Pliocene olive to black diatomaceous mud between 45-107 mbsf. Hole 679C, with 95% recovery, was dedicated to whole-round sampling. In Hole 679D the same stratigraphic sequence was drilled a third time with a similarly high rate of recovery. Below 107 mbsf, however, recovery declined within an upper Miocene unit of the same overall lithology of olive-gray to dark-gray diatomaceous mud, silt and fine sand but containing phosphorite, opal CT and dolomite layers. Induration and cementation eventually stuck the APC core barrel during a single attempt to improve recovery at 245 mbsf and the hole was abandoned. In Hole 679E coring was resumed at 245 mbsf and, though low recovery continued, a late Miocene series of light to dark gray mudstones and siltstones with calcite cementation was recovered. At 338 mbsf a change in lithology to a very dark gray shale marks a major unconformity

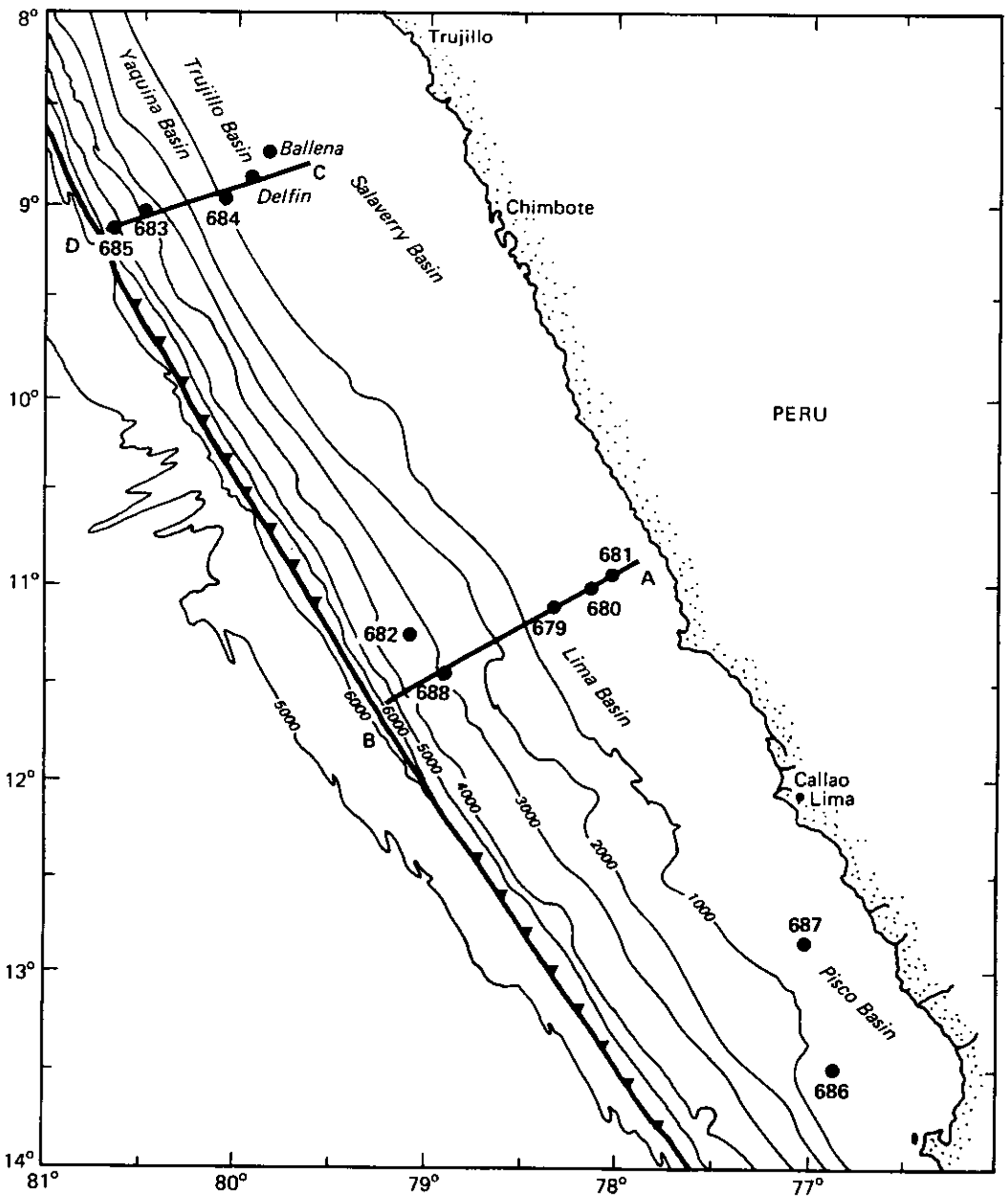

Figure 1. Site location map for Leg 112, Peru continental margin.

between the upper and middle Miocene, below which sonic velocities are higher, especially in a calcite-cemented section near the top. At the bottom of the hole this unit contained low concentrations of thermogenic hydrocarbons C3 to C6+, in addition to methane, within a thin silt layer and in traces disseminated throughout a dark gray shale. Thus, drilling was suspended about 100 m above the basement target. An excellent suite of logs gave no indications of unusual lithologies in unrecovered intervals and confirmed depths to major unconformities.

The section contains a condensed record of late Neogene and Quaternary coastal upwelling. The sedimentation rate of these organic-rich muds favors a chemical environment where abundant dolomites, phosphates and sulfides form during early diagenesis.
The middle Miocene unconformity separates this upwelling facies from a sequence with terrigenous or near-shore environmental affinities.

SITE SUMMARY, SITE 680
Latitude: 11°03.9′ S
Longitude: 78°04.6′ W
Water Depth: 263.8 m

Site 680 (PER-3A) is centered on an east-west transect of three sites across the coastal upwelling deposits of the Peruvian outer shelf and upper slope. Coring at Site 680 thus sampled a detailed record of coastal upwelling, for investigation of vertical shifts in the depth of the oxygen minimum layer through time and seaward-landward shifts of upwelling centers in response to Pleistocene sea level fluctuations.

Three holes were drilled at Site 680. At Hole 680A, 81.2 m of core were recovered from 93.8 m (total depth) of thinly laminated Upper Quaternary dark olive green foraminiferal-diatomaceous muds and sandy silts in graded layers. At Hole 680B, the same Upper Quaternary sequence was piston-cored with excellent recovery to a depth of 92 mbsf. Poor core recovery was obtained during rotary drilling with the XCB to the Miocene/Pliocene boundary just above total depth in Hole 680B at 195.5 mbsf. Feldspathic clastic sediments associated with beds of phosphatic conglomerates and sands are characteristic lithologies of the Pliocene unit. Four cores were drilled in Hole 680C with 100% recovery before the hole was terminated due to sandline failure. Samples from this hole were designated for geomicrobiological and organic geochemical studies.

At Site 680, all stages of dolomite and calcite formation, phosphate replacement, and early silica diagenesis were common. Dolomite is the predominant authigenic phase and was first found only 0.79 m sub-bottom as disseminated rhombs. Phosphates occur in all units as thinly laminated beds of friable carbonate-fluor-apatite, concentrated in diatom laminae, and as dark, dense peloids typically in sandy and conglomeratic strata. Bedded opal-CT chert, pyrite, and calcite are other authigenic phases common at Site 680. This sediment sequence and its pore water and dissolved gas chemistries reveal considerable early diagenetic activity which appears uniquely affected by ascending saline pore fluids also discovered at Site 680. Salinities, chlorinities, and other dissolved major ions in pore waters of these Upper Quaternary sediments increased to more than twice the concentrations of normal seawater at 195.5 mbsf.

Conceivably, replenishment of dissolved sulfate from these fluids might inhibit microbial methanogenesis and promote sulfate reduction much beyond the depth normally seen in organic-rich sediments. Likewise, replenishment of magnesium and calcium might control dolomitization.

The section recovered contains a Late Neogene and Quaternary record from the center of the Peruvian coastal upwelling regime with well-preserved and abundant diatom floras. In this environment, the sediment undergoes unique early diagenesis controlled by an influx of highly saline pore fluids which promote the widespread formation of organic dolomites for which the Peruvian continental margin is well known.

SITE SUMMARY, SITE 681
Latitude: 10°58.6′ S
Longitude: 77°57.5′ W
Water Depth: 150.5 m

Of the three sites (679, 680, and 681) along the east-west transect crossing the upwelling deposits of the Peruvian shelf and upper slope, Site 681 (PER-1) is the most landward target and consequently in the shallowest water. It is also located closest to the origin of coastal upwelling centers around the headlands near 11oS and its depth nearly coincides with the top of the oxygen minimum zone. Thus, at Site 681 an expanded Quaternary record was obtained for studies of temporal changes in the main upwelling parameters sea surface temperature, salinity, bio-productivity and oxygen.

Three holes were drilled at Site 681. Hole 681A penetrated to 187.0 mbsf and recovered >90% of the sediment record to 139.5 mbsf. The section to this depth consists of repeated sequences of dark olive gray diatomaceous mud with laminae of diatom ooze and massive dark gray terrigenous muds with some degree of bioturbation. Below 139.5 mbsf to the bottom of Hole 681A at 187.0 mbsf, the poorly recovered section is dominated by dark gray silty sand with sparse units of diatomaceous mud. Throughout the section recovered at Site 681 authigenic dolomite was found as rhombs, nodular and blocky horizons, and thinly bedded layers. Friable yellowish phosphorites and dark nodular phosphorites attested to in-situ formation and reworking, respectively, as the mechanisms for concentrating carbonate-fluor-apatite at certain stratigraphic horizons. In Hole 681B the same Quaternary sequence was piston-cored with excellent recovery to 143.5 mbsf. The Brunhes/Matuyama boundary and the Blake event were located in both holes and numerous floral and faunal markers and phosphorite lag deposits facilitate chrono- and litho-stratigraphic correlation between Holes 681A and 681B. At Hole 681C, the drill crew set a record for drilling operations aboard JOIDES RESOLUTION when 10 APC cores were brought on deck within two hours. The samples from this hole were used to complete whole-round sampling for geomicrobiology, organic geochemistry, and physical properties projects which had been cut short at the previous site.

The sediment, its pore water, and dissolved gas chemistries reveal considerable early diagenesis affected by highly saline pore fluids similar to the previous site, 680. Chloride and other dissolved major ion contents at the bottom of Hole 681B increased to concentrations twice those of seawater. The distinctly higher rate of sedimentation at Site 681, as compared to Site 680, drives microbial sulfate reduction to completion at 25 mbsf and a zone of methanogenesis develops between 25 and 85 mbsf. Below this depth, methanogenesis is inhibited again by sulfate replenished from the subsurface brine. The dolomites forming within this lower zone of sulfate reduction should record a distinct "brine" signature in their stable isotope composition.

The section recovered contains a high-resolution Quaternary record of the Peruvian coastal upwelling regime with well-preserved and abundant diatom floras in laminated muds alternating with bioturbated silty muds. The frequency of alternation appears similar to that of major glacial/interglacial cycles. The large amplitudes of sea level fluctuations have not erased the upwelling record at Site 681 because tectonic subsidence maintained optimal water depth during deposition.

SITE SUMMARY, SITE 682
Latitude: 11°15.99′ S
Longitude: 79°03.73′ W
Water Depth: 3801 m

The objective of Site 682 (PER-8) was to determine the extent and nature of crust underlying the lower slope of the Peru Trench. Although the basement was not penetrated at Site 682, the overlying lower slope section is continental because the cores contain Eocene through Quaternary terrigenous slope sediment. The site was on part of the Peruvian continental margin prior to the Andean orogeny rather than on an element accreted during that orogeny.

The litho- and biostratigraphy of the 437 m penetrated records three tectonic/paleoceanographic environments. The first 267 m record diatomaceous sedimentation that began in the middle Miocene. The sediment that accumulated in a typical continental slope environment consists of mud and materials derived from upwelling systems up-slope. These sediments contain the diagenetic products associated with "upwelling" sediment except phosphorites. The benthic foraminiferal assemblages lived near the present water depths. Paleontological evidence indicates a relatively brief hiatus at the Miocene/Pliocene boundary (110 mbsf) associated with a spectacular zone of slump folds and a change in the reflectivity of seismic horizons. The underlying upper Miocene diatomaceous mudstone is more consolidated, fracturing readily and deforming brittly. The benthic foraminiferal assemblages lived at middle rather than lower bathyal depths. Approximately 30 m below the hiatus the sediment is composed of displaced lower Miocene nannofossils, benthic foraminifers, and a mixed assemblage of diatoms eroded from an area upslope observed in seismic records. These transported components were noted through part of the upper and upper-middle Miocene to about 275 mbsf. A zone of poor recovery yielding only gravel marks another abrupt increase in consolidation of the sediment.

The second sequence (320-387 mbsf), a section of lower to middle Miocene mudstones, is texturally coarser, more terrigenous, and less diatomaceous than those above. The inhomogeneous lithologies indicate a varied continental slope environment. The benthic foraminiferal assemblages are of middle bathyal affinities.

A major hiatus that probably includes most of Oligocene time separates the second and third sediment sequences. Rare clasts indicate proximity to continental basement and the recovery of only gravel corresponds in character to the high-amplitude and broken reflections observed in seismic records. This rough reflective zone, interpreted as basement during site selection, extends at least 10 km across the slope. The extent as well as the 15 m.y. gap indicate an important unconformity perhaps associated with the lowered sea level during the Oligocene. The middle and upper Eocene rocks below this hiatus are silty mudstones and sandstones locally cemented by authigenic carbonate. These rocks exhibit pervasive scaley fractures as well as deformation in a semi-lithified state. Thus, in addition to deformation from down-slope remobilization, there is also a tectonic imprint of deformation from deeper faults. Transported elements include shallow water and Cretaceous nannofossils. The in-situ benthic foraminiferal assemblages lived at upper to upper-middle bathyal water depths.

The presence of gas-hydrate below about 60 mbsf is inferred from (1) increase of chlorinity above the part of the sedimentary section characterized by high concentrations of methane, which is attributed to enrichment of dissolved ions in a residual brine during the formation of the hydrate, and (2) decreasing salinity and chlorinity in pore waters with depth. Although evidence for the presence of gas-hydrate was found in the pore-water chemistry, hydrate was not visually observed. The hydrocarbon gases show an overall decrease in the methane/ethane ratio in a manner normal for deep sea sediment. However, three isolated abrupt decreases in the ratio were encountered. It was concluded that below some threshold drilling rate, heat from the drill bit friction thermally alters the sediment organic matter. Hydrocarbons are produced artificially, some of which do not normally occur in a natural environment.

