NEWS FROM THE JOINT OCEANOGRAPHIC INSTITUTIONS/U.S. SCIENCE SUPPORT PROGRAM ASSOCIATED WITH THE OCEAN DRILLING PROGRAM

JOI/USSAC NEWSLETTER

MARCH 1996 VOLUME 9. NUMBER 1

Pacific mud and Greenland ice show climate links

contributed by Richard J. Behl

In November 1992, the Ocean Drilling Program's *JOIDES Resolution* recovered a spectacular 160,000-year record of late Quaternary oceanographic and climatic change at Site 893, in the Santa Barbara Basin (SBB). This record, retrieved during a one-day operation at the conclusion of Leg 146 (Cascadia Margin), has the potential to match the ultra-high chronologic resolution of the recently analyzed Greenland ice cores. Although famous for its varved sediments, the SBB had never been explored by the Deep Sea Drilling Project or by the ODP. Only the uppermost Holocene sedimentary record was known from studies of relatively short box and piston cores. Yet these studies provided the impetus to extend the paleoceanographic record in the SBB by drawing attention to the high sedimentation rates, the presence of organic-rich and unbioturbated mud, the abundance of all major microfossil groups, the links to the California Current system, and the benefit of the coastal setting, which enables SBB to receive both oceanic and continental (e.g., pollen) signals.

The SBB is a ~600 meter-deep, silled, inboard basin in the Californian Continental Borderland [*Emery,* 1960] containing both marine and terrestrial climatic proxies within its hemipelagic mud (Figure 1). The Mediterranean-type climate in this region results in a terrigenous sediment supply that is highly seasonal, with most material delivered by runoff of winter and early spring rains [*Soutar & Crill,* 1977]. Consequently, biogenic sedimentation fueled by upwelling in the late spring, summer and fall is undiluted by siliciclastic material. Below sill depth (475 m), the modern basin is filled with oxygen-depleted waters derived from the upper intermediate waters and the Oxygen Minimum Zone off central California. Inside the basin, these waters are further stripped of oxygen by the degradation of settling plankton, rendering the seafloor inhospitable to macrofauna and preventing bioturbation [*Emery & Hülsemann,* 1962]. Seasonal variations in sediment composition (siliciclastic vs. biogenic) are preserved this way as mm-scale laminations and provide a record of past changes in seasonality and surface productivity.

Hole 893A recovered a 196-meter sequence of hemipelagic mud that extends back to about 162,000 years before present [*Kennett, Baldauf, et al.,* 1994]. Moderate amounts of gas expansion within the organic-rich

INSIDE...

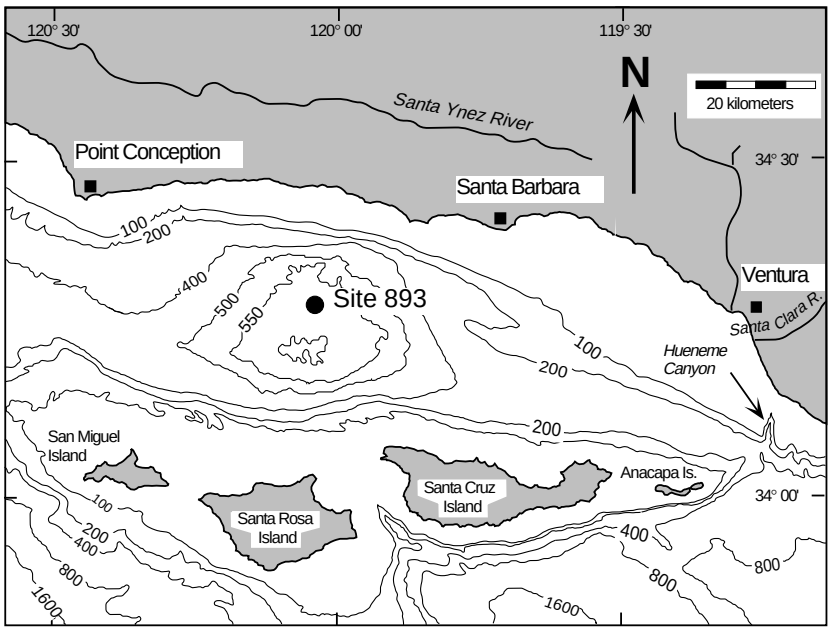

Fig. 1: Location of ODP Site 893 in California's Santa Barbara Basin. Bathymetric contours are in meters.

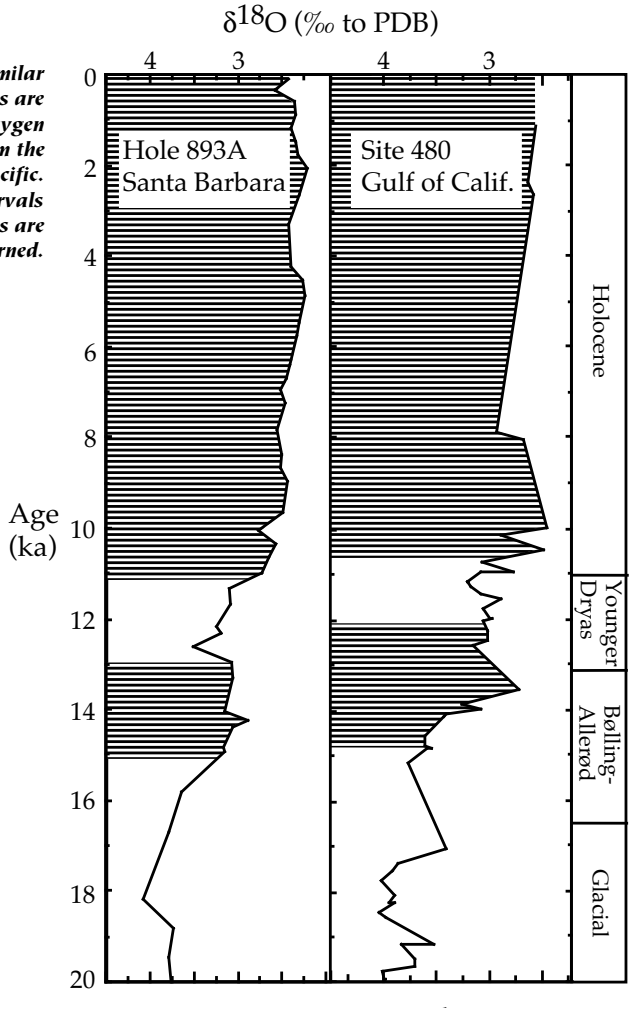

Fig. 2: Similar deglacial histories are observed in two oxygen isotope records from the Northeast Pacific. Sedimentary intervals with varves are patterned.

sediment partially extruded some cores and created excitement on deck. Yet this expansion only minimally disturbed the sediments by creating a set of bedding-parallel partings. A second hole (893B), intended to insure complete recovery of the sequence, was aborted at 69 mbsf when coring time expired. The short transit to port precluded shipboard analysis or description of the cores. Instead, the cores were split, described, and sampled two months after the cruise by a shore-based scientific party in College Station, Texas.