SITE SUMMARY, SITE 683
Latitude: 09°01.69′ S
Longitude: 80°24.40′ W Water
Depth: 3071.8 m Hole 683A
3076.6 m Hole 683B

Site 683 (PER-14) was chosen to investigate the history of vertical tectonic movement of the Peruvian continental margin along the northern of two transects. Objectives at this site were to recover metamorphic basement at an estimated depth of 600 mbsf and to extend the regional stratigraphy. Based on published ages assigned to sediments in the Ballena and Delphin industry wells (to the seaward flank of the Yaquina Basin), the sediments seen in seismic record CDP-2 at the location of Site 683 were interpreted as a thin Neogene sequence to a depth corresponding to 0.2 sec two-way travel time underlain by landward- dipping irregular reflectors of inferred Eocene age, extending from 0.2-0.5 sec sub-bottom depth. The location appeared ideal to recover samples of metamorphic basement unconformably overlain by sediment recording vertical tectonic movement.

Drilling showed that these age assignments for the Yaquina Basin sediments were incorrect. Hole 683A was cored from 0.0-419.2 mbsf; Hole 683B was cored from 402.5-488.0 mbsf. The sequence recovered is mostly of Neogene age, and the top of the basement reflections corresponds to Eocene mudstone. The unconformity and associated hiatus that separates these stratigraphic units encompasses the Oligocene and early Miocene. The results show that tectonic events on the northern transect off Peru are coeval to those established on the southern transect at Sites 679, 680, 681, and 682.

The sedimentary sequence recovered at Site 683 consists of three units: Quaternary-Pliocene diatomaceous mud with minor calcareous mud and turbidites, poorly indurated middle Miocene diatomaceous mudstone and volcanic ash, and well-indurated middle Eocene mudstone with minor volcanic ash, dolomite, and limestone. The boundary between the upper and middle units is marked by the middle Pliocene to middle Miocene hiatus, while the boundary between the middle and lower units is the major biostratigraphic hiatus between middle Miocene and middle Eocene. The sediments record a history of continuous hemipelagic sedimentation, with almost continuous volcanic activity peaking during the middle Miocene. Repeated cycles of upwelling-related sedimentation alternating with more terrigenous sedimentation are recognizable in the upper part of the Quaternary. Moderate to extensive bioturbation throughout the section suggests that bottom waters remained oxic. Structures within the sediments reveal a history of soft sediment deformation related to downslope creep and slumping, followed by extensional microfaulting, and minor compressional microfaulting.

The sediments at Site 683 show all of the early diagenetic processes previously seen at Site 682, but overall the reactive zones are more readily discernible and reaction pathways less ambiguous. Gradients of dissolved chemical species are steeper, maxima and minima of Ca, Mg, and alkalinity, involved in carbonate mineral diagenesis, are more pronounced, and authigenic calcite and dolomite phases appear more abundant. The zone of sulfate reduction is compressed towards the sediment/water interface (<20 mbsf), as is typical for rapidly accumulating organic carbon-rich sediments. Methanogenesis dominates throughout the remainder of the hole. Calcite precipitates first near the base of the sulfate reduction zone. This causes the Mg/Ca molar ratio to increase dramatically to around 13, the highest value ever reported for non-evaporitic environments. Consequently, highly favorable conditions for rapid dolomitization prevail. With increasing dolomitization at increasing depth the Mg/Ca ratio decreases to a value <2, again favoring calcite formation. Generations of micritic dolomite layers and authigenic calcite cements throughout the sequence support the proposed reaction sequence.

Gas hydrates should form from the high biogenic methane contents generated below the thin sulfate reduction zone at Site 683. Characteristic dissolved chloride profiles signal the presence of methane hydrates, though none were observed. A significant chloride maximum at around 50 mbsf is believed to reflect salt exclusion during gas hydrate formation. This chloride maximum advances above the gas hydrate front by diffusion as previously suggested at Site 682. Chloride decreases gradually below this maximum to 454 mM (= 80% of seawater value) at 452 mbsf. This is attributed to fresh-water dilution from dissociation of gas hydrates.

Although basement was not

reached at Site 683, the overlying sediment is a typical continental sequence displaying a lithostratigraphy and geochemistry not normally found in open ocean basins. This sediment was deposited before the Andean Orogeny and thus the site overlies crust attached to the continent rather than an oceanic element tectonically accreted at the front of the Andean convergent margin.

SITE SUMMARY, SITE 684
Latitude: 08°59.49′ S
Longitude: 79°57.35′ W
Water Depth: 426.0 m

Site 684 (PER-10), the northern point of a transect along the Peruvian coastal upwelling regime, is located in a sediment pond on the upper slope in an area otherwise devoid of sediments. Drilling at Site 684, in concert with the other sites along the transect, provides a record of the latitudinal variability of upwelling parameters. The samples document the differentiation of the "upwelling" facies by reworking of the poleward-flowing undercurrent. Pore waters, gases, and sediments at Site 684 yield data on the distribution, source, and impact on early diagenesis of hypersaline fluids. These fluids were discovered in the subsurface of the Peru outer shelf at Sites 680 and 681.

Three holes were drilled at Site 684. Hole 684A was cored to 136.2 mbsf, first using the APC with >95% of core recovery to 69.6 mbsf, and then using the XCB, with poorer recovery, for the remainder of the hole. The change in coring tools was necessitated by frequent dolomite layers interbedded with diatomaceous silty muds. At 684B these dolomite layers were not penetrated and the hole was terminated at only 55.0 mbsf. Hole 684C was cored in the APC mode, again yielding maximum recovery above the massive dolomite layers, and in the XCB mode to 115.0 mbsf below it with moderate recovery. Excellent cross-correlation was established between holes based on litho- and biostratigraphic markers.

Two hiatuses are recorded at Site 684. The first at 13.5 mbsf separates <0.9 Ma-old well-laminated olive and gray diatomaceous muds interbedded with coarse calcareous, phosphatic and terrigenous beds from underlying 2.5 to 4.5 Ma-old Pliocene bioturbated dark to olive gray mud with micro- and macrofossil-bearing units. The second hiatus at 56.2 mbsf in Hole 684A (59.5 mbsf in Hole 684C) separates these Pliocene deposits from >7.8 Ma-old Miocene olive gray nannofossil-bearing diatomaceous mud with laminated and mottled beds to the bottom of the holes. The late Quaternary environment is characterized by well-preserved floral "upwelling" assemblages. In the lower section, normal graded beds of shell debris, foraminifers, bone fragments, glauconitic and phosphatic grains are interlayered. These are indicative of deposition during lowered sealevel either due to repeated glacial retreats within one deglaciation event or to multiple major glacial events. The Pliocene depositional environment was in shallow water outside the influence of coastal upwelling, because bioturbation, erosional contacts and coarse-grained beds are prevalent.

Diagnostic floral "upwelling" assemblages are absent. The Miocene "upwelling" environment is characterized by frequent blooms of diatoms and coccoliths which show little evidence of reworking. They are indicative of high nutrient supply to surface waters during brief and alternating cold and warm phases.

Dolomite, calcite, and phosphate formation and phases of diagenetic replacement reactions are common. Dolomite is the predominant authigenic phase. It occurs as disseminated rhombs and massive layers, conspicuously frequent at the Pliocene/Miocene hiatus, but also throughout the Miocene section. Phosphates occur in all units as thinly laminated beds of friable carbonate-fluor-apatite, concentrated in diatom laminae, and as dark, dense pellets typically in sandy strata. A hypersaline brine was present in the subsurface at Site 684. Chloride and dissolved major ion contents at the bottom of Hole 684C increased to concentrations twice those of seawater. Microbial sulfate reduction and methanogenesis, as the important driving mechanisms of diagenesis, respond quickly to the brine influx.

The section recovered contains portions of late Quaternary, middle Pliocene, and late Miocene records of the coastal upwelling regime. The sediments underwent early diagenesis which was affected by an influx of highly saline pore fluids. This promoted the widespread formation of dolomites. The areal extent of the subsurface brine over the Peru shelf appears enormous, and studying its origin remained a challenging objective for future sites of Leg 112.

<u>SITE SUMMARY, SITE 685</u>
Latitude: 09°06.78′ S
Longitude: 80°35.01′ W
Water Depth: 5070.8 m

Site 685 (PER-17), on the lower slope of the Peru margin, is located about 1200 m above the trench floor. The main objective here was to establish the nature and the age of the transition between the accreted sediments at the front of the margin and the continental crust drilled previously. The frontal part of the transition is inferred at a landward-dipping boundary that transects the upper plate. We sampled landward-dipping reflectors 1 km downslope where thinner slope deposits allowed ample drill penetration.

The two main lithologies in the 468.6 m cored were slope deposits and the accreted complex. The slope deposits (0-200 mbsf) consist of an 80-m-thick diatomaceous mud with small normal faults, overlying a diatomaceous mud with folding, locally developed fissility, and a fabric that cuts the beds at high angles. Fossils are of Pleistocene age and most are transported from the shelf; the age range is well constrained and yields a sedimentation rate of 100 m/m.y.

A hiatus with a minimum duration of 4.3 m.y. separates the lower Pleistocene slope deposits from the lower upper Miocene accreted complex. The dominantly diatomaceous mudstones are variably calcareous. In the upper part the rocks show a moderate to strong scaly fabric parallel to the dipping beds. Toward the bottom of the cored section the well-lithified parts are intensely fractured and show compressional structures. The apparent bedding dips cluster between 45° and 60°, whereas those of the reflections in the seismic record are 10° to 20°, thus indicating tectonic thickening. The hole bottomed in sand and sedimentary breccias with Eocene to upper Miocene clasts. The lower unit has a transported fauna, and diatom assemblages are from a single zone (6.1-6.8 Ma). A minimum rate of sedimentation not corrected for tectonic thickening is about 250 m/m.y., but only half of the thrust packet was penetrated.

Methane gas hydrate was recovered at 99 mbsf and was visually observed to 165 mbsf, consistent with the shallow generation of biologic methane at only 11.6 mbsf. Total organic carbon contents are lower at this site than at the other Leg 112 sites, because of dilution by rapid rates of sedimentation. This rapid sedimentation is responsible for extreme concentration gradients of chemical species dissolved in pore water. Maxima in alkalinity (156 mM), phosphate (0.826 mM), and ammonia (31.7 mM) are the highest reported during ODP. Despite the extreme concentration gradients, the amounts of diagenetic minerals that form per unit volume of sediment is small. When sedimentation rates are high and convective flow is impeded, the system rapidly closes and shuts off the essential depleted reactants needed to replenish diagenetic reactions.

The stratigraphy and structure cored is consistent with the accretionary structure in the seismic section. The late Miocene change from non-accretion to accretion along the Peru Trench occurs after the Nazca Ridge was subducted at the latitude of the site and during increased sedimentation.

<u>SITE SUMMARY, SITE 686</u>
Latitude: 13°28.81′ S
Longitude: 76°53.49′ W
Water Depth: 448.2 m

Site 686 (PER-4), the southernmost point of the paleoceanographic N-S transect along the outer Peru shelf, is located in the West Pisco Basin. This site was selected to obtain a high-resolution record of upwelling and climatic history from Quaternary and possibly Neogene sediments, to calculate mass accumulation rates of biogenic constituents from an upwelling regime, and to document in detail early diagenetic reactions and products specific to the coastal upwelling environment. Diagenetic reactions over the entire shelf and upper slope off Peru are influenced by a saline brine which extends throughout the subsurface over an enormous area. New data on the distribution and chemistry of this brine were obtained which will help understand its source and the full impact of this phenomenon on early diagenesis.

Two holes were drilled at Site 686. Hole 686A was cored to a total depth of 205.7 mbsf using the APC to 64.7 mbsf, followed by the XCB. Hole 686B was cored using the same drilling combination to 303.0 mbsf. In both holes overall core recovery was very good (80%); several sand layers, however, were moderately well recovered. Cores from both holes were readily cross-correlated based on litho- and biostratigraphic markers as well as on physical index properties.

The sediments at Site 686 consist of diatomaceous mud. Three major laminated intervals alternate with three bioturbated intervals. All sediments recovered are of Quaternary age and comprise six lithologic units. The bioturbated intervals commonly contain silty, sandy and shelly beds, whereas the laminated intervals are more phosphoritic, in the form of friable phosphate layers. Dolomites are common in all units except in Unit I between 0-16 mbsf, which is a laminated diatomaceous mud with peloidal phosphorites. The major cyclic sequences contain numerous smaller alternations between bioturbated and laminated diatomaceous muds. These cycles may record fluctuations in sea level and the position and intensity of the oxygen minimum zone. Diatoms could be grouped into floras indicative of strong coastal upwelling, intermediate coastal upwelling, and low intensity coastal upwelling with oceanic admixtures. At least three prolonged phases of intense coastal upwelling appear coincident with lithologic Units 1, 2 and 3. Superimposed on these major and minor cycles is a clear tectonic trend of deepening of the depositional environment of the West Pisco Basin during the time from 1.5 Ma to the present. Benthic foraminiferal assemblages record four successively deeper habitats from shelf edge (50-100 m) at the bottom of the holes to upper middle bathyal depths (500-1500 m) near the surface. The basin subsidence rate is approximately 150 m/m.y.

The diagenetic sequence of calcite formation followed by dolomitization, ubiquitous along the Peru margin, is also recognized at Site 686 and is reflected in maxima and minima of dissolved calcium and magnesium profiles. A subsurface brine, clearly seen in a chloride anomaly, continually replenishes Ca and Mg used up in carbonate mineral formation. At Site 686 the brine is loaded with large quantities of dissolved ammonia and phosphate and depleted in sulfate, unlike along the transect at 11°S. This is thought to reflect the brine's history in passing through organic-rich sediments which undergo mineralization by sulfate reduction and injection of dissolved metabolites.

The cores from Site 686 contain all the components of a well-developed and variable coastal "upwelling" facies of Quaternary age. The sediment record is expanded in time, continuous, and reveals low-temperature diagenetic reactions typical of organic-rich environments, particularly of dolomitization. These diagenetic reactions are strongly influenced by a saline subsurface brine.

<u>SITE SUMMARY, SITE 687</u>
Latitude: 12°51.78′ S
Longitude: 76°59.43′ W
Water Depth: 306.8 m

Site 687 (PER-2) is located on the seaward flank of the tectonically stable Lima Platform which, in this area, forms the eastern and southern boundary of the Lima Basin. It was selected to obtain from shallow water a high-resolution record of Neogene/Quaternary upwelling and climatic history, to evaluate the role of the oxygen minimum on organic matter burial, and to document in detail early diagenetic reactions and products specific to the coastal upwelling environment.

Two holes were drilled at Site 687. Hole 687A was cored to a total depth of 207.0 mbsf using the APC to 55.0 mbsf followed by the XCB. Hole 687B was cored using the same operational drilling combination to 195.3 mbsf. In both holes overall core recovery was moderate (50%); several thick sand intervals, however, were poorly recovered (<20%). Cores from both holes could readily be correlated based on litho- and biostratigraphic markers.

The sediment at Site 687 consists of diatomaceous mud with large compositional and textural variations. The compositional variation reflects different proportions of authigenic dolomite and calcite as well as biogenic, mainly foraminiferal and molluscan, calcium carbonate. The textural variation is due to sand and silt contents which are higher at Site 687 than anywhere else along the paleoceanographic transect off Peru. Indeed, lithologic units are subdivided by the frequency of sand and silt interlayers. These units display a trend from laminated intervals with little textural variation and rare bioturbation to laminated and bioturbated intervals containing more frequent sand beds. Accordingly, the environment of deposition at Site 687 is thought to have changed over the past 2.5 Ma from one equivalent to the present water depth to a shelf environment and back again to upper slope depths. These changes are supported by assemblages of benthic foraminifers which also indicate low oxygen contents for the deep habitats. In all sections diatom floras were found characteristic of different intensities of coastal upwelling and fertility. At least five prolonged phases of intense coastal upwelling and high productivity occur during shallow and deep water periods at Site 687.

Diagenetic products are very common throughout the cores of Site 687. Of these, friable phosphates occur only in diatomaceous mud units, but dense phosphate peloids are present in all lithologic units, especially as conglomerates at the base of erosional contacts. Authigenic calcite and dolomite are both abundant in the sediment as disseminated crystals in unlithified sands, silts, or muds and as fully lithified nodules and beds. The first dolomite bed occurs below the zone of sulfate depletion and coincides with an increase in methane. In this zone biogenic methane is accompanied by persistent and anomalously high ethane contents, the source of which is unclear. A subsurface saline brine is evident in a strong chloride anomaly. There are subtle differences in the Ca, Mg, alkalinity, NH3, and PO4 profiles affected by the brine between Sites 686 and 687. These are related to the rates of sedimentation, rates of authigenic mineral formation, and loading of metabolites. The loading of metabolites is thought to occur during the brine's subsurface passage through organic-rich sediments which undergo decomposition by sulfate reduction.

SITE SUMMARY, SITE 688

Latitude: 11°32.26′ S
Longitude: 78°56.57′ W
Water Depth: 3819.8 m

The three distinct sedimentary sequences encountered in the 770 m of sediment penetrated at Site 688 (PER-8A) record sedimentation in progressively deeper water on the continental margin from early Eocene to Quaternary time. The first sequence consists of 339 m of bioturbated Quaternary diatomaceous mud. Common terrigenous turbidites in the top 66 m evidence transported sediment input. Benthic foraminiferal assemblages within the diatomaceous mud indicate deposition at present water depths. From 75 to 312 mbsf the sediment is a uniform black color that is associated with a significant pyrite and iron monosulfide content. Biostratigraphic data indicate sedimentation rates of around 300 m/m.y.

The second sedimentary sequence (339-592 mbsf) consists of diatomaceous mud of early Miocene to Pliocene-Quaternary age. A hiatus separates the

Quaternary and Pliocene sections. Finely laminated sediment of alternating diatomite and mudstone with associated minor phosphorite is present in the late Miocene and Pliocene-Miocene sections. This upwelling facies association is similar to that of contemporaneous sediments found in the onshore Pisco Basin section. Upper-middle bathyal benthic forams indicate deposition of the Miocene sequence in water depths of about 500-1500 m. Throughout the Pliocene-Miocene sequence, pervasive soft sediment deformation is evident. Sedimentation rates for the Miocene section are approximately 23 m/m.y.

A marked lithological change to diatom-free calcareous sediment rich in terrigenous clastic detritus occurs at 593 mbsf. This coincides with a 21.5 m.y. hiatus between middle Eocene and earliest Miocene time. The sediments recovered from 593 to 659 mbsf are predominantly gray, poorly sorted, carbonate-cemented quartzo-litho-feldspathic sandstones interbedded with sandy siltstone and black mudstone. Benthic foraminifers indicate middle to upper bathyal water depths. The early Eocene sequence from 678 to 745 mbsf includes transported plant matter, coarse pebbly layers and bioclastic material. Towards the base of this unit, calcareous mudstone and sandstone and silty, bioclastic limestone contain well-preserved mollusc shells. Benthic foraminifers and nannofossil assemblages indicate shelf depths of deposition. Interbedded sandstone, siltstone, and mudstone with abundant plant material and forams indicating shelf depths of deposition occur from 764 to 769.5 mbsf. A chert pebble at this level contains a planktonic foraminiferal fauna of Cenomanian age identical to faunas of Albian to Cenomanian limestones and cherts found in the Central Andes and in the onshore Talara Basin. Sedimentation rates for this part of the Eocene are approximately 12 m/m.y.

The most extreme chemical gradients and concentrations in ammonia, alkalinity, and phosphate found during Leg 112 (as well as during the entire history of ocean drilling) occurred at Site 688. In addition, this site contains one of the best-documented occurrences of gas hydrates found at surprisingly shallow depth. The hiatus at 350 mbsf marks the boundary between the signals from two different regimes of interstitial water. A distinct freshening was observed below 350 mbsf, which may be caused by dilution with water originating from dewatering of subducted sediment or the accreted wedge.

ODP ENGINEERING REPORT

NAVI-DRILL CORE BARREL (NCB)

The prototype NCB2 coring system fabrication is nearly complete. Surface-set and impregnated diamond core head designs have been reviewed and other required buy-out components identified. A detailed drilling test plan for the system has been developed and reviewed by Institute of Petroleum Engineering (ITE) in Clausthal, Federal Republic of Germany. Necessary ODP outer core barrel test equipment has been shipped to Germany. Hydraulic and drilling tests are scheduled for January 1987. Sea trials will be conducted on Leg 114 (March-May 1987).

DRILL STRING INSPECTION

A metallurgical failure analysis was performed on a broken non-magnetic drill collar. The conclusion was that cracking on the inside diameter (I.D.) at the pin connection significantly weakened the connection which subsequently failed due to overload. The cracks were visible to the naked eye in the region of the pin close to the failure surface. The cracks were the result of stress corrosion cracking common to "sensitized" stainless steel exposed to stress in a chloride environment. Ideally, stainless steel used in these conditions is not "sensitized". The drill collars made from these highly non-magnetic alloys are unavoidably sensitized during their thermal strengthening process. The oil industry has had similar problems with 10-20% of all such drill collars. Fabrication techniques and material changes have been developed that alleviate the problem. ODP has requested quotes on the recommended non-magnetic alloy drill collars fabricated from SCC-resistant materials.

The re-inspection of down-graded drill pipe returned to TAMU confirmed all results obtained during the port call inspection in Barbados. Several joints of especially pitted pipe were selected for further analysis in the upcoming months. They will be sectioned and examined on the I.D. by more exhaustive techniques to calibrate the readings of pit depth and wall loss achieved from the standard inspection. Also, potential cracks in the base of the largest pits will be sought. Inspection of the DSDP-vintage S-135 pipe had to be delayed until the pipe rubbers could be removed.

HIGH TEMPERATURE DRILLING

The Los Alamos National Laboratory has responded to ODP's request for a proposal to analyze steam flash conditions while drilling into an ocean hydrothermal system. The objective of the analysis is to determine pressures, flow rates and temperatures assuming unrestricted flow through the drill pipe. A report will be prepared summarizing the expected effects on operations including safety considerations. Operating fluid temperatures will be set at 300°C, 400°C and 500°C.

Attempts to modify the Los Alamos National Laboratories wellbore heat transfer (WBHT) code from its present 350°C limit to 500°C was not successful. An alternate finite element code was available and it is being modified at Los Alamos to provide for 500°C temperature simulation capability.

LOCKABLE FLAPPER FLOAT VALVE (LFV)

Final shore tests of the lockable float valve were completed at the ODP Engineering Test Facility during December, 1986. Different XCB/HPC inner barrel core heads were cycled through the lockable float valve. To further test system compatibility, different combinations of lockable float valve internal hardware, including latch springs and balls, were subjected to cycling tests. Some of the tests were done in a mixture of sand and water. Minor modifications were made to the shore test prototype to optimize performance. The lockable flapper functioned successfully in all tests.

Two sea trial prototypes of the LFV were fabricated for testing on Leg 113. Downhole testing will be conducted as time allows during APC/XCB coring operations on Leg 113. Successful operation of the LFV will enable open-hole logging to be performed at any stage of an APC/XCB hole without the necessity (and expense) of a bit release.

LOGGING AND SANDLINE SAVER TOOL

A set of "off the shelf" downhole logging/sandline cutters were put on the ship for Leg 112. In the event the logging line becomes fouled, preventing the logging tool from being pulled back into the pipe, the logging/sandline cutter can be dropped down the drill pipe over the line and landed in the bottom hole assembly. An explosive charge contained within the tool is detonated actuating a mechanism that cuts the logging line. The logging line can then be retrieved, eliminating a time consuming and costly wireline cutting and stripping operation. The tool can also be used to cut sandlines which become fouled down hole.

A modified version of the conventional sandline cutter is currently being developed. The new tool, in addition to cutting the line, will clamp the line firmly below the severing point to hold the logging tools after the line is cut, allowing the tools in open hole to be retrieved to the surface as the drill pipe is tripped out of the hole. A prototype of this crimping tool should be ready for testing by the middle of February, 1987.

MINING-TYPE CORING SYSTEM

A study has been initiated to determine the feasibility of deploying a diamond coring system as in use by the mining industry. In this system, parallel wall drill rods and a wireline core barrel could be run using the drill string as a riser. The inner barrel with the core would be brought up by means of an over-shot assembly, while the drill pipe and the outer core barrel with the diamond bit remain in the hole. The system could be rotated by a top drive system from the ship or by use of a downhole mud motor. Standard wireline core barrels in use by the mining industry have core block indicators or anti-jam features. The wireline system has not been standardized throughout the mining industry yet, so all parts would have to conform to one particular manufacturer's design. Currently under review are systems fabricated by Longyear and Christensen. Further contact will be made to review the operational experience gained by diamond drilling contractors in coring highly fractured igneous rocks.

WIRELINE SERVICES CONTRACTOR REPORT

The following report was compiled from ODP monthly technical progress reports from the Borehole Research Group at Lamont-Doherty Geological Observatory and from the Preliminary Report from Leg 111. For further information contact either Roger Anderson or Rich Jarrard of the Borehole Research Group, LDGO, Palisades NY 10964.

SUMMARY OF LOGGING RESULTS FROM LEG 111

Almost 14 days of logging were completed at Hole 504B. Logging operations at Hole 504B overcame the technical difficulties of logging at temperatures up to 152°C and recovered a comprehensive suite of high quality downhole measurements. Hole 504B, the deepest penetration into oceanic crust to date, was logged, deepened by almost 250 m, then further logged. Logs obtained included the Schlumberger geochemical and mineralogy combinations, dual laterolog resistivity, L-DGO multichannel sonic, L-DGO borehole televiewer, and both Japanese and Schlumberger magnetometers. Station measurements included packer, vertical seismic profile and fluid sampling. The one disappointment of downhole measurements at Hole 504B was that the Repeat Formation Tester not only failed to seat adequately against the borehole wall for pore fluid sampling, but also jammed in the bottomhole assembly on the way out of hole.

Multiple passes with the geochemical combo obtained the deepest continuous and unbiased record of geochemical variations vs. depth ever recovered from the oceanic crust. The geochemical, velocity, density, porosity and permeability differences between pillow basalts and layers 2A-2B and dikes of layer 2C were clearly documented. A vertical seismic profile detected layer 3 below the drilled section. Within layers 2A and 2B, the geochemical effects of past seawater/basalt interactions were documented, and locations of highly fractured intervals and thin magnetic reversals were identified. Current processing capabilities for the geochemical logs yield only relative abundance among detected elements for most logs. However, software soon to be available will permit calculation of weight percentages of nearly all major elements from the Hole 504B data.

Because the logging and downhole experiments are essential for interpreting the core (12.6% recovery) and downhole conditions at 504B, the detailed results appear in the Leg 111 report (p. 18).

PRELIMINARY LOGGING RESULTS FROM LEG 112

Logging operations on Leg 112 were successful, although logging time was shortened from the planned seven and a half days, as required by PCOM, to two days. Two holes were logged with the three Schlumberger combinations: Hole 679E (359 mbsf) was logged from 50 mbsf to 339 mbsf, and Hole 685A (469 mbsf) was logged above a bridge at 284 mbsf. The sidewall entry sub was not needed at Hole 679E and was not used at Hole 685A because it slowed logging slightly. Log quality at both sites was generally very good. The logs have been used to produce a synthetic seismogram and for delineation of gas hydrate zones, identification of porosity and compaction trends with depth, and interwell correlation of lithologic cyclicity.

At Hole 679E, the Schlumberger seismic stratigraphic, lithoporosity and geochemical combinations were run over virtually the entire drilled section (359 mbsf); only a 20 m interval filled with cavings at the bottom of the hole and the top 50 m (through the pipe) were not logged. A synthetic seismogram based on sonic and density logs showed all of the major reflectors seen on the seismic line. Log delineation of lithologic units was excellent. In particular, a hard streak was identified at the same depth where a bit was broken at 679D; the hard streak forms a permeability barrier, with freshening water indicated beneath it by the gamma spectroscopy tool (GST) and occasional porous stringers indicated beneath it by resistivity logs. Shallow depositional cycles with periods of less than 190,000 years were evident in the logs. New GST software was used successfully to provide more reliable porosities than those determined with Terralog. A normal compaction trend perturbed by overpressure was observed.

At Hole 685A (469 mbsf), the Schlumberger seismic stratigraphic, lithoporosity and geochemical combinations were run over the interval above a bridge at 284 mbsf. Using core results for calibration of aluminum concentrations from the aluminum clay tool, an aluminum curve for the entire logged interval was derived. The locations of gas hydrates were clearly seen on the logs.

A gamma ray cyclicity similar to that seen at 697E was evident at 685A: the lower frequency of the cycles at 685A is consistent with paleontological indications of much higher sedimentation rates at 685A.