The cores proved fertile ground for a whole host of studies that examined the foraminifera, diatoms, radiolarians, stable isotopes, carbonate, organic matter, alkenones, and sedimentary fabric and mineralogy [*Kennett, Baldauf, & Lyle,* 1995]. Milankovich- to submillenial-scale variation in the SBB record has been found to be tightly correlated to deep-sea and ice-core records of global change, yielding new insights into the ocean-atmosphere-cryosphere system.

Pollen and oxygen isotope data allow integration of the marine and continental/lacustrine records in and offshore of California [*Heusser,* 1995]. The brief 24 hours of ship time has thus far resulted in a *Scientific Results* volume with 23 scientific papers, four data reports, and approximately a half dozen papers published in open literature.

One of the simplest determinations — quantification of bioturbation — proved to be one of the most revealing. Varves, which are characteristic of the low oxygen conditions in the Holocene, are present only intermittently in the older portions of the sedimentary sequence. The presence-absence of the varves reflects cyclical changes in basin oxygenation, which was confirmed by changes in benthic faunas. While 70 percent of the sequence is bioturbated, the extent of vertical mixing of sediment was minimal. Burrows were never observed to penetrate more than about 2 cm into the organic-rich sulfidic mud, so biological mixing rarely homogenized more than a 15-year interval [*Behl,* 1995]. Therefore, despite bioturbation, the cores maintained their ability to provide ultra-high resolution climate records. For the first time in ODP history, extended paleoclimatic studies were able to document changes that occurred within typical human life-spans.

With age constraint provided by radiocarbon dating and oxygen isotope stratigraphy, paleoceanographic changes at Site 893 are placed into regional and global context. More than 30 major anoxic (laminated) events are recorded at Site 893 during the past 160,000 years. For at least the past 60 kyr, laminated sediments (anoxic events) are closely associated with warm climates, whereas bioturbated sediments (oxic events) correspond to cold. This pattern is clearly shown during the warming from the last glacial maximum to the Holocene, which was temporarily interrupted by the Younger Dryas cooling event (Figure 2) [*Kennett & Ingram,* 1995]. A similar pattern is observed at DSDP Site 480 in the Gulf of California, suggesting that the benthic environments distributed along the northeastern Pacific margin were simultaneously influenced by regional fluctuations in the oxygen content of intermediate waters. The regional and temporal extent of these oscillations will be explored further during the upcoming Leg 167 to the California Margin.

Rick Behl is a brand-new Assistant Professor of Geological Sciences at the California State University, Long Beach. Rick's university career and prior life as a mud-logger (well-site geologist) moved him from San Diego to San Luis Obispo to Santa Cruz to Santa Barbara to Long Beach. Many people suspect that Rick's research interests in the Miocene Monterey Formation, deep-sea cherts, and evolution of the Pacific Rim are a thinly disguised excuse to live and work within view of the California beach.

A global link between the oceanic and atmospheric systems is revealed when SBB anoxia events are compared with the Greenland ice core records of air temperature (Figure 3). A key feature of the Greenland record during the last glaciation is the occurrence of more than 20 abrupt, millennial-scale warming events, referred to as "Dansgaard-Oeschger interstadials" [*Dansgaard et al.*, 1993]. Warming was extremely rapid for most events, occurring within decades. The warming was followed by a slower return to glacial conditions over hundreds of years. Prior to coring the SBB, evidence for Dansgaard-Oeschger cycles was limited to the Greenland/North Atlantic region and the spatial extent of these extreme temperature oscillations was unknown. The similarity in timing, duration and magnitude of the events (Figure 3) indicates that changes in atmospheric circulation and temperature directly influenced the mixture, flux, and composition of intermediate waters that bathed the California Margin at Site 893 [*Behl & Kennett*, 1996]. Furthermore, benthic faunal changes associated with these anoxic events indicates that abrupt climate change was capable of catastrophic effects on benthic ecosystems.

This level of correlation between ice and sediment cores is possible because sedimentation rates at Site 893 are about 10 times higher than in typical deep-sea cores. Yet SBB is probably not alone in preserving such detailed records. For the most part, marginal marine settings have been overlooked as sites for paleoceanographic studies because

Post-cruise opportunity for Saanich Inlet cores: Study of ultra-high-resolution climate change

JOI/USSSP will make limited funds available for post-cruise scientific research stemming from ODP's coring of a western Canadian fjord during subleg 169S. Two sites will be cored in two days this August in Saanich Inlet, near Victoria, British Columbia. Canada's Dr. Brian Bornhold was the principal drilling proponent and will serve as Chief Scientist.

The procedures for funding U.S. scientific research associated with this subleg vary from the normal USSSP procedures because drilling lasts only two days and because the shipboard party is significantly smaller than normal. Nevertheless, JOI/USSSP recognizes the great scientific potential of Saanich Inlet and thus seeks to provide support for a limited amount of post-cruise shorebased scientific research. To this end, U.S. scientists interested studying the recovered core material should send a curriculum vitae and a cover letter detailing their scientific research plan to:

Dr. Jack Baldauf, Manager of Science Operations, Ocean Drilling Program, Texas A&M University, 1000 Discovery Drive College Station, TX 77845-9547
tele: (409) 845-929; fax: (409) 845-0876
e-mail: jack_baldauf@odp.tamu.edu

SCIENTIFIC PLAN

During Leg 169S ODP will drill into a rapidly deposited stratigraphic sequence that promises an ultra-high-resolution record of Holocene environmental change. Sedimentation rates of 780 cm/kyr are anticipated from a presumed basal age of 16,000 years and a sequence thickness of 125 m.