DEEP SEA DRILLING PROJECT

DATABANK TRANSFER AND DATA REQUEST PROCEDURES

INTRODUCTION

The Information Handling Group of the Deep Sea Drilling Project is responsible for all scientific data collected on board the Glomar CHALLENGER during her 96 cruises and produced in the Deep Sea Drilling Shore laboratories. It is the mission of the group to protect and preserve this data, to provide for distribution of the data throughout the scientific community and to encourage the use of the data through technical support to scientists.

The group comprises members with a broad variety of geological and data processing background. Senior members of the group joined Deep Sea Drilling shortly after the beginning of drilling. This maturity of staff helps the group to provide data services for the wide variety of data found in the Deep Sea Drilling Project databases, and to provide valuable assistance to researchers in choosing the best data for their research objectives.

DATA SERVICES

The responsibility for data services is currently shared by DSDP and the National Geophysical Data Center (NGDC) in Boulder, Colorado. During the phaseout of DSDP all data service responsibility will gradually shift to NGDC.Several major databases have already been transferred to NGDC. Researchers are encouraged to make NGDC their primary contact for DSDP data, since NGDC may be able to provide correlative data from other sources. NGDC will forward any requests requiring special treatment to DSDP for prompt attention. DSDP is concentrating most of its available resources on completing all databases prior to phase out and will only process data requests requiring special treatment.

All prime data collected as part of Deep Sea Drilling operations and some special files compiled by the Information Handling Group are available for distribution to researchers. Table DSDP-1 summarizes and categorizes the types of data available. The data files listed under Special Files represent compilations and ancillary data which may be of particular assistance to researchers.

Data files can be provided in their entirety or the researcher may request subsets of the data based on research criteria. Databases can be searched on most data items, using simple or complex search expressions. Using linked searches all databases can be searched on common drill site summary data and paleontological age unit assignments. Records selected from one database can be correlated with records from others. DSDP search software also contains internal tables which assign all sites to appropriate geographical (ocean, sea) locations.

The preferred medium for providing the results of data requests is magnetic tape. Printed listings can also be provided for small volume data requests. Modest sized data files may also be available on floppy disks. On experimental basis DSDP can also provide direct transfer of data via the UNIX UUCP Network and remote login via guest accounts on our computer.

DATA TRANSFER TO NGDC

As DSDP databases are completed they are being transferred to the National Geophysical Data Center in Boulder, Colorado. Transferred databases are marked with an asterisk in Table DSDP-1. All DSDP data files will be transferred to NGDC prior to the end of DSDP data service operations in early 1987. We will periodically report on the progress of database transfers in this journal. Investigators may also request personal copies of Table DSDP-1 from DSDP. Requests for data services for transferred databases will, in general, be referred to NGDC.

DATA REQUEST PROCEDURES

Data requests can be submitted in writing or by telephone. When writing please include a brief description of your research project so that we can best determine which data sets would be most helpful. When requesting data on magnetic tape please be sure to include your preferred tape specifications. Tapes can be provided at 800 or 1600 bpi, odd parity, EBCDIC or ASCII character set, labelled or unlabelled, single or multiple files per reel. Please state any block (physical record) size limitations required by your host system.

Please address your requests for information and data to:

Marine Geology & Geophysics Division
National Geophysical Data Center
NOAA E/GC3
325 Broadway
Boulder, CO 80803

Data orders phone:
(303) 497-6338 or FTS 320-6338

Technical Information phone:
(303) 497-6339 or FTS 320-6339

AVAILABLE DSDP DATA

Data file: legs available	Data source	Description	Comments
Part 1. Lithologic and stratigraphic data			
***Paleontology: 1-96**	*Initial Reports*	Data for 26 fossil groups. Code names, abundance and preservation data for all Tertiary fossils found thus far in DSDP material. The fossil dictionary comprises more than 12,000 fossil names and codes.	Does not include Mesozoic fossils. No data for Leg 83. Legs 1-85 at NGDC.
Smear Slide: 1-96	Shipboard data	Information about the nature and abundance of sediment components.	No data for Leg 83 (hard rock cores only).
Thin Sections: 4-92	Shipboard Data *Initial Reports*	Petrographic descriptions of igneous and metamorphic rocks. Includes information on mineralogy, texture, alteration, vesicles, etc.	No data for Legs 1-3, 5, 8, 9, 15, 20-21, 24, 27, 40-41, 42B, 44, 47-48, 50, 56, 71-72, 75-76, 78, 80, 95, 96.
Visual Core Descriptions: 1-96	Shipboard data	Created from shipboard descriptions of the core sections. Information about core color, sedimentary structures, disturbance, etc.	
Visual Core Descriptions - igneous rocks: 4-94	Shipboard data	Igneous and metamorphic rock lithology, texture, structure, mineralogy, alteration, etc.	No data for Legs 40, 42B, 44, 47-48, 50, 56, 95, 96. Legs 22-94 available in digital form.
SCREEN: 1-96	Processed data	Computer generated lithologic classifications. Basic composition data, average density, and age of layer.	
Part 2. Physical properties and quantitative analytic core data			
***Carbon-carbonate: 1-96**	Shore Laboratory Shipboard, carbonate bomb data	Percent by weight of the total carbon, organic carbon and carbon carbonate content of a sample. Bomb data has carbonate only.	No data for Legs 46, 83, 88, 91, 92.
***Grain Size: 1-79**	Shore laboratory	Sand-silt-clay content of sample.	No data collected for Leg 16, 64 and 65.
***GRAPE (gamma ray attenuation porosity evaluator): 1-96**	Shipboard data	Continuous core density measurements.	No data for Leg 46.
Hard-rock major element analyses: 13-92	Shore-based and shipboard analyses	Major-element chemical analyses of igneous, metamorphic and some sedimentary rocks composed of volcanic material.	No data for Legs 20, 21, 31, 40, 42B, 44, 47, 48, 50, 56, 71, 93-96.
Hard-rock minor element analyses: 13-92	Shore-based and shipboard analyses	Minor-element chemical analyses of igneous, metamorphic and some sedimentary rocks composed of volcanic material.	No data for Legs 20, 21, 27, 35, 40, 42B, 44, 47, 48, 50, 56, 57, 66, 67, 71, 93-96.
Hard-rock paleomagnetics: 14-92	Shore-based and shipboard	Paleomagnetic and rock magnetic measurements of igneous and metamorphic rocks and a few sedimentary rocks composed of volcanic material.	No data for Legs 1-13, 17, 18, 20-22, 24, 30, 31, 35, 36, 39, 40, 47, 48, 50, 56, 57, 67, 68, 74, 93-96.
Intersitial Water Chemistry: 1-96	Shore-based and shipboard analyses	Quantitative ion and/or pH, salinity, alkalinity analyses of interstitial water and surface sea water samples.	No data for Legs 46, 83.
***Long-core spinner magnetometer sediment paleomagnetics: 43, 68, 70-72, 75, 90**	Shipboard analyses	Paleomagnetic measurements: declination and intensity of magnetization. Data from hydraulic piston cores only.	Should be used with reservation since the cores were later discovered to be rust-contaminated and disturbed. Quality of the data for each core clarified by documentation.
Discrete sediment sample magnetics: 1-94	Shipboard laboratory	Paleomagnetic measurements: declination, inclination, and intensity of magnetization. NRM measurements and AFD measurements when available.	Rotary cores: 1-76, 78 encoded. HPC cores: 71-75 encoded. No data for 95, 96.
Alternating field demagnetization: 4-96	Shipboard laboratory	Paleomagnetic measurements of sediments on which alternating field demagnetization is carried out.	Rotary cores: 4-73 encoded. HPC cores: 72-79 encoded.

Part 2. Physical properties and quantitative analytic core data. (Cont.)

*Sonic velocity: 2-95	Shipboard analyses	Hamilton frame and 'ear muff' methods.	No data for Legs 1, 13, 96.
*Vane Shear: 31-94	Shipboard data	Sediment shear strength measurements using Wykeham Farrance 2350 and Torvane instruments.	No data for Legs 32-37, 39-40, 45-46, 49, 52-56, 59-60, 62, 65-67, 70, 77, 79, 81-84, 86, 88-89, 92.
*Analytic water content, porosity, and density: 1-96	Shipboard laboratory	Measurements by syringe method from known volumes of sediment.	No data for Leg 41.
*Well Logs: 6-96	Shipboard data	Analog charts and magnetic tapes produced by Gearhart-Owen and Schlumberger.	Schlumberger LIS tapes: 48, 50, 51, 57, 80-84, 87, 89, 95, 96. Gearhart-Owen tapes: 60, 61, 63-65, 67, 68, 70, 71, 74-76, 78. Analog data only: 6, 8, 46, 66, 69.
*X-ray mineralogy: 1-37	Shore laboratory	X-ray diffraction	Data for Legs after 37 not available in digital form.

Part 3. Underway geophysics

*Bathymetry: 7-96	Shipboard data	Analog record of water-depth profile.	Available as digital data and 35mm continuous microfilm. No data for Legs 10-12, 57-60.
*Magnetics: 7-96	Shipboard data	Analog record produced on the Varian magnetometer in gammas. Digitized at 5-min. intervals on an OSCAR X-Y digitizer.	No data for Legs 10, 11.
*Navigation: 3-96	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.	
*Seismic: 1-96	Shipboard data	Sub-bottom profiles recorded on Edo Western Graphic Model 550. Digital data for Legs 89-96 in SEG-Y tape format.	Both Bolt and Kronllite filters available on board. Fast and slow sweeps available on microfilm and photographs.

Part 4. Special reference files

*Site Summary: 1-96	Initial Core Descriptions	Information on general hole characteristics (i.e., location, water depth, sediment nature, basement nature, etc.).	
DSDP Guide to Core Material: 1-96	*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.	
*AGEPROFILE: 1-96	*Initial Reports* Hole summaries	Definition of age layers downhole.	
*COREDEPTH: 1-96	Shipboard summaries	Depth of each core. Allows determination of precise depth (in m) of a particular sample.	

Part 5. Aids to research

DATAWINDOW	An on-line search and retrieval program to access many DSDP files; also used for data base maintenance. An account can be arranged at the University of California computer center to allow remote access to data files compatible with DATAWINDOW.
MUDPAK	A plotting program; handles multiple parameter data (e.g., plots of well logs, plots of physical properties).
DASI	A file of DSDP-affiliated scientists and institutions. Can be cross-referenced and is searchable.
KEYWORD INDEX	A computer searchable bibliography of DSDP related papers and studies in progress.
SAMPLE RECORDS	Inventory of all shipboard samples taken.
DSDP Site Map	DSDP site positions on a world map of ocean topography.

* - indicates that the database is complete and transferred to NGDC.

ODP DATABANK REPORT

The JOIDES/ODP Databank received the following data between September, 1986 and December, 1986. For additional information on the ODP Databank, please contact Carl Brenner at Lamont-Doherty Geological Observatory, Palisades, NY 10964.

- From D.Hayes, LDGO: Summary report of IPOD site survey of candidate sites off Northwest African Continental Margin.

- From K.Hinz, BGR: R/V POLARSTERN multichannel seismic lines, along with accompanying navigation, in the Caird Coast/Amery Basin area (documenting Leg 113 "W4 transect" sites in the Weddell Sea).

- From H.Roeser, BGR: Digital tapes of geophysical values merged with navigation, from R/V VALDIVIA studies in the Red Sea area.

- From H.Baecker, Preussag AG: Bathymetric contour maps of the Red Sea area.

- From K.McDonald, UCSB: Deep tow magnetic and topographic profiles, and sidescan sonar lineation chart, with corresponding navigation, Nereus Deep area of the Red Sea.

- From R.von Huene, USGS, Menlo Park: SHELL MCS line P1017, along which Leg 112 site 7A is located.

- From K.Lighty, ODP/TAMU: Digital tape of navigation merged with underway geophysics, and microfilm of bathymetric, seismic reflection and magnetic data, ODP Leg 104 (Norwegian Sea).

- From K.McDonald, UCSB: Magnetic and bathymetric profiles, bathymetric contour map and structure map, Nereus Deep area of the Red Sea.

- From K.Hinz, BGR: Multichannel seismic profiles BGR 86-30, 86-31, 86-32 and 86-33 (both stacked and migrated processings) collected during POLARSTERN survey in the Maud Rise area.

- From K.Lighty, ODP/TAMU: Digital tape of underway geophysics merged with navigation, and microfilm of seismic profiles, for ODP Leg 105 (Baffin Bay/Labrador Sea).

- From D.Fuetterer, Wegener Institute, FRG: Preliminary Seabeam maps for Maud Rise and Caird Coast areas, and selected core descriptions.

- From J.LaBrecque, LDGO: Preliminary set of seismic profiles documenting Leg 114 sites SA-2, SA-3, SA-5 and SA-6, collected during POLAR DUKE survey.

- From K.Hinz, BGR: Multichannel line BGR 78-002, documenting site W5A of Leg 113 (Weddell Sea).

- From J.Seguofin, IPG, Paris: Preliminary single channel seismic profiles from MARION DUFRESNE cruise 48, Kerguelen Paleau area.

EXECUTIVE COMMITTEE REPORT

The Executive Committee met on 15-16 October 1986 at the Pacific Geosciences Centre, Sidney, B.C. in conjunction with the Canadian ODP Council Meeting. The EXCOM session was chaired by D. Caldwell. Highlights of the session appear below.

FY87 PROGRAM PLAN AND BUDGET

The program plan and budget assignments included $1.4M to JOI, Inc., $30.1M to TAMU and $2.75M to LDGO. The increases in the FY86 budget by $1.745M can be attributed to increased emphasis on engineering and logging, start up of publications and increased ship costs due to remote deployment.

The Science Operator Program Plan report was presented by P. Rabinowitz, with assistance from W. Rose (Publications), J. Foster (Computer Services) and S.Serocki (System and Engineering Development). An increase in the TAMU budget for FY87 of approximately $1M over the previous fiscal year largely represents costs associated with publications. The Leg 101-102 Part A (Initial Reports) were in press at the time of the meeting and the Part B, peer-reviewed final reports, for those legs are scheduled for May, 1988.

The increases in Computer Services are largely in personnel, telecommunications, maintenance and repair and programming costs. Activities scheduled for FY87 include enhancing the ODP Data Base and implementing a manuscript tracking system. The Systems and Engineering Development group is focusing on five broad catagories of engineering: high-temperature drilling, drill string analysis, core-bit development, major coring systems and miscellaneous system development. Major coring systems upgrades, budgeted at $185K, will support hard-rock drilling. About $70K is budgeted for a mining coring system wherein the use of the drill string as a riser will be investigated.

The Wireline Logging Services FY87 Program Plan, presented by R. Jarrard, emphasized the need for hard rock technology (needed in time for the Southwest Indian Ridge leg) and high-temperature logging tools. Improvements on standard methods continues. Jarrard emphasized the need to maximize the scientific use of logs, addressed partly through increased training via logging schools. The FY87 budget increase to $2.75M from FY86 ($2.5M) represents an increase in Schlumberger rates, logistics costs associated with remote drilling sites, and a 12% increase in personnel costs. EXCOM approved the purchase of a wireline packer (about $80K) as it presented no patent right problems for member nations.

EXCOM accepted the Planning Committee's prioritizations on the FY87 enhancement budget.

BUDGET PROTOCOL

A budget protocol, which specifies EXCOM and PCOM input to JOI and NSF, was developed by a group consisting of the EXCOM Budget Subcommittee (M.Keen, H.Durbaum and R.Heath), an NSF representative (D.Heinrichs), a JOI representative (T.Pyle), and the EXCOM and PCOM Chairmen (D.Caldwell and N.Pisias).

The budget review schedule was set up for the immediate fiscal year and for future years. A Budget Committee (BCOM), consisting of three EXCOM members (2 non-U.S. and one U.S. representatives) and two PCOM members (the Chairman and one other U.S. representative) was established; M. Keen, C. Helsley and K. Kobayashi were elected as the BCOM representatives from EXCOM. The budget protocol will determine scheduling for future PCOM and EXCOM meetings, and as a result EXCOM will now meet twice per year, beginning in FY88.

USSR MEMBERSHIP

V.Krashenninikov, an invited guest to EXCOM, reported on the status of the Soviet Union's membership to ODP. EXCOM had agreed one year previously at the meeting in Bonn to invite the Soviet Union to join ODP. The Soviet government had signed a document justifying Soviet participation shortly before the 1986 fall meeting.

Krashenninikov officially informed NSF and EXCOM that the Soviet Union is ready to join ODP and to sign the Memorandum of Understanding with the financial commitment of $2.5M (U.S.) per year, beginning in January, 1987, and continuing through 1993. Krashenninikov reported that broad circles of geologists in the USSR met the news with enthusiasm. He expressed his own enthusiasm because of his commitment since 1969 to the Deep Sea Drilling Program. He also noted that the USSR Academy of Sciences would be the official representative to the program. He transmitted an invitation to the head of the National Science Foundation, along with a delegation to include up to five members, to come to Moscow to sign the MOU. Along with the signing, other matters were to be discussed, including participation of Soviet scientists on the JOIDES RESOLUTION in 1987. Krashenninikov said that the USSR welcomes the establishment of links between the National Committee and the Ocean Drilling Program. The government is very positive toward Soviet participation in the program, not only for its high scientific value, but for the opportunity of developing ties to other nations with interests in oceanic geology.

D.Caldwell expressed for EXCOM his pleasure in the news of the Soviet intentions to join ODP. G. Gross, for NSF, expressed his and NSF's pleasure in the announcement and said that the NSF would make necessary arrangements for the signing of the MOU.

[EDITOR'S NOTE: Signing of the MOU in Moscow is tentatively scheduled for March, 1987.]

PARTICIPATION OF THIRD WORLD SCIENTISTS IN ODP

An EXCOM motion provided that $50,000 be set aside from the annual base budget in order to support participation of Third World scientists in the Ocean Drilling Program. Suggestions for extending this support to non-ODP countries included not only for cruise-related participation, but possibly for work with ODP projects at land-based laboratories, including those at Texas A&M.

PANEL CHAIRMEN REPORTS

Below are the summaries of the Panel and Committee Chairman reports given at the 19-23 January 1987 Annual Planning Committee Meeting in Honolulu. The recommendations from the panel chairmen on engineering development priorities are listed in Table 2 of the Planning Committee Meeting report (page 62).

REPORT OF THE LITHOSPHERE PANEL

R.Detrick, Chairman, reported for the LITHP. Based on the experience of Legs 106, 109 and 111, together with LITHP drilling objectives, the panel has stressed a need for:

- a substantial, long-term commitment from ODP to develop new engineering techniques to improve penetration and recovery rates when drilling in young crustal rocks
- development of drilling and logging tools capable of operating in high temperature (>300°) conditions
- a recognition in the planning process that drilling crustal objectives will take time to achieve; ODP must be prepared to dedicate multiple legs to a single objective or even a single site

Recommendations for the Indian Ocean Program

The LITHP has two major objectives for the SWIR program: to obtain a relatively deep hole into lower crustal and upper mantle rocks and to define crustal structures at oceanic fracture zones.

Other LITHP interests in the Indian Ocean are the Ninetyeast Ridge program, Kerguelen and the Mascarene Plateau.

Recommendations for the Western/Central Pacific Program

In the current WPAC prospectus, the panel has ranked Bonin I, Bonin-Mariana II, the Lau Basin and the Japan Sea as the highest priority legs. LITHP's major emphases in the Central and Eastern Pacific are:

- magmatic and thermal processes at mid-ocean ridges (EPR, Juan de Fuca/Gorda Ridge and Gulf of California sites)
- deeper structure and composition of oceanic crust and upper mantle (fast-spreading crust, fracture zones)

REPORT OF THE TECTONICS PANEL

D.Cowen, Chairman, reported on the panel's major issues for 1986.

The Western Pacific Program

Thematic priorities outlined were:
- back-arc basins (early rifting)
- arc evolution (vertical histories, diapirs)
- collisions

The TECTP has reviewed the second WPAC prospectus and ranked the proposals in a nine-leg program as follows:

1. Bonin I
2. Nankai
3. Japan Sea
4. Bonin-Mariana II
5. Banda-Sulu-S. China Sea basins
6. Vanuatu

7. Lau Basin
7. Nankai physical properties
8. Sunda backthrusting

The fourth-ranked program has changed in scope, with elimination of diapir drilling, since the last review and TECP is not sure it now meets original panel priorities.

Central and Eastern Pacific Program

Mature problems in the area with thematic interests that can be addressed by drilling include:

- dating oceanic crust; kinematics
- vertical displacements and flexure
- ridge trench interactions
- geochemistry of arcs and descending crust
- subduction rates

Immature problems seen by the panel as needing more definition include oceanic plateaus, structures in oceanic crust and deformation and physical properties deep in accretionary prisms.

The panel strongly endorses geochemical reference holes; several shallow holes (20-30 m) into basement rather than single deep holes are favored.

REPORT OF THE SEDIMENT AND OCEAN HISTORY PANEL

L. Mayer, Chairman, reported for SOHP and suggested to PCOM that the mandate for the panel, being very broad, might require changes in the panel structure or additional members in the future. He also said that the liaison system works well only with strong and outspoken membership.

Major SOHP themes from 1985 and through 1988 include:

1. Cretaceaous-Neogene, high latitude paleoclimate problems
2. A paleo-upwelling program (PUP), and
3. A deep stratigraphic test program

SOHP Summary of the Indian Ocean Program

The panel's emphasis and site priorities include:

1. Kerguelen-Prydz Bay: late Mesozoic paleo-climate/marine environment, migration of the Polar Front.

2. Neogene I: As it addresses the Indus Fan/uplift of the Himalayas and monsoon histories.

3. Argo Basin/Exmouth Plateau: As a suitable area for a deep stratigraphic test site.

SOHP Summaries of the Western Pacific Program

Regional objectives and priorities for SOHP include:

1. Mixed carbonate/siliclastic province in a passive margin setting (the Great Barrier Reef program).
2. An isolated back-arc basin (Sea of Japan).
3. Young, passive margin with a sedimentary basin (S. China Sea)
4. Bonin I (to study the effects of the ridge on history of bottom water circulation)

SOHP Summaries of the Central Pacific Program

Drilling objectives, suggested approaches and site criteria include:

1. High-low latitude and depth transect of sites with shallow burial, carbonate, low paleolatitude and continuous sections;

oceanic plateaus area are primary targets
2. Old Pacific crust (pre M-25) for open ocean records from the Jurassic and Cretaceous
3. Atolls
4. Episodicity of volcanism to see relationships with spreading rates and climatic change
5. Fans and depositional processes
6. Fluid circulation studies: rock/seawater interactions and geochemical mass balances

REPORT OF THE DOWNHOLE MEASUREMENT PANEL

P.Worthington, the new Chairman for DMP, reported for the panel, with input from M. Salisbury, who could not attend due to illness.

Worthington asked PCOM to consider panel replacements from outside of the oil industry. He outlined the DMP philosophy on logging/downhole experimentation:

- properly executed logs, apart from the core measurements, provide the only continuous record of a site

- an ODP hole is not an objective in itself, but a scientific legacy

Enhancements and recommended tools

Worthington presented a list of recommended enhancements to the program which included:

- acquiring a four-arm slimline formation microscanner

- acquiring software to read neutron activation data

- putting Terralog processing stations in ODP member countries for regional databases

- acquiring a back-up multichannel sonic tool

Recommendations for new technology included:

- upgrading the physical properties lab

- developing wireline re-entry capabilities

- acquiring fishing/side-tracking gear

- improving penetration/recovery in hard rock

- acquiring three new guidebases by 1989 for Lau Basin, Juan de Fuca and EPR drilling)

- developing high temperature logging capabilities

- developing long-term observatory packages

Worthington recommended that PCOM/DMP should develop a policy for reoccupation of holes and that the recommendations from the USSAC workshop on physical properties be implemented.

Current and future trends

Worthington said that current thrusts for the program include nuclear spectroscopy, formation imaging, packers and measurements during drilling. Future trends include a "new stratigraphy" which will synthesize core and log measurements. Other suggested developments include in situ geochemical analyses and multisensor imaging of sedimentary facies. Vertical seismic profiling is underutilized in the program.

PCOM commended past DMP Chairman, Matt Salisbury, for his effective chairmanship of the panel.

REPORT OF THE INDIAN OCEAN PANEL

R.Schlich, Chairman, opened his remarks with a schedule of membership rotations which comply with PCOM's recommendations of replacements.

Western Indian Ocean Drilling

Schlich said that over a hundred drilling proposals had been reviewed; the planned programs include:

1. Southwest Indian Ridge: maximum drilling effort on the ridgecrest recommended; recent Seabeam data should improve guidebase deployment.
2. Neogene: proposes a seven-site transect across the Oman Margin, Owen Ridge and Indus Fan; excellent SCS data available.
3. Makran: only a single seismic line is available thus making data interpretation difficult.
4. Carbonate dissolution profile: four sites are proposed with possible basement objectives at the CARB-1 site; site survey from March HMS DARWIN cruise is needed.
5. Mascarene Plateau: LITHP support for the program; will provide information on plate kinematics/age progressions. Site survey data will be available in March, 1987.
6. Kerguelen program: IOP in agreement with Kerguelen working group on site selection. Southern leg data need additional interpretation and additional basement objectives need to be better addressed.

Eastern Indian Ocean Program

Schlich summarized the panel's views as follows:

1. The Intraplate Deformation objectives can be met with five sites, and may be a full-leg program.
2. The Broken Ridge transect has good recent site surveys and can be drilled in less than one leg.
3. Ninetyeast Ridge depth transect will be substituted by the Carbonate Saturation Profile package; the program should yield data complementary to DSDP sites, including basement ones.
4. Exmouth Plateau: presently consists of four sites, with trade-offs of EP7 and EP5 being discussed.
5. Argo Abyssal Plain: sites AAP1B and AAP-2 (double cored in the lower sediments), with about 50 m of basement penetration recommended. A single deep hole might be considered.

REPORT OF THE SOUTHERN OCEAN PANEL

P.Ciesielski (Alternate) reported for P.Barker (Chairman) who was at sea with Leg 113. Details of Leg 113 and 114 and of the Kerguelen Working Group (K-WG) were deferred to subsequent agenda items. SOP is concerned with clearance to drill SA2 and SA5 on Leg 114 as well as the obligation of 114 to complete the Leg 113 objective at Site W7.

Indian Ocean Program

SOP endorses the K-WG report but would like a latitudinal/depth transect preserved in the final plans. Drilling the Antarctic margin is a high priority, even with site survey problems with Prydz Bay.

Pacific/Antarctic Margin Drilling

Ciesielski reminded PCOM and the other panels of the importance of S. Pacific drilling in fulfilling COSOD objectives and for understanding global systems. The panel would like to see the Ross Sea drilled, and if possible, a combination of proposals for drilling south of Australia to get a viable program there.

REPORT OF THE WESTERN PACIFIC PANEL

B.Taylor, Chairman, reported on the panel's progress in defining the program in the Western Pacific. A second drilling prospectus was developed with input from the thematic panels and from TAMU and LDGO (for drilling and logging time estimates). A third prospectus will be available for the next PCOM meeting. Changes in the second prospectus include: a combined Banda-Sulu-S.China Sea basins program, a reduced number of sites from the Bonins program and more consideration of reference sites. The priority list for the WPAC program is:

1. Banda-Sulu-South China Seas basins
2. Bonin I
3. Lau Basin
4. Vanuatu
5. Japan Sea
6. Nankai Trough
7. Great Barrier Reef
8. Sunda
9. Bonin II
10. Nankai geotechnical "mini-leg"
11. South China Sea margin
12. Zenisu Ridge

Taylor emphasized that the first nine programs do not represent nine legs. He said that exchange with the thematic panel has resulted in compromises to accomodate their objectives.

In ranking the programs, Taylor noted that programs 9 through 11 were similarly ranked by the panel. Site surveys are still pending and the ranking was based on available data. Crustal characteristics/ages in SE Asia are important problems as well as evolution of the basins for the program. The Japan Sea drilling has been highly ranked by all thematic panels and the Lau Basin, even without site surveys available, has been a priority program for WPAC. Taylor proposed a clock-wise track through the N. Pacific, then proceeding to a southern route, possibly integrating CEPAC programs.

In conclusion, Taylor asked PCOM to reconsider the total of three years allotted to Pacific drilling in reference to the COSOD circumnavigation objective.

REPORT OF THE CENTRAL AND EASTERN PACIFIC PANEL

S.Schlanger, Chairman, reported that his panel expects additional proposals before a final ranking from CEPAC. The drilling packages in Table 1 represent a provisional plan.