The scientific objectives of Saanich Inlet drilling are to:

1. Obtain an ultra-high-resolution record of Holocene climate, oceanography, marine productivity, ecology, and terrestrial vegetation;
2. Establish the frequency of earthquakes in the Cascadia convergent margin (particularly those greater than magnitude eight);
3. Advance our understanding of diagenesis in organic-rich sedimentary basins and especially the role of microbial processes. The finely laminated (varved) sediments thought to have accumulated in the inlet since deglaciation will be cored at two sites in the deeper axial region of the fjord; these two sites (at 200 and 225 m water depth) have significantly different organic contents and accumulation rates. Saanich Inlet will provide an important companion to the high-resolution Site 893 drilled in Santa Barbara Basin (Leg 146) and Site 1002 drilled in Venezuela's Cariaco Basin (Leg 165).

Approximately 100 to 125 m of Holocene diatomaceous silts and clays and upper Pleistocene glaciomarine muds will be cored with the advanced hydraulic piston corer (APC) to refusal at the two sites. Both sites will be triple APC cored. If additional time is available, each site will be APC cored four times. If time is short, only the northern site will be triple cored. Temperature measurements will be made in the lowermost part of the proposed Site SI-02B if time permits. Only the A hole from each site will be measured using the multisensor track (MST), split, and photographed on board. The B and C holes will be measured using the MST during Leg 169 and returned to the core repository at ODP/TAMU for further work. Sampling of the A holes will occur the week after the cruise at the Pacific Geoscience Center, in Sydney, B.C. Sampling of the B and C holes will occur at ODP/TAMU.

of potential erosion, unconformities, and paucity of microfossils. Yet, at a recent conference of International Geological Correlation Programme 374: "Paleoceanography and Paleoclimatology from Laminated Sediments," studies from other marginal marine settings were presented that appear to record similar oceanographic or ecological manifestations of the short-lived Dansgaard-Oeschger events [*Behl & Kennett,* 1995]. The success in the SBB has proven critically important to the subsequent approval of other paleoceanographic coring programs in marginal marine settings such as Cariaco Basin (Site 1002, Leg 165, Dec./Feb. 1996) and Saanich Inlet (Leg 169S, August 1996). Over the next few years, data from other promising marine locations such as Guaymas Basin (Mexico), Sea of Japan, and the Pakistan/Indian Margin will be combined with climatic records from terrestrial lacustrine sites, such as Lake Estancia (New Mexico), and Lake Mascardi (Argentina) to create a truly global picture of how Earth systems interact during abrupt climatic change.

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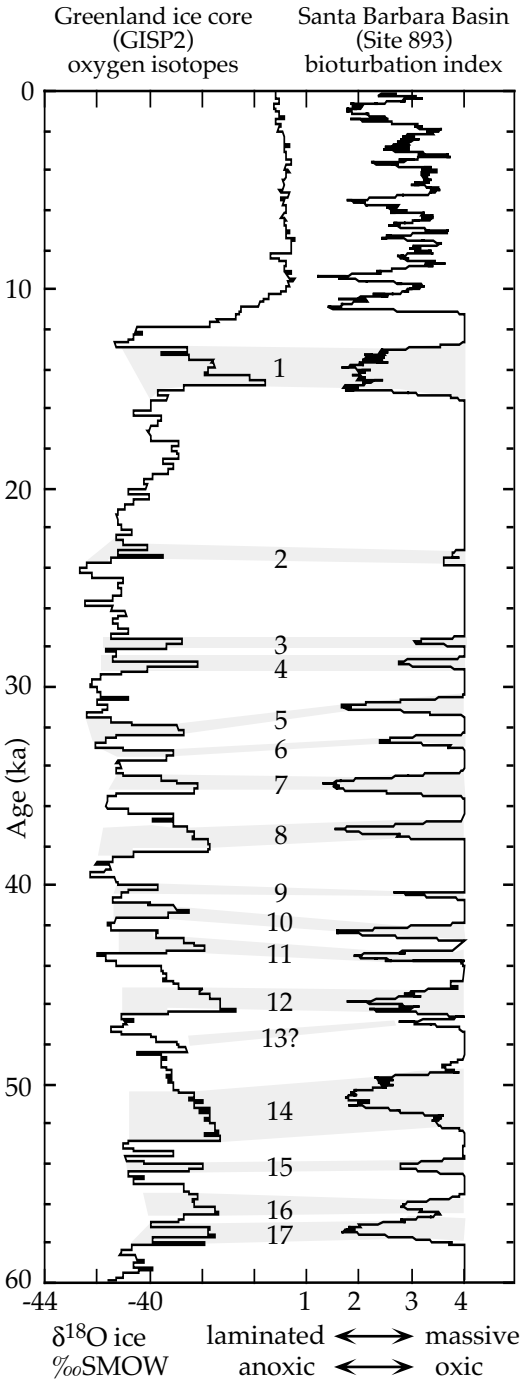


Fig. 3: Correlation of climate records from ice and marine cores. An excellent link is observed between anoxia (laminations) events and the warm interstadial (Dansgaard-Oeschger) events in the ice core. Chronologies for the two records were independently derived.

Drill Bits

ODP Publications – A status report

The rumor mill is in full swing regarding **potential** changes to ODP publication policy. To dispel some of these rumors, we supply the following status report.

At their December meeting, the JOIDES Planning Committee (PCOM) made several recommendations to JOI to make changes to policies regarding both the "Initial Reports" and "Scientific Results" volumes. These proposed changes take into account recommendations made by the JOIDES Information Handling Panel at their September 1995 meeting and the report of the PCOM Publications Subcommittee. As we go to press, JOI has not yet instructed ODP/TAMU to implement these recommended changes; JOI is currently considering the long-term implications of these policy changes to the Program. Executive Committee (EXCOM) approval of the changes will be sought in June.

Three of the most significant recommended policy changes are: (1) Removal of the requirement for participating scientists to publish in the "Scientific Results" volume. A scientist's contribution would be considered the submission of a reviewable manuscript to either the "Scientific Results" volume or to another refereed journal and would meet a criterion for performance as a participant in the leg. To fulfill the requirement to publish, the scientist must submit an article by the time that the "Scientific Results" volume closes. (2) The deadline for initial submission of papers for the "Scientific Results" volume would be increased to 24 months post-cruise. (3) The date for lifting the moratorium on independent outside publication would be 12 months post-cruise.

Unless you hear from ODP/TAMU about a change in publications policy affecting your leg, do not assume that these recommendations have been implemented.