Of particular note in the program are:

- the addition of a program to investigate old Pacific crust Mesozoic sediments and the basalts of the Nauru and Mariana basins.
- good recovery through chert/chalk/limestone will be needed for many CEPAC programs.
- the flexure proposal on the Hawaii moat will require deep holes with detailed biostratigraphic resolution.
- the East Pacific Rise drilling has CEPAC support, but the three legs proposed are biasing the workload of the CEPAC program

In response to Schlanger's

concerns on the EPR drilling, a suggestion to spread out the drilling as was done with 504B was forwarded. Schlanger concluded by noting that the Southern Pacific and Gulf of California workshops are expected to generate additional proposals; he added that a site survey summary was in preparation.

REPORT OF THE ATLANTIC REGIONAL PANEL

J.Austin, Chairman, reported a decrease in activity for the panel because of regional studies elsewhere for ODP and asked PCOM to address the issue of panel membership during the "off-season". He recommended workshops as a way to keep panel interest up as well as to encourage international participation; the forthcoming South Atlantic workshop (USSAC-funded) has had excellent response from South American and African scientists. Workshops on Caribbean, N. Atlantic/Artic, Mediterranean and Central Atlantic drilling are planned, although non-U.S. workshops are not funded by USSAC.

REPORT OF THE TECHNOLOGY AND ENGINEERING DEVELOPMENT COMMITTEE

J.Jarry, Chairman, reported that the panel has toured the JOIDES Resolution and TAMU facilities in the past year in order to open up exchanges with the engineering and operations staff. TEDCOM has designated working groups to monitor progress and act as technical support in the following areas:

- high-temperature drilling
- hard and fractured rock drilling
- drilling in pressured areas (well control and riser drilling)

To address the high-temperature problems, industry contacts are being encouraged (e.g.Los Alamos Laboratory) and for hard rock drilling, the addition of a TEDCOM member from the mining industry is recommended.

Jarry discussed the ODP research and development budget and TEDCOM has recommended that a general increase of 33% toward R&D be made in the coming six years. TEDCOM seeks increased communications with the panels and TAMU engineers; the panel encourages joint meetings, attendance of panel chairmen at TEDCOM meetings and workshops. TEDCOM has also recommendaed that a SECDO engineer attend its meetings as a permanent observer.

REPORT OF THE INFORMATION HANDLING PANEL

D.Appleman, Chairman, reported that the final publications from DSDP were proceeding well. Micropaleontological reference centers have been set up for DSDP samples (Table 2).

The IHP has considered sampling policy and guidelines on core distribution to give to cruise scientific parties. Appleman emphasized that the policy should lend archival value to ODP cores and not hinder science.

Appleman reported that the ODP Proceedings (Part A) were out for Legs 101-102; logging results were not reproduced alongside the barrel sheets to avoid bad correlations and to reduce volume costs. The ODP Databases are now a higher priority for the TAMU programming staff and PC-disk and remote accessing capabilities are being developed.

As Appleman is retiring from the IHP, N. Pisias concluded the report by thanking him for his service to the panel beginning with DSDP Leg 1. (T.Moore will next chair the panel.)

REPORT OF THE POLLUTION PREVENTION AND SAFETY PANEL

G.Claypool, Chairman, reported that the safety review for Leg 114 was near completion. In the future, PPSP would like site survey data well in advance of actual drilling. He said tha the Prydz Bay site survey had been reviewed by three panel members: problems existed but a drilling strategy could probably be developed.

As Claypool will step down from the panel chairmanship after PPSP's next meeting, N. Pisias expressed PCOM's thanks for his service to ODP.

REPORT OF THE SITE SURVEY PANEL

J.Peirce, Chairman, reported that the panels has been generally pleased with the quality of site surveys in the past year. He said the "catch-up" game in the Indian Ocean is almost over and hoped that the Western Pacific surveys would be scheduled well in advance. Other issues discussed included:

- the watchdog system is working well for most programs
- the SSP matrix is serving a useful communications function with the panels
- the ODP Databank is becoming more important to SSP activities and Carl Brenner in particular has helped communications

Indian Ocean Program

Peirce outlined the site surveys for the program. Of note are:

- SWIR: Excellent Seabeam data available for the median ridge, but the panel cannot recommend a site on transform fault
- Mascarene Plateau: new SCS data should be available by April
- Sites have not been picked for the Intraplate/Broken Ridge programs
- Prydz Bay: site surveys are inadequate; SSP requests that the Australian seismic lines be reprocessed.

Other SSP Reviews

Peirce summarized the Western Pacific site surveys and all are in place or funded with the exception of the Lau Basin, where side-scan data are also recommended. A MCS survey is planned on the Great Barrier Reef this summer and proponents are being asked to identify problems with drilling in a national park.

CEPAC RANKING OF DRILLING PROGRAMS

CEPAC named 'drilling packages' to more clearly define and combine high ranking thematic objectives with inclusive regional grouping (each panel member was allowed to select 7 packages):

Ranking		Drilling Packages	Number of votes received (11 voting members)
1.		Atolls and guyots	11
2.	-	N-Pac paleocean & plate reconstr.	10
	-	Ontong Java general	10
4.	-	Zero-age barerock crust	8
	-	Sedimented zero-age crust JdFuca	8
6.		Old Pacific (E.Cret - Jura)	7
7.		Bering Sea paleocean-environ	6
8.	-	Lith flexure	3
	-	Costa Rica underplating	3
	-	South Pacific tect - sed	3
11.		Aleutian/Alaskan convergence/accretion	2
12.	-	Cascadia accretion/convergence	1
	-	Gulf of Alaska terranes	1

<u>no votes for</u>:

- Equatorial Pac paleocean-environment
- Sedimentary processes
- Chile triple junction
- California margin tectonics

Table 1.

CURATORS OF DSDP MICROPALEONTOLOGICAL REFERENCE CENTERS

<u>Ocean Drilling Program</u>

Dr. Russ Merrill
Ocean Drilling Program
Oceanography
Texas A&M University Research Park
77843
1000 Discovery Drive
College Station, TX 77840

<u>U.S. Gulf Coast</u>

Dr. Stefan Gartner
Department of

Texas A&M University
College Station, TX

<u>U.S. West Coast</u>

Dr. W.R. Riedel
Scripps Institution of Oceanography
University of California, San Diego
La Jolla, CA 92093

<u>U.S. East Coast</u>

The Curator
Lamont-Doherty Geological Observatory
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<u>New Zealand</u>

Dr. Tony Edwards
New Zealand Geological Survey
Department of Scientific & Industrial Research
P.O. Box 30368
Lower Hutt, New Zealand

<u>U.S.S.R.</u>

Dr. Ivan A. Basov
Institute of Lithosphere
Staromonet 22
Moscow 109180, U.S.S.R.

<u>Japan</u>

Dr. Y. Tanimura
Department of Earth Sciences
National Science Museum
3-23-1 Hyakunin-cho
Tokyo, 160 Japan

<u>Europe</u>

Dr. J.B. Saunders
Natural History Museum
CH-4001, Basel
Switzerland

Table 2.

PLANNING COMMITTEE REPORT

The following paragraphs are highlights from the Planning Committee Annual Meeting held 19-23 January at the Hawaii Institute of Geophysics, Honolulu.

SHORT TERM PLANNING

Leg 114: Subantarctic/South Atlantic

PCOM rescinded the requirement that Leg 114 complete the Leg 113 objectives at Site W7. The leg is limited to 59 days, which includes three days for testing of the Navi-drill. PCOM guidelines, after considering the scientific objectives for the proposed sites, were that leg 114 be required to log, penetrate to basement and test the Navi-drill. If any site is to be dropped in order to meet the 59 day schedule, it must be Site SA5.

INDIAN OCEAN PLANNING

Due to the impacts of weather windows and incomplete site survey data, and to include drilling technologies now under development, PCOM rearranged the Indian Ocean schedule into the following legs:

- 115: Mascarene Plateau-Carbonate Dissolution Profile
- 116: Intraplate Deformation & North Ninetyeast Ridge
- 117: Neogene Package (Oman Margin, Oman Ridge, Indus Fan)
- 118: Southwest Indian Ridge
- 119: Kerguelen I
- 120: Kerguelen II
- 121: Broken Ridge & Ninetyeast Ridge
- 122: Exmouth Plateau
- 123: Argo Abyssal Plain

The Operations Schedule on page 11 lists details of Legs 115 through 120.

Leg 115: Mascarene Plateau/Carbonate Dissolution Profile

This program consists of four sites across the Seychelles Ridge which form a depth transect for studying carbonate dissolution and three sites at the Mascarene Plateau with basement objectives. Table 1 gives a description and location of the proposed sites. A SCS site survey for final location of Mascarene Plateau sites will be done by HMS DARWIN in March, 1987. A total of 41 days, including transit time, is available for completion of this leg.

Leg 116: Intraplate Deformation & North Ninetyeast Ridge

A recent site survey recovered excellent data, but final sites have not yet been chosen. Because of logistical reasons, this leg will include one North Ninetyeast Ridge site (site 1, 6° N). A total of 48 days will be available for this leg.

Leg 117: Neogene Package

Timing of this program was constrained by start-up of the monsoon season as the success of the program strongly depends on high resolution stratigraphy. A total of 51 days, including transit time, is dedicated to this program. The leg will consist of sites NP 1-7 which include two transects across the Owen Ridge and a site on the Indus Fan. If time permits, sites NP 1-3 (the shallower of the two transects) will be logged.

Leg 118: Southwest Indian Ridge

Postponing of this program to Leg 118 makes it likely that the improved Navi-drill will be available. The first priority for this leg will be to deploy the guidebase on the central ridge within the Atlantis Fracture Zone, the only proven place where predominantly ultramafic rocks crop out. A logging program of approximately 8-10 days will be included at this site. If the deployment of the guidebase runs into problems, a transect slightly south of the central ridge ("the gravel pit") will be the (second priority) target. Total leg time is 42 days (36 operational days).

Legs 119 and 120: Kerguelen

The Kerguelen Working Group (K-WG) is scheduled to meet again in March. A complete set of processed French data and hopefully additional Australian seismic lines for the Prydz Bay will be available. The K-WG will look for better sites to achieve the 'basement objectives'; significant drilling into chert is expected. Leg 119 allotted 61 days and leg 120, 60 days.

WESTERN PACIFIC PLANNING

Twelve high priority programs have been defined by WPAC, which incorporate the top priorities of the thematic panels:

1. Banda-Sulu-South China Sea Transect
2. Bonin I
3. Lau Basin
4. Vanuatu
5. Japan Sea
6. Nankai
7. Great Barrier Reef
8. Sunda Backthrusting
9. Bonin II
10. Nankai Physical Properties
11. South China Sea margin
12. Zenisu Ridge

The first seven programs make up approximately nine legs, which was, and still is, considered the time frame for Western Pacific drilling. Four programs have been identified as a basis of a core western Pacific drilling program: Banda-Sulu-South China Sea basins; Bonin I; Nankai and; Japan Sea. PCOM has now asked WPAC to 'break down' this programs into legs. Based on the results PCOM will then establish a preliminary schedule for the WPAC area.

CENTRAL AND EASTERN PACIFIC PLANNING

The Central and Eastern Pacific Panel has been examining and reviewing the 49 proposals submitted to ODP. To continue the process of thematic input to regional panel discussion, PCOM has asked the thematic panels to begin identifying proposals in the central and eastern Pacific which address key thematic issues.

ENGINEERING DEVELOPMENT PRIORITIES

PCOM discussed top priorities for engineering developments within ODP (see Table 2). This summary was compiled during the 18 January 1987 Annual Panel Chairmen's meeting and reflects technologies which will be needed for regional and thematic objectives. Some developments, such as 'high temperature drilling', will be needed some years into the Western Pacific program, but will need considerable lead time and should be started now. Another issue mentioned by most panels was 'recovery of hard/soft sediment sequences'. A solution to this standard problem is extremely important as it effects nearly every program.

LEG 115 PROPOSED DRILLING SITES

Site (Location)	Water Depth (m)	Penetration (m) Total	Basemt	Time (days) Total	Log
Mascarene Plateau Sites:					
MP-1 (18°45'S 59°05'E)	2000	250	50	5.5	1.5
MP-2 (15°30'S 59°40'E)	2500	350	50	5.5	1.5
MP-3 (13°30'S 61°30'E)	2700	450	50	6.5	1.5
Carbonate Saturation Profile Sites:					
CARB-1 (7°30'S 59°00'E)	1600	250	50	2.5	
CARB-2 (4°00'S 60°30'E)	3000	250		3.5	
CARB-3 (4°20'S 60°50'E)	3800	250		3.5	
CARB-4 (2°12'S 61°25'E)	4600	250		4.0	

Table 1. Site on the Mascarene Plateau are to be single bit rotary drilled and the Carbonate Saturation Profile sites are double APC/XCB sites except for CARB-1 which maybe drilled to basement.

ENGINEERING PRIORITIES

	LITHP	TECP	SOHP	DMP	SOP	IOP	WPAC	CEPAC
A. Young crustal drilling (Navidrill/XCB/APC)	X			X	X	(X)	X	X
B. High temperature drilling and logging	X		X	X			(X)	
C. In situ pore pressure, permeability (packers)		X					X	
D. In situ physical properties		X					X	
E. Pressure-core barrel, gassy sediments		X	X			X	?	
F. Recovery in alternating hard/soft sedimentary sequences		X	X		X	X	X	X
G. Coarse grained, unconsolidated sediments		X	X		X	X	X	
H. Rotary/XCB/APC improvements			X		X			
I. Bare rock guide base (mini cones)	X			X		X		X
J. Deep stable holes (2-3 km)			X					

Table 2. Engineering Priorities identified by Panel Chairmen at the FY87 Annual Chairmen's Meeting.

PROPOSALS RECEIVED BY THE JOIDES OFFICE

1 October 1986 - 31 January 1987

Ref. No.	Date Rec'd.	Title	Investigator(s)	Inst.	Site Survey Avail. Data	Site Survey Future Need	Panel Reference	PCOM Ref.	Remarks
				ATLANTIC OCEAN					
204/A	10/17/86	Florida escarpment drilling transect	Ch.Paull M.Kastner A.Neumann	UNC Scripps	Yes	Yes	ARP 10/86 SOHP 10/86		Revised version; see Carb. Bank & Guyots W.S.
264/A	12/2/86	Montagnais impact structure and its ejecta on the Scotia Shelf	R.A.F.Grieve P.B.Robertson L.Jansa	GS Canada	Yes	Yes	SOHP 12/86 ARP 12/86		
		[Testing mass Extinction]	L.Jansa G.Pe-Piper		Yes	Some			(updated version title change)
				INDIAN OCEAN					
262/B	11/20/86	Mid-Indus Fan	B.U.Haq V.Kolla	Exxon Houston	No	Yes	IOP 11/86		related to 78/B and 141/B
				WESTERN PACIFIC OCEAN					
250/D	10/15/86	Ogasawera Plateau region near Bonin Arc, NW Pacific	T.Saito, et al.	Yamagata U., et al.	Yes	Yes	WPAC 10/86 LITH 10/86 TECP 10/86 SOHP 10/86		related to 181/D
265/D	12/4/86	Drilling the western Woodlark Basin	S.Scott, et al.	U.Toronto Canada	Yes	Some	WPAC 12/86 LITH 12/86 TECP 12/86 SOHP 12/86		
266/D	12/23/86	Lau Basin	"Lau consortium"	U.Calif., et al.	Yes	Some	LITH 12/86 WPAC 1/87 TECP 1/87		

Ref. No.	Date Rec'd.	Title	Investigator(s)	Inst.	Site Survey Avail. Data	Site Survey Future Need	Panel Reference	PCOM Ref.	Remarks
268/D	12/29/86	Hydrothermal processes and ore deposition--a contribution to the ODP Queensland Plateau and Queensland Trough drilling project	L.Jansa D.Sangster J.Welham	G.S.Canada Mem.Univ. Canada	Yes	Yes	WPAC 1/87 SOHP 1/87		Proposed as tandem to the GBR (206/D)
Addendum	1/25/87	Sulu Sea Transect	K.Hinz C.Rangin H.U.Schluter	G.S.FRG UPMC, Paris			WPAC 1/87 SOHP 2/87 TECP 2/87		See proposal 27/D and 48/D
			CENTRAL AND EASTERN PACIFIC OCEAN						
256/E	9/15/86	Queen Charlotte transform fault and oblique convergence zone	R.Hyndman, et al.	various inst., Canada	Yes		TECP 9/86 CEPAC 9/86 SOHP 9/86 LITHP 9/86		See also 213/E and 237/E
257/E	9/23/86	Farallon Basin, Gulf of California	L.A.Lawver, et al.	UT	Yes	Yes	CEPAC 9/86 LITHP 9/86 TECP 9/86 SOHP 9/86		Related to 75/E
258/E	10/1/86	Drilling in a stockwork zone on Galapagos Ridge	R.Embley, et al.	NOAA/ MRRD/OSU	Yes		CEPAC 10/86 LITHP 10/86		
259/E	10/14/86	Meiji sediment drift, NE Pacific	L.Keigwin	WHOI			CEPAC 2/87		Preliminary
261/E	10/15/86	History of the Mesozoic Pacific Ocean	R.Larson Y.Lancelot	URI UPMC, Paris		Yes	CEPAC 10/86 LITHP 10/86 SOHP 10/86		
263/E	11/24/86	Drilling the Southern Explores Ridge, NE Pacific	R.L.Chase, et al.	UBC, and others	Yes	Some	CEPAC 12/86 LITHP 12/86		See also 237/E and 256/E

Ref. No.	Date Rec'd.	Title	Investigator(s)	Inst.	Site Survey Avail. Data	Site Survey Future Need	Panel Reference	PCOM Ref.	Remarks
269/E	12/29/86	Study the passage of Aleutian subareal pyroclastic flows into the marine environment	J.Stix	U.Toronto, Canada	No	Yes	CEPAC 1/87		Preliminary
		GENERAL AND INSTRUMENTAL							
267/F	12/29/86	Drilling old ocean crust at convergent margins: Argo Abyssal Plain and Western Pacific	C.H.Langmuir J.Natland	LDGO	Yes	Yes	IOP 1/87 WPAC 1/87 CEPAC 1/87 TECP 1/87 SOHP 1/87 LITHP 1/87 DMP 1/87		
270/F	1/12/87	Tomographic imaging of a hydrothermal circulation cell	D:Nobes	U.Waterloo, Canada			LITHP 2/87 DMP 2/87 CEPAC 2/87		

JOIDES / ODP BULLETIN BOARD

1987 MEETING SCHEDULE

Date	Place	Committee/Panel
23-25 February	College Station, TX	IHP
25-26 February	San Francisco	BCOM
2-4 March	Tokyo	WPAC
9-11 March	Menlo Park, CA	SOHP
11-12 March	College Station, TX	Kerguelen WG
30-31 March	Evanston, IL	CEPAC
31 March - 1 April	Palisades, NY	IOP
2-3 April	Woods Hole, MA	SOP
2-3 April	Woods Hole, MA	ARP
13-14 April*	Miami, FL	DMP
10-12 April	Washington, DC	PCOM
22-24 April	Austin, TX	TECP
28-30 April	College Station, TX	EXCOM/ODP Council
4-7 May	Houston, TX	TEDCOM
1-3 June*	Sidney, BC	WPAC
30 June - 3 July*	Copenhagen	SSP
1-3 July*	Paris	CEPAC
6-10 July	Strasbourg	COSOD II
26-28 August	Japan	PCOM
9-11 September*	Palisades, NY	IHP
2-4 November*	London	WPAC
early November*	Honolulu, HI	SSP
30 Nov. - 4 Dec.	Oregon	PCOM/Panel Chairmen (Annual Meeting)

* Tentative meeting (not yet formally requested/approved)

NEW JOIDES PANEL CHAIRMEN

The following people were recommended and have accepted the post of Panel Chairman to these panels:

- Downhold Measurement Panel -

Dr. Paul Worthington
Exploration & Production Division
BP Research Centre
Chertsey Road
Sunbury-on-Thames
Middlesex TW16 7LN, U.K.
(44) 9327-63263

- Information Handling Panel -

Dr. Ted Moore
Exxon Production Research Co.
P.O. Box 2189
Room PT 1785
Houston, TX 77252-2189
(713) 940-4946

- Pollution Prevention and Safety Panel -

Dr. Mahlon M. Ball
U.S. Geological Survey
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
(617) 548-8700

ODP/TAMU PANEL LIAISONS

Atlantic Regional Panel - JACK BALDAUF
Central & Eastern Pacific Regional Panel - ELLIOT TAYLOR
Downhold Measurements Panel - SUZANNE O'CONNELL
Information Handling Panel - RUSS MERRILL
Indian Ocean Regional Panel - BRAD CLEMENT
Lithosphere Panel - ANDREW ADAMSON
Pollution Prevention & Safety Panel - LOU GARRISON
Sediments & Ocean History Panel - AMANDA PALMER
Site Survey Panel - AUDREY MEYER
Southern Oceans Regional Panel - LOU GARRISON
Technology & Engineering Development Committee - BARRY HARDING
Tectonics Panel - CHRISTIAN AUROUX
Western Pacific Regional Panel - AUDREY MEYER

NEW BUILDING DEDICATED AT TEXAS A&M

It was "standing room only" as hundreds of people streamed into the new ODP building on a perfect fall day. Cynics scoffed about building openings not being a major event on campus, especially those held on a late Friday afternoon, but Nov. 21 was an exception. Speeches were made, tours taken, cores examined, photos shot, and punch and cookies downed. Toddlers joined Board of Regents members in looking over the building as the day turned out to be a family affair.

A slide show projected onto the main lobby overhang showed informal shots of ODP personnel at work, on the ship and in various ports around the world. A videotape filmed on Leg 107 was also shown.

Speakers included Dr. James Baker, president of JOI, Inc.; David G. Eller, chairman of the Texas A&M University System Board of Regents; Dr. Mark L. Money, vice chancellor for Research Park and Corporate Relations; Dr. Frank E. Vandiver, president of Texas A&M University, and Michel T. Halbouty, chairman of GERAC (Geosciences and Earth Resources Advisory Council). Dr. Melvin Friedman, dean of the College of Geosciences and principal investigator, presided.

Special guests were Dr. Arthur Maxwell of the University of Texas at Austin and president of the JOI Board of Governors, and Jack Clotworthy, vice president of JOI. Many of the Leg 107 shipboard participants, who were at ODP for their post-cruise meeting, also attended.

An informal consensus concluded that ODP director Phil Rabinowitz's remarks were among the best. He told the group that ODP is important because "it will yield information with respect to Earth and Earth's environment." Earth is dynamic and a key to our understanding "lies locked in the sediments and rocks beneath the seafloor."

To his staff, Phil said: "The work has not been easy in the past, and I don't imagine it to ease up in the future. I know that many of you have been pushed to your limits and that it may be difficult for your families to understand your exceptional drive and dedication. This afternoon, all I can say to them and to you, is that it is rare in any of our lives to have the opportunity to work on a project, that when successfully completed, will change the very way people think about Earth.

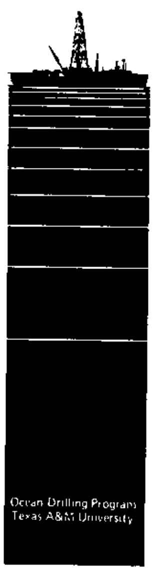
"The program is important. It is important to mankind. Assuring its success is a singular honor and a grave responsibility -- one that attracts exceptional people -- people like you."

The building is the first in the new Texas A&M Research Park. It is located on a six-acre tract at the west side of the campus. The two-story office space is 31,000 square feet and the single-story laboratory, core storage and warehouse is 29,000 square feet, for a total of 60,000 square feet. Of the total space, 10,000 square feet are dedicated to refrigerated core storage.

The building is brick and precast concrete with bronze-framed tinted glass. The building features a two-story lobby area and an enclosed patio. A large conference room with partitions and smaller offices that serve as mini-meeting rooms will allow most meetings to be held at ODP. Wall and furniture colors are predominantly turquoise, deep mauve and beige.

Construction began in February 1985 and was completed in November 1986. Cost of the building was $4.5 million and furnishings were an additional $1 million.

The official name of the building -- so far -- is the prosaic Ocean Drilling Program Building.



The Ocean Drilling Program has pulled up and moved to a new site. Effective November 10, 1986 our new address is:

Ocean Drilling Program
Texas A&M University Research Park
1000 Discover Drive
College Station, TX 77840 USA

Telex: 792779 / ODP TAMU
Telemail: Ocean.Drilling.TAMU
Easylink Number: 62760290

Most telephone numbers have remained the same. The general telephone number is: (409) 845-2673.

The general brochure for the Ocean Drilling Program has been updated. This edition features a color photo of the JOIDES RESOLUTION when she was in the Panama Canal this summer. The section on research has been updated and includes a summary of upcoming cruises in the Weddell Sea and the South Atlantic. Copies may be ordered from Karen Riedel, Ocean Drilling Program, 1000 Discovery Drive, College Station, TX 77840 USA.

SAMPLE DISTRIBUTION

The twelve-month moratorium on samples distributed after a cruise, is completed for Ocean Drilling Program Legs 101-107. Approved requests for materials from these cruises no longer require contribution to the ODP Initial Reports. These cruises include cores collected on the Mid-Atlantic Ridge south of the Kane Fracture Zone (Leg 106) and the Tyrrhenian Sea (Leg 107).

Preliminary sample record inventories for ODP Legs 101 through 106 and Leg 108 are now in searchable database structures.

Investigators requiring information about the distribution of samples and/or desiring samples should address their requests to:

The Curator
Ocean Drilling Program
Texas A&M University
1000 Discovery Drive
College Station, TX 77840

MISSING THIN SECTIONS

Many thin sections that were loaned to investigators from DSDP Repositories are still missing from the collection. These thin sections are a unique representation of the material on which the descriptions of each core are based and are a part of the reference collection maintained at each Repository for visiting scientists and for future studies. Their absence diminishes the usefulness of the collection to the entire scientific community. All investigators who have borrowed thin sections are urged to return them as soon as possible to the repository where the corresponding cores are stored. Questions should be referred to:

The Curator
Ocean Drilling Program
Texas A&M University
P.O. Drawer GK
College Station, TX 77840
(409) 845-6620

COMPUTER SERVICES GROUP

The Computer Services Group recently installed new computer hardware for the VAX 11/750 systems and made three additional 456 megabyte disk drives, two 1600-6250 bpi tape drives and various "cluster" hardware.

The new disk and tape drives provide more mass storage, while the cluster hardware more tightly links together processors, disks and tapes. Both CSG and ODP VAX systems can now access a common set of disk and tape drives. Some have been eliminated because a user can now logon to either processor and access programs and data on the shared devices. The two line printers and the laster printer can be accessed by the PRINT command from either system.

PUBLICATIONS UPDATE

The big news is that the first book of the Proceedings of the Ocean Drilling Program was distributed in December 1986. This tome incorporates Part A (Initial Reports) portions of Vols. 101 and 102 under one cover, separated by a prominent maroon sheet. Our publications program has benefited greatly from the experience and professionalism of the DSDP program, and the "blue books" have served as an excellent standard for us to emulate. Beyond this, we intend to establish our own standards in the way best suited to ODP's needs.

At this writing, manuscripts for Part A portions of Vols. 103, 104, 105, 107, and 108 are in press. We expect to have the Part A manuscripts in hand for Legs 106 and 109 following the post-cruise meeting in February.

We have already received many of the Part B (Final Reports) manuscripts for Vols. 101, 102, and 103. These papers are undergoing peer review and author revision. We plan to begin editorial processing this spring.

Norman J. Stewart came to work for ODP in November as Chief Editor. He was formerly with the U.S. Geological Survey and has a combined experience in editing and publishing of 18 years. This spring we plan to add our final two editors, another production editor, and our final two illustrators.

LEGS 101 THROUGH 107 DATABASES

ODP databases for Legs 101 through 107 are available to the public as of the middle of February, 1987. Anyone who wishes to make a request can do so by calling or writing the ODP Data Base Group. Please contact Kathe Lighty at (409)845-8495 at the Ocean Drilling Program, 1000 Discovery Drive, College Station, Texas 77840.

DSDP/ODP SITE SURVEY CATALOGUE

The revised and updated catalogue of DSDP and ODP site survey data will be available from the ODP Databank in the summer of 1987. Included will be track charts and descriptions of data available for each survey carried out in support of ocean drilling. For further information contact the Manager, ODP Databank, Lamont-Doherty Geological Observatory, Palisades, NY 10964.