ODSN workshop

JOI/USSSP supported Woody Wise, Tom Davies, and Cinzia Spencer-Cervato to participate in the international workshop, "Objectives and Implementation of an Ocean Drilling Stratigraphic Network (ODSN)," held in Bremen, Germany in December 1995. The goal of the workshop was to define the structure of an ODSN, to determine which data are available and should be included in it, and to decide how to organize the infrastructure and communication necessary for the development of a database accessible to the whole research community. Approximately 60 people attended the meeting, convened by V. Spiess, H. Grobe, W.W. Hay, W. Kuhnt, J. Thiede, and G. Wefer. A volume of workshop proceedings is expected soon.

ODP Long Range Plan

JOI is pleased to announce the availability of the new ODP Long Range Plan, "Understanding Our Dynamic Earth Through Ocean Drilling." This important document provides the framework for scientific ocean drilling into the 21st century. All drilling proposals, from this point on, will be evaluated in the context of this LRP. In addition, EXCOM directed PCOM to develop an implementation strategy for the LRP, including the neces-sary changes to the JOIDES panel and committee structure, which EXCOM will review at its June meeting. The July issue of this newsletter will report the results of those deliberations.

American Geophysical Union Special Session

PALEOCEANOGRAPHY OF THE ATLANTIC BASIN: ODP RESULTS

1996 AGU Spring Meeting
Baltimore, Maryland
May 20-24 (exact date and time not yet scheduled)

Come hear the latest and greatest paleoceanographic results from scientists that sailed on recent ODP legs. Invited talks will be presented by a variety of international shipboard scientific party members and by U.S. Co-Chiefs from Legs 150 (N.J. Transect), 154 (Ceara Rise), 155 (Amazon Fan), 162 (Atlantic Arctic Gateways II), 164 (Gas Hydrates), and 165 (Caribbean Ocean History). The science will focus on the paleoenvironmental evolution of the Atlantic Ocean Basin and the role it plays in global ocean and climate systems. Session conveners are William Showers (MEAS, North Carolina State U) and John Farrell (Joint Oceanographic Institutions).

JANUS UPDATE

The ODP computer database management system

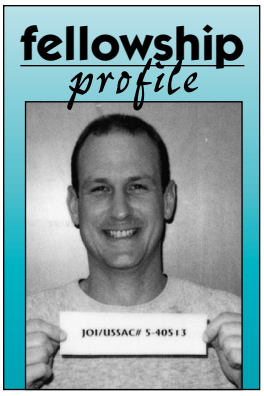
Much has been accomplished on the Janus Project — the effort to replace the ODP computer database management system — since our last report in the November newsletter. Implementation of the project now extends to the ship. In December, the ship database server hardware (DEC Alpha Server), software (Neuron Data and Oracle), and documentation were packaged and delivered to *JOIDES Resolution* for installation, prototyping, and testing during Leg 165. Installation of the server went without a hitch and progress was made following the Incremental Build and Development Methodology where the data model is verified, prototyping occurs, and user feedback is provided. Most progress was made on the Group 1 and 2A applications. These applications focus on: drilling operations; core tracking; core sampling and curation; multi-sensor track data (GRAPE, P-Wave, magnetic susceptibility, and natural gamma); and logging. Prototyping began on Group 3 (physical property) and Group 4 (chemistry) applications. Two Tracor personnel sailed on Leg 165, and one on Leg 166. Shipboard Janus efforts will increase significantly during transit leg 166T (April 14-20), and will involve personnel from ODP/TAMU, Tracor Inc., and the JOI Database Management Steering Committee. When finished, the database will be accessible from Macintosh, Windows and UNIX platforms. Back on shore, ODP/TAMU is busy creating software tools that will be linked to Janus, enabling, among other things, World Wide Web access to the Oracle database through a home page. The next big topic to be tackled will be to incorporate a digital image-based core description system and database. Paleontology will be tested on Leg 167 and Janus will be fully operational on Leg 169. For more information about Janus, see the home page at http://www-odp.tamu.edu/janus/, or contact the new chair of the JOI Steering Committee, Dr. Kate Moran (moran@agc.bio.ns.ca). Finally, we thank Dr. Terri King for her dedication and hard work while serving as chair of the committee.

An abstract opportunity...

JOI/USSAC invites you to contribute a summary of your most exciting ODP scientific results to a full-color abstract volume to be published by JOI in the spring of 1997. This document will be included with other materials provided by NSF/ODP to the National Science Board in support of ODP renewal in the U.S. for the years 1998-2003, but will also be available free to the entire community upon completion.

If you are interested in contributing one or more abstracts to this volume, please send titles to Ellen Kappel (ekappel@brook.edu) no later than May 15, 1996. Completed abstracts will be due at JOI on October 1, 1996. Abstracts should be approximately 250 words in length, should be accompanied by one illustration or photo (color, if possible), and be written for a general scientific audience. Electronic submission of materials is preferred. Please note that all submitted abstracts may not be included in the volume, and JOI reserves the right to edit abstracts.

Rapid diversification of planktonic foraminifera in the tropical Pacific (ODP Site 865) during the late Paleocene thermal maximum



D. Clay Kelly

Ph.D. Student:
UNC Chapel Hill

Faculty Advisor:
Tim Bralower

The late Paleocene thermal maximum (LPTM) occurred at roughly 55.5 Ma and is characterized by a sudden increase in global temperatures, one of the most dramatic extinctions of deep-sea benthic foraminifera of the past 100 myr, and a marked negative isotopic shift in the global carbon reservoir. Researchers have interpreted these abrupt (~ 10 kyr) changes as signifying a fundamental alteration in the global pattern of ocean circulation. The relatively complete late Paleocene-early Eocene sequences recovered at ODP Site 865 presented us with the unique opportunity to investigate this short-lived (50 to several hundred kyr) paleoceanographic event and its effects on the tropical, calcareous microplankton.

Our study of the LPTM microfossil assemblages indicate that the pattern of depth-stratification typically associated with Paleogene planktonic foraminifera temporarily collapsed. Furthermore, near-surface dwelling taxa rapidly diversified, while forms generally regarded as inhabiting thermoclinal depths became locally absent. The transient diversification seen in the near-surface dwelling planktonic foraminifera stands in stark contrast to the mass extinction suffered by their benthic counterparts.

We used single-specimen isotopic analysis to distinguish *in situ* specimens from those that had been reworked into the ~ 15 cm LPTM interval. These data demonstrate that 1) conventional counting methods grossly underestimated the relative abundances of the ephemeral LPTM taxa, 2) differing groups of near-surface dwelling planktonic foraminifera underwent parallel patterns of paleobiogeographic and paleoecologic change in response to the LPTM, and 3) thermal gradients within the water column were significantly diminished.

Influences on calcite Sr/Ca records from Ceara Rise and other regions: Distinguishing ocean history and calcite recrystallization

Gretchen Hampt

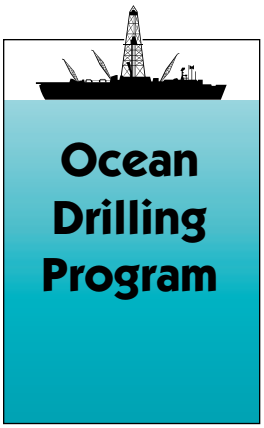
Ph.D. Student:
UC Santa Cruz

Faculty Advisor:
Peggy Delaney

Strontium/calcium ratios in deep-sea carbonate sediments have been used both as recorders of paleoceanographic Sr/Ca and, in conjunction with pore water Sr, as indicators of diagenetic alteration of calcite sediments. My JOI/USSAC fellowship has supported efforts to evaluate the relative impacts of ocean history and calcite recrystallization on calcite Sr/Ca records, using a combined approach of geochemical measurements and numerical modeling of diagenesis.

In various combinations, I have compared new bulk calcite Sr/Ca records from Ceara Rise (Leg 154) and the eastern equatorial Pacific (Leg 138), and existing bulk calcite records from Ontong Java Plateau (Leg 130) and global foraminiferal records. Within each data set, Sr/Ca appears to vary most consistently with age, rather than sediment depth, indicating that it more strongly represents a record of ocean history rather than depth-controlled diagenetic alteration — something of a surprise! All records show similar trends, increasing in Sr/Ca values through the Cenozoic, with particularly large fluctuations superimposed on this trend in the Neogene. However, scatter in Sr/Ca values for contemporaneous samples between sites within a region and between regions is significantly larger than analytical error and may or may not reflect differences in initial Sr/Ca uptake. Future analytical work will include efforts to distinguish Sr/Ca uptake variability and to distinguish the diagenetic patterns of different size fraction components of the sediments.

I have worked with a Sr-exchange model of calcite diagenesis to evaluate diagenetic effects on bulk calcite Sr/Ca. My equilibrium calculations suggest that authigenic celestite ($SrSO_4$) probably precipitates in all but the deepest sites at Ceara Rise and Ontong Java Plateau. Model results show that celestite precipitation can have a large effect on pore water Sr profiles, and thus lead to the under-interpretation of the extent and effects of diagenesis on Sr/Ca ratios. In addition, the presence of celestite may account for some fraction of the scatter in contemporaneous Sr/Ca values in calcite. Future modeling will continue to focus on how variations in diagenetic history may explain the scatter that exists among Sr/Ca records and to quantify diagenetic effects on calcite Sr/Ca ratios.



Summaries of upcoming ODP Legs 171B-176

If you are interested in participating in any of these ODP legs, contact:

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At the December 1995 meeting, the JOIDES Planning Committee finalized the fiscal year 1997 drillship operations schedule. The following are brief descriptions of Legs 171B-176 taken from the JOIDES Science Plan. We encourage you to contact the leg co-chief scientists and/or Jack Baldauf if you are interested in obtaining more information about a particular leg.

LEG 171B: Barbados LWD
Co-Chief: Moore (USA)

The purpose of the Logging While Drilling (LWD) transect at the Barbados accretionary prism is to better understand the interrelationships of deformation, fluid flow, seismic imaging and changes in physical properties. Specifically, the program will: (1) establish porosity-depth and porosity-velocity-depth variations in an accretionary prism, (2) investigate the properties of faults and fluid conduits and hydrate zones, (3) examine the consolidation state of sediments in and around faults, and (4) better define the relationship between physical properties and the polarity and shape of the seismic waveform from fault zones.

LEG 171C: Blake Plateau/Blake Nose
Co-Chiefs: Norris (USA), TBN

Drilling on the Blake Plateau meets several high priority objectives outlined by COSOD II, which emphasize the acquisition of low-latitude records with integrated bio- and magnetochronologies required for high-resolution studies of Paleogene climate, biotic evolution, and watermass structure. The planned transect on the Blake Plateau will test existing models for the Paleogene and Cretaceous history of intermediate and deep waters in the Atlantic and Tethys.

LEG 172: W North Atlantic Sediment Drifts
Co-Chiefs: Keigwin (USA), Rio (Italy)

The major objectives of the Blake-Bahama Outer Ridge (BBOR) program are to obtain a detailed history of Late Neogene paleoceanography and paleoclimate in the North Atlantic by investigating: (1) millennial scale oscillations of stable isotopes (C, O), carbonate, and trace metals in rapidly deposited drift deposits, (2) the nature of cyclicity of these oscillations, and (3) how are these cycles related to the history of northern hemisphere glaciations during the Late Neogene. The BBOR and Carolina slope are located at the western boundary for deep water circulation in the North Atlantic and the surface waters of the Gulf Stream, which are important as a source of salt and heat to the northern North Atlantic. For this reason, the BBOR is the optimal location to monitor changes in North Atlantic Deep Water (NADW). It is also an excellent location to monitor Antarctic Bottom Water because that watermass is recirculated in the subtropics, blending with the exposed NADW.

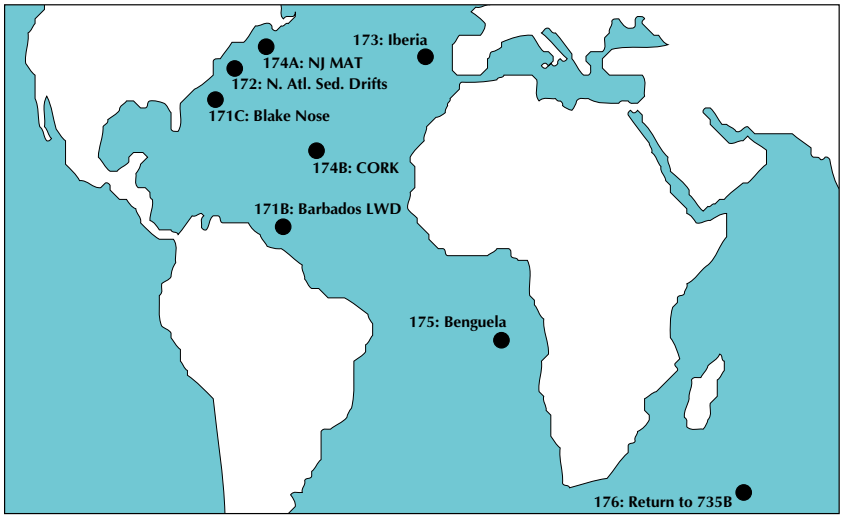
LEG 173: Iberia Margin
Co-Chiefs: Beslier (France), Whitmarsh (UK)