REVISED ODP WIRELINE LOGGING MANUAL AVAILABLE

The Borehole Research Group at Lamont-Doherty Geological Observatory has completely revised the 1985 Wireline Logging Manual. Volume 1 includes descriptions of how ODP logging tools work and an expanded discussion on the geologic information available from each tool. Chapters on ODP shipboard logging techniques and capabilities and on logging time estimates have been added. Volume 2 describes scientific applications of ODP logging and includes many examples of how logging can contribute to the interpretation of seismic stratigraphy and applications such as marine geological environments. A selected bibliography on well-logging literature appears as an appendix to the manual. Information on the manual is available from:

David Roach
Lamont-Doherty Borehole Research Group
Rte. 9W, P.O. Box 190
Palisades, NY 10964
Telephone: (914) 359-2900 x330
TWX: 710-5762653

REQUEST FOR NOTICES

The editorial staff of the JOIDES Journal encourages members of the scientific community to submit news items for publication in the JOIDES/ODP Bulletin Board section of the Journal. We would welcome updates on:

- upcoming meetings, workshops and symposia
- availability of relevant publictions such as workshop reports
- any other announcements of interest to the ODP community.

The Journal is published in February, June and October of each year; notices should be received no later than one month before press time to ensure their publication. Please send items to:

JOIDES/ODP Bulletin Board
JOIDES Office
College of Oceanography
Oregon State University
Corvallis, OR 97331 USA
Telemail: JOIDES.OSU

CO-CHIEF SELECTION PROCESS FOR ODP CRUISES

With the move of the JOIDES Planning Office to Oregon State University, we have received a number of questions and concerns about procedures of the Planning Committee. One such question addresses the selection process of co-chief scientists. We felt that it may be appropriate to use the JOIDES Journal to state some of the existing PCOM policies on co-chief selection.

There are two contractual obligations in the co-chief selection process. First, the Science Operator, Texas A&M University, has the final responsibility for selecting all scientific staff which will participate on a particular leg. Secondly, the "Memorandum of Understanding" (MOU) signed by all members states that, on average, each non-U.S. member should have one co-chief position in a year.

The co-chiefs are selected by the Science Operator from a list of names forwarded by the Planning Committee. This list comes from input by the advisory panels, names suggested by non-U.S. science advisory committees and other names suggested by PCOM. The list may also include people who have expressed an interest in participating as a co-chief on a particular leg. In providing advice to the Science Operator, PCOM identifies names of original proponents, scientists who carried out site surveys, scientists with major interest in the region to be drilled, and those with expertise in the problems being addressed by the particular leg. In addition, PCOM may identify names of those who have been co-chiefs a number of times in order to bring attention to new people on the list who have not had the opportunity to participate in the program as a co-chief scientist.

The responsibilities of co-chief scientists include overseeing a shipboard staff of nearly 50 people and the successful completion of a multi-million dollar cruise (including the ultimate publication of both data and scientific reports). The co-chief selection process is intended to select those who have the experience, maturity, and scientific expertise to coordinate and conduct the scientific program assigned to each leg. As many legs have been developed from combinations of proposals and different data sources, and because of the obligations stated in the MOU, it is not possible, to guarantee that all proponents will be selected to serve as co-chief scientists.

TELEMAIL LISTINGS WANTED

The JOIDES Journal will now list Telemail addresses as well as telephone and telex numbers. If you have a Telemail listing, please forward it to: Cherry Moss, JOIDES Office, College of Oceanography, Oregon State University, Corvallis, OR 97331 (Telemail: JOIDES.OSU).

JOIDES JOURNAL MAILINGS

As of 1 July 1986, Joint Oceanographic Institutions (JOI), Inc. has been handling distribution of the JOIDES Journal. Please notify JOI of any changes or additions to the mailing list, or if you have not received your copy of the Journal:

JOI, Inc.
1755 Massachusetts Ave., NW
Suite 800
Washington, DC 20036
Telephone: (202) 232-3900
Telex: (RCA) 257828/BAKE UR UD
Telemail: E.Kappel

Now that JOI is in charge of mailing of the JOIDES Journal, we wish to both simplify and clarify how the Journal mailings will be done in the future. This is a reminder of how JOI wishes to coordinate the JOIDES Journal mailings to recipients in member countries:

1. JOI will continue to send individual copies of the Journal to:
   a) members of PCOM and EXCOM;
   b) recipients at U.S. institutions;
   c) JOIDES panel chairmen; and
   d) individuals in non-member countries, including Third World nations.

2. JOI will send a bulk mailing to each foreign partners' ODP secretariat, who will then take care of mailing individual copies of the Journal to their own country's recipients. Non-U.S. individuals of member nations should send JOIDES Journal requests to their own secretariat. If the secretariat needs additional copies of the Journal for the bulk mailing, a request should be sent to Dr. Ellen Kappel at the JOI Office in Washington at the address listed above.

3. The JOIDES office at OSU will forward updated lists of JOIDES panel members to the JOI Office. All requests by U.S. individuals should be made directly to Dr. Ellen Kappel at the JOI Office.

BIBLIOGRAPHY OF THE OCEAN DRILLING PROGRAM

The following publications are available from the ODP Subcontractors. Information from Texas A&M University can be obtained from ODP Headquarters, TAMU, College Station, Texas 77843-3469. Information from the Lamont-Doherty Geological Observatory can be obtained from R. Anderson or R. Jarrard at the Borehole Research Group, L-DGO, Palisades, N.Y. 10964.

TEXAS A&M UNIVERSITY

1. Technical Notes

#1 Preliminary time estimates for coring operations (REVISED EDITION December 86)

#2 Operational and laboratory capabilities of JOIDES RESOLUTION (June 85)

#3 Shipboard scientist's handbook (September 85)

#4 Five papers on the Ocean Drilling Program from "OCEANS '85" (May 86)

#5 Water Chemistry Procedures aboard JOIDES RESOLUTION (September 86)

#6 Organic Geochemistry aboard JOIDES RESOLUTION - An Assay (September 86)

#7 Shipboard Organic Geochemistry on JOIDES RESOLUTION (September 86)

2. Scientific Prospectuses

#0 (March 1986) Leg 100
#1 (January 1985) Leg 101
#2 (February 1985) Leg 102
#3 (March 1985) Leg 103
#4 (April 1985) Leg 104
#5 (June 1985) Leg 105
#6 (September 1985) Leg 106
#7 (October 1985) Leg 107
#8 (December 1985) Leg 108
#9 (March 1986) Leg 109
#10 (April 1986) Leg 110
#11 (July 1986) Leg 111
#12 (August 1986) Leg 112
#13 (October 1986) Leg 113
#14 (February 1987) Leg 114

3. Preliminary Reports

#0 (May 1986) Leg 100
#1 (April 1985) Leg 101
#2 (June 1985) Leg 102
#3 (July 1985) Leg 103
#4 (September 1985) Leg 104
#7 (May 1986) Leg 107
#8 (June 1986) Leg 108
#9 (August 1986) Leg 109
#10 (September 1986) Leg 110
#11 (November 1986) Leg 111

4. Other Items Available

- Ocean Drilling Program (in English, French, Spanish or German)
- Onboard JOIDES RESOLUTION
- ODP Sample Distribution Policy
- Instructions for Contributors to the Proceedings of the Ocean Drilling Program
- ODP Engineering and Drilling Operations

LAMONT-DOHERTY GEOLOGICAL OBSERVATORY

Wireline Logging Manual (2nd Edition, December, 1986)

DRILLING BULLETIN BOARD

A new and expanded electronic bulletin board called DRILLING is now available on Omnet's Science Net. The board includes items of interest to both the Ocean Drilling and Continental Drilling Programs, coordinated by JOI, Inc. (Joint Oceanographic Institutions, Inc.) and DOSECC, Inc. (Deep Observation and Sampling of the Earth's Continental Crust, Inc.), respectively. Weekly summaries from the drillship JOIDES RESOLUTION are posted to DRILLING by the ODP at Texas A&M University, as well as ship schedules for forthcoming ODP legs as they are updated. Updated schedules of JOIDES committee meetings are posted by the JOIDES Office at Oregon State University. The JOI Office in Washington posts information on new programs (e.g. issuance of RFP's, fellowships, etc.), and the ODP Office of NSF anticipates using the bulletin board to announce proposal deadlines and other matters. Others are encouraged to use the DRILLING bulletin board to announce appropriate meetings, workshops, results, etc.

JOI will not control access to the bulletin board, but if you have any questions about it, please contact the coordinator, Dr. Ellen Kappel (telemail E.Kappel, telephone 202-232-3900). Information about accessing Omnet can be obtained from: Omnet Inc., 70 Tonawanda St., Boston, MA 02124 (telephone 617-265-9230).

To post a message, address it to: DRILLING. To facilitate scanning of board contents, use the prefix OD for items relevant to Ocean Drilling and CD for Continental Drilling (or OD/CD for both audiences) in the Subject heading. At the bottom of the message, a purge date is required so that the board is kept up-to-date.

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Schluter, H.U.	WPAC	(49)511-643-2327	0923730/BGR HA D
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Schrader, H.	CEPAC		
Schuh, F.J.	TEDCOM	(214)380-0203	794784/ARCO PLNO
Sclater, J.C.	IOP	(512)452-6223	9108741380/UTIG AUS
Scott, S.	WPAC	(416)978-5424	0623887/GEOLOGY TOR
Scrutton, R.A.	IOP	(44)31-667-1081	727442/UNIVED G
Segawa, J.	IOP	(81)3-376-1251	25607/ORIUT J
Sengor, A.M.C.	CEPAC	(90)1-433-100	23706/ITU TR
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Shipley, T.H.	PCOM	(512)458-5358	9108741380/UTIG AUS
Sibuet, J-C.	ARP	(33)98-22-42-33	940627/OCEAN F
Silver, E.	WPAC	(408)429-2266	9105984408/UC SC LIB SACZ
Sinton, J.	LITHP	(808)948-7751	(RCA)7238285/HIGCM HR
Sliter, W.	CEPAC	(415)323-8111 x4147/2261	171449/PCS USGS MNPK
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Smythe, D.	ARP	(44)31-667-1000	727343/SEISED
Sparks, C.	TEDCOM	(33)1-47-52-63-95	203050/IFP A F
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Srivastava, S.	TECP	(902)426-3148	
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Stel, J.	EXCOM	(31)20-22-29-02 x125	16064/NRZ NL
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Summerhayes, C.	SOHP	(44)9327-762672	296041/BPSUNA G
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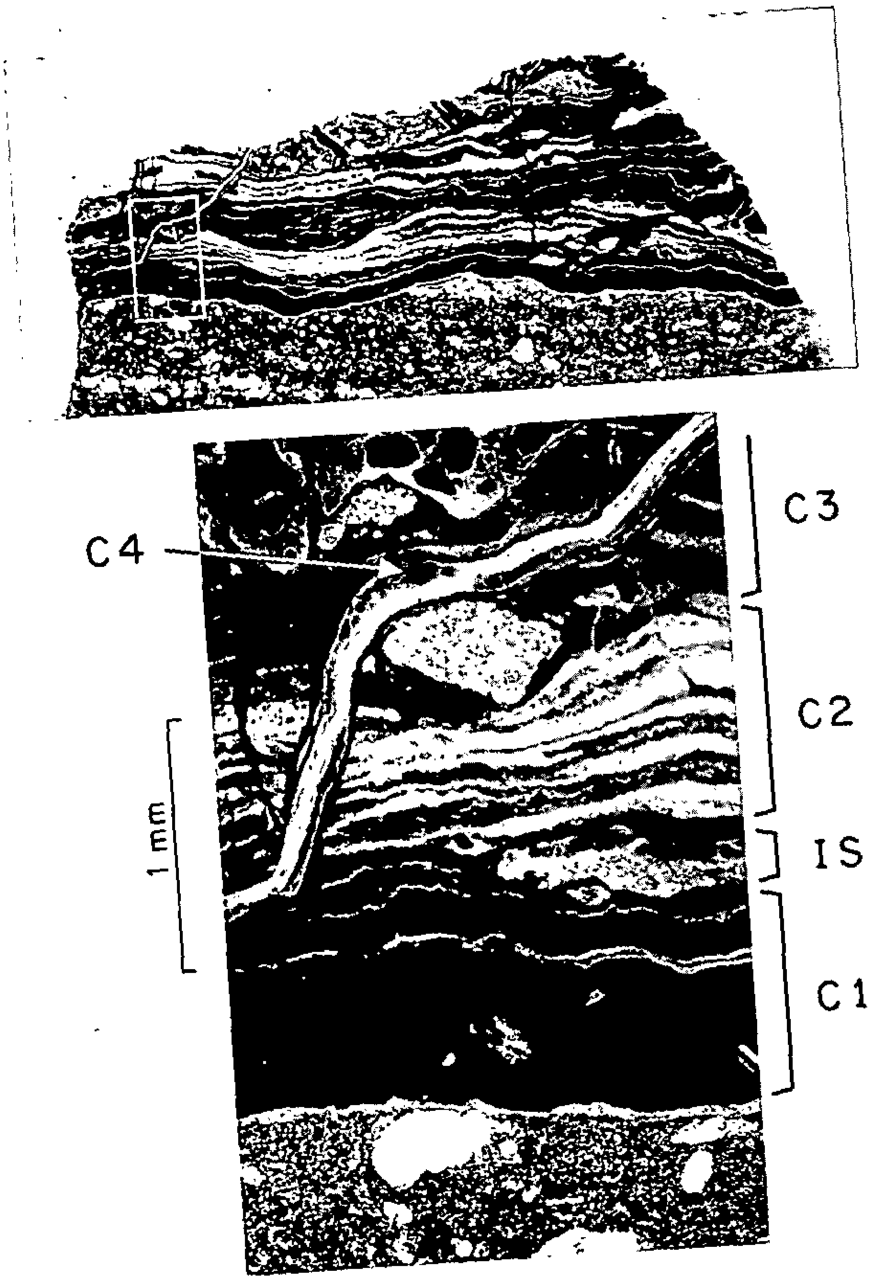
Special Issue No. 4: Guide to the Ocean Drilling Program, September 1985, (Volume XI)

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

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

BACK COVER

Core and thin section from Hole 684A, Leg 112. Core recovered at 117 mbsf. Laminated carbonate cements tainted with disseminated, black opaques exhibiting multi-generation superposition relationships. The matrix is micritic carbonate with cement-filled foraminiferal molds. Cement zones C1, C2, and C3 are separated by discontinuity surfaces which may indicate periods of corrosion. Zones C1 and C2 are locally separated by a lens of internal sediment (IS). A fourth generation of fracture-fill cement (C4) cuts all previous growth zonations. (Photograph provided by E.Suess, Leg 112 Co-Chief; graphics by D.Reinert, OSU.)


C4
C3
C2
IS
C1
1 mm