Leg 173 will aim to drill a small number of holes to basement on basement highs, mainly within the Ocean-Continent Transition (OCT) along the Iberia continental margin, to characterize the OCT, to test the simple-shear lithospheric extension hypothesis for this lower-plate (?) margin, to determine the extent of syn-rift magmatism, and to determine the existence and nature of the first-formed oceanic crust. The major thematic scientific objectives for Leg 173 include: (1) determining the extent to which rifting was asymmetric, (2) characterizing the OCT (defined as the part of the lithosphere which includes the crust between the thinned continental crust characterized by tilted fault blocks, and the first oceanic crust formed by seafloor spreading), and (3) assessing the role of low-angle, principally crustal, normal faulting in the rifting process.

LEG 174A: New Jersey Shelf
Co-Chiefs: Austin & Christie-Blick (USA)

The New Jersey Shelf is an ideal location to investigate the Oligocene-Recent history of sea level change for several reasons: rapid sedimentation, tectonic stability, good chronostratigraphic control, and abundant reconnaissance-quality seismic, well log and borehole data. The drilling goals are to: (1) data major Oligocene-Recent sequences on the New Jersey margin, (2) evaluate their correlation with glacioeustatic age estimates obtained from the oxygen isotopic record,

(3) estimate the amplitudes and rates of sea-level change independent of oxygen isotopic estimates, and (4) assess the stratigraphic response of sequence architecture and facies successions to glacioeustatic forcing. An additional goal is to take the next step towards a global sea-level investigation by evaluating Paleocene to Eocene sequences, a time for which debate continues over the existence of ice sheets (the "Doubthouse World"). Leg 174A drilling on the New Jersey outer continental shelf and slope will focus on upper Miocene-Recent depositional sequences and test models of sedimentation and relative sea-level changes.



Locations of ODP Legs 171B-176.

LEG 174B: CORK 395A
Co-Chief: Becker (USA)

This program on the Mid-Atlantic Ridge will carry out a selected suite of downhole experiments in Hole 395A and then install an instrumented borehole seal or CORK with a thermistor cable and pressure sensor. The primary purpose of the CORK experiment is to monitor how the hydrological system varies with time as natural hydrogeological conditions are reestablished once the hole is sealed. The experiment will provide essential information about the formation pressure and permeability structure, which are the real keys to understanding the crustal hydrogeology, and which control the apparently more active off-axis hydrologic system at 395A. Hole 395A is an excellent place for this experiment because the natural thermal regime will allow determination of whether the observed downhole flow is dynamically maintained due to active circulation in the basement, regardless of whether or not a borehole is present, instead of flow induced by the geothermal gradient.

174C: Engineering

To be determined.

LEG 175: Benguela Current
Co-Chiefs: Berger (USA), TBN

The purpose of Leg 175 drilling at nine sites off Angola and Namibia is to reconstruct the history of the Benguela Current and the coastal upwelling of the region between 5° S and 32° S. The Leg 175 sites will be above the calcite compensation depth in a passive margin area characterized by high rates of sedimentation. They should provide high-resolution records of the processes governing the cycles of carbonate dissolution, productivity, and continental sedimentation. ODP drilling on this leg will also aid the study of early diagenetic processes in organic rich sediments (dolomite, phosphorite and chert), and will contribute to a better understanding of the composition and origin of organic matter in high-production areas. These organic-rich sediments also contain an excellent record of productivity history which can be read on a very fine scale.

LEG 176: Return to 735B
Co-Chiefs: TBN

The principal objective of Leg 176 drilling is to determine the nature of the magmatic, metamorphic, and tectonic processes in the lower crust. Drilling results (encountering either a gabbro-periodite transition or a long gabbro section) will enable discrimination among the conceptual models designed to explain ocean crust formation at this location. Drilling may reach petrologic Moho, the boundary between rocks which are the residues of the processes by which magmas form and migrate to the crust, and rocks produced by the crystallization of those magmas as they rise out and pool above the upwelling mantle peridotite. Recovery of a truly representative section of plutonic crust, would, by itself, be a major breakthrough in understanding the geologic processes occurring beneath ocean ridges.

ANNOUN

REMINDER

ODP/InterRIDGE/IAVCEI Workshop
Co-sponsored by JOI/USSAC

THE OCEAN LITHOSPHERE AND SCIENTIFIC DRILLING INTO THE 21ST CENTURY

DATE: May 26-28, 1996

LOCATION: WHOI, Woods Hole, MA

CONVENERS: H.J.B. Dick and C. Mével

TO PARTICIPATE: Ocean Lithosphere and Scientific Drilling Conference, InterRIDGE Office, Dept. of Geological Science, University of Durham, South Road, Durham, DH1 3LE, UK, intridge@durham.ac.uk

U.S. PARTICIPANT TRAVEL SUPPORT: Dr. Henry Dick, c/o Ms. May Reed, McLean Laboratory, WHOI, Woods Hole, MA 02543, mreed@whoi.edu.

NON-U.S. PARTICIPANT TRAVEL SUPPORT: Contact your national RIDGE, ODP, or other national source.

fellowship OPPORTUNITIES

JOI/USSAC is seeking doctoral candidates of unusual promise and ability who are enrolled in U.S. institutions to conduct research compatible with that of the Ocean Drilling Program. Both one- and two-year fellowships are available. The award is $20,000 per year to be used for stipend, tuition, benefits, research costs, and incidental travel, if any. Applicants are encouraged to propose innovative and imaginative projects. Research may be directed toward the objectives of a specific leg or to broader themes.

PROPOSAL DEADLINES FOR	
Shipboard Work (Legs 170-175)	*4/15/96*
Shore-based Work (regardless of leg)	*11/15/96*
Shipboard Work (Legs 176-181)	*4/15/97*

For more information and/or to receive an application packet please contact Andrea Johnson at:
JOI/USSAC Ocean Drilling Fellowship Program, Joint Oceanographic Institutions, 1755 Massachusetts Ave., NW, Suite 800, Washington, DC 20036-2102; Tel: (202) 232-3900 x213; Fax: (202) 232-8203; Internet: ajohnson@brook.edu

ODP FROM MOUNTAINS TO MONSOONS

The interactive, educational CD-ROM, *ODP: From Mountains to Monsoons,* is now available in both Mac and PC formats. An accompanying teachers manual is also available upon request. For copies, please contact: JOI/USSSP, Joint Oceanographic Institutions, 1755 Massachusetts Ave., NW, Suite 800, Washington, DC 20036-2102; tele: (202) 232-3900, fax: (202) 232-8203, e-mail: joi@brook.edu

IMPLEMENTATION PLAN FOR INVESTIGATING

CLIMATE INTERVALS OF EXTREME WARMTH

DATES: July 11-14, 1996
LOCATION: Santa Cruz, California
SPONSORS: MESH and JOI/USSAC
CONVENERS: Lisa Sloan and Nick Pisias
with: T.C. Moore, Jr., E. Barron, and J. Zachos

The MESH Program Plan has placed high priority on studying the warm climate intervals that occurred between the early Eocene and the latest Pliocene. The ODP's new Long Range Plan also discusses the importance of describing and documenting climatic extremes which will be used to (1) test the sensitivity of existing climate models, and (2) provide parameters for climate model runs. At this workshop, an implementation plan will be drafted for investigating warm paleoclimates from the perspective of MESH and ODP goals. We will identify key ocean localities and materials that will increase our understanding of the conditions that lead to the evolution and maintenance of warm climates. The primary goal of the workshop is to foster the submission of specific drilling proposals to JOIDES.

The workshop is open to all interested parties. Limited travel support for U.S. participants will be provided by JOI/USSSP and MESH. Those interested in participating should contact Nick Pisias by May 15 at: College of Oceanography, Oregon State University, Oceanography Admin. Bldg 104, Corvallis, OR 97331-5503, (503) 737-2296, e-mail: pisias@oce.orst.edu.

C E M E N T S

ODP Log Data Catalog

http://www.ldeo.columbia.edu/BRG/brg_home.html

AVAILABLE ONLINE NOW

Now you can have a complete listing of all log data collected by ODP at your fingertips. You can search by leg, hole, tool, or location and then submit your request electronically.

AVAILABLE ONLINE SOON

Stay tuned for further details about online log data.

FOR MORE INFORMATION:

mreagan@ldeo.columbia.edu or
kazuko@ldeo.columbia.edu
Tel: (914) 365-8341, Fax: (914) 365-3182
Borehole Research Group/LDEO

JOI/USSSP SUPPORTED SHIPBOARD PARTICIPANTS

LEG 166: BAHAMAS TRANSECT

U.S. Co-Chief: Gregor Eberli, U of Miami
U.S. Co-Chief: Peter Swart, U of Miami
ODP Staff Scientist: Mitch Malone
Lamont Logging Scientist: Carlos Pirmez
Flavio Anselmetti, U of Miami
Karin Bernet, U of Miami (USSAC Fellow)
Beth Christensen, U of S Carolina
Eric De Carlo, U of Hawaii
Tracy Frank, U of Michigan
Geoff Haddad, Rice U
Miriam Katz, LDEO
Philip Kramer, U of Miami
Donald McNeill, U of Miami
Seiichi Nagihara, U of Houston
James Wright, U of Maine

LEG 167: CALIFORNIA MARGIN

U.S. Co-Chief: Mitch Lyle, Boise State U
ODP Staff Scientist: Carl Richter
Lamont Logging Scientist: Peter de Menocal
Lamont Logging Trainee: Candace Major
Richard Behl, UC Santa Barbara
Margaret Delaney, UC Santa Cruz
Julie Hood, U of Miami
Steven Hovan, Indiana U at PA
Thomas Janecek, Florida State U
Aleksandra Janik, U of Miami
James Kennett, UC Santa Barbara
David Lund, Oregon State U
A. Christina Ravelo, UC Santa Cruz

ANNOUNCING A CONFERENCE ON

MAGNETIZATION OF OCEANIC CRUST

DATES: October 21-24, 1996
LOCATION: Orcas Island, San Juan Islands, Washington
REGISTRATION DEADLINE: 1 August 1996
CONVENERS:
Paul Johnson, UW, johnson@ocean.washington.edu, tele: 206-543-8474
Dennis Kent, LDEO, dvk@lamont.ldeo.columbia.edu, tele: 914-365-8544

Marine magnetic anomalies have played a pivotal role in the theory of Plate Tectonics, and studies of the magnetization of oceanic crust continue to influence our view of the formation and evolution of the oceanic basins. In spite of the interdisciplinary implications of these studies, there has not been a conference related to the Magnetization of Oceanic Crust for almost 20 years. Research initiatives that focus on the formation of ocean crust (RIDGE/InterRIDGE), off-axis crustal evolution (Ocean Drilling Program) and large-scale behavior of the geomagnetic field (CSEDI) all rely heavily on the record of magnetization that is transcribed, with varying fidelity, within the ocean floor. New developments in the acquisition and analysis of magnetic survey data, and the recent availability of upper and lower crustal rock samples from the sea floor, have carried our understanding of ocean crustal magnetization beyond the simple block models that have served the community for decades. A number of research groups are developing these recently-acquired data sets into exciting new, and sometimes conflicting, models of the magnetization of the sea floor. In order to evaluate these new models, and to devise a common strategy for advancing our understanding of the magnetization of the sea floor, a conference on the Magnetization of Oceanic Crust will be held during October, 1996. Partial support for conference participants will be available through USSAC and RIDGE funds (with priority based on arrival-date of registration material), with additional funding being requested from NSF. Further information regarding the conference and registration process is available from either of the conveners listed above.

NOW AVAILABLE

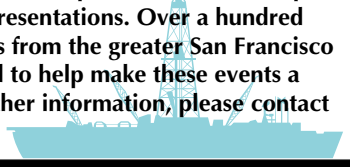
SEAFLOOR ATLAS of the NORTHERN NORWEGIAN-GREENLAND SEA

Editors: Kathleen Crane & Anders Solheim

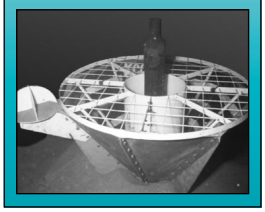
For more information on obtaining a copy contact:
Joint Oceanographic Institutions
1755 Massachusetts Avenue, NW, Suite 800
Washington, DC 20036-2012
e-mail: joi@brook.edu

USSAC prepares for the San Francisco port call

Plans are underway for exciting events surrounding the *JOIDES Resolution's* June 16-21 port call in San Francisco. USSAC, JOI, and ODP/TAMU are working together to coordinate a reception, exhibition, ship tours, and scientific presentations. Over a hundred ODP-related scientists from the greater San Francisco area have volunteered to help make these events a great success. For further information, please contact the JOI office.



BOREHOLE REPORT



CORK string registers fluid overpressure

contributed by Keir Becker, Jean-Paul Foucher, and the ODPNaut scientific party

In December 1994, a meeting sponsored by JOI/USSAC was held to consider the growing need for an integrated effort to instrument and sample ocean boreholes for periods of years to decades. The meeting participants recommended formation of BOREHOLE (BOREHole Observatories, Laboratories, and Experiments), an organization to facilitate post-drilling, sub-seafloor science.

Background

A major objective of ODP drilling at accretionary complexes has been to document how fluids affect deformational and geochemical processes at subduction zone plate boundaries. Fluid pressure has long been known to be a critical factor in the behavior of faults, with high fluid pressures reducing the strength of and resistance to motion along faults. It is now also recognized that an important component of global geochemical cycling occurs via transport of chemical constituents in fluids expelled from the subducted plate as well as accretionary prisms by compaction and deformation. The flow of these fluids in fine-grained accretionary prisms is thought to be episodic and largely controlled by permeability along the complex of faults and fractures. Fault- and fracture-permeability is itself dependent on fluid pressure; as fluid pressure in faults increase towards lithostatic pressure, the effective permeabilities of these faults increase. In simple terms, tectonics and fluid processes in accretionary prisms can be envisioned to be intimately related in an episodic cycle. Plate tectonic stresses result in increased fluid pressures in the formation; as fluid pressures build up along faults, effective permeability increases but the strength of the fault decreases, eventually reaching the point of stress relief by fault motion and/or pulses of fluid circulation.

Thus, understanding tectonic and fluid processes at accretionary prisms requires documenting the interrelationships between these processes and fluid pressures. Seismic reflection polarities are sensitive to fluid pressures in major fault zones, but only drilling provides the hope of directly determining these fluid pressures to "ground-truth" our understanding of fluid and tectonic processes. Unfortunately, the nature of the drilling method, which requires extensive circulation of drilling fluids and mud, virtually precludes accurate determination of *in situ* fluid pressures at the time of drilling. Instead, long-term experiments are required, to allow recovery from the drilling disturbance and then to accurately document fluid pressures in fault zones. We report here the results of this kind of long-term experiment, conducted in two holes drilled during Leg 156 into the Barbados accretionary prism. The results may represent the first successful long-term measurement of significant overpressure along the décollement—the major plate boundary fault at the base of an accretionary prism.

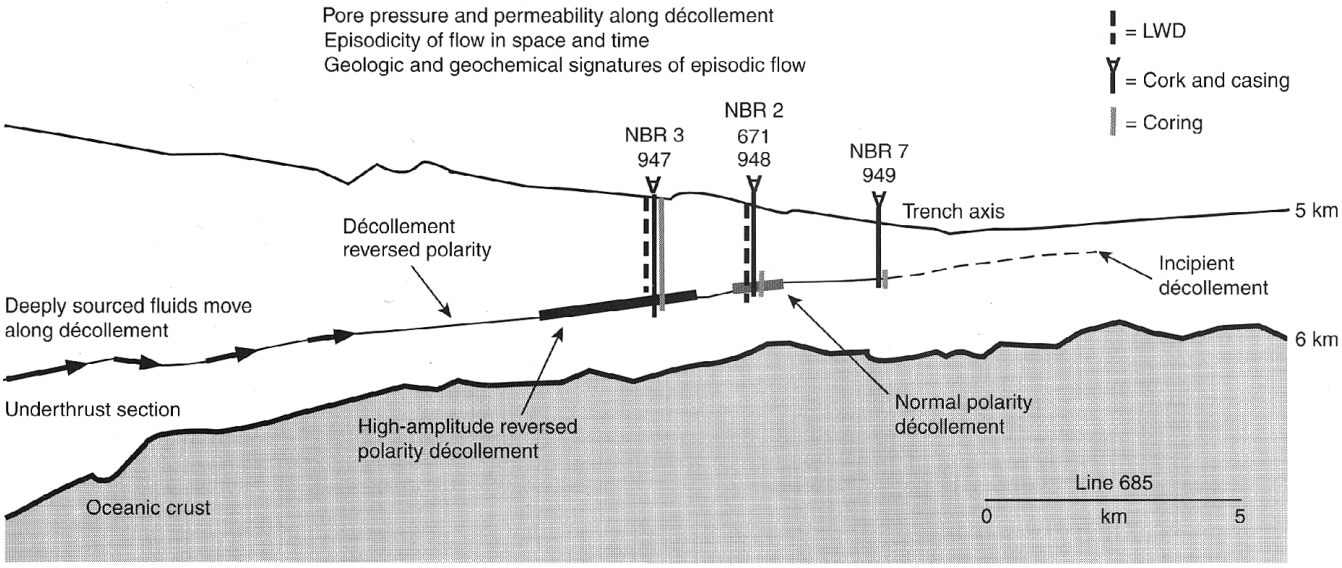


Fig. 1: Schematic layout of the ODP Leg 156 drilling program (from Shipley, Ogawa, Blum, et al, 1995).

Barbados CORK experiments

In June-July of 1994, ODP Leg 156 embarked on a focused study of the role of fluid pressures and episodic fluid flow in the Barbados accretionary prism, utilizing a range of innovative experiments and new techniques [*Shipley, Ogawa, Blum, et al.,* 1995]. Critical to this effort was the deployment of instrumented borehole seals or "CORKs" [*Davis et al.,* 1992] in two reentry holes drilled across the décollement at the base of the accretionary prism (Figure 1). The two CORK experiments were designed to obtain long-term (2-3 year) records of temperature and pressure in the sealed holes, both to determine background *in situ* conditions along the décollement and to monitor for signs of the episodic fluid flow events that are now inferred to dominate the active hydrology of accretionary prisms. In December of 1995, French and American scientists conducted the "ODPNaut" expedition, a joint *Nautile* submersible cruise to the Barbados CORKs supported by IFREMER and NSF. During this cruise the long-term data from both CORKs were successfully recovered nearly 1.5 years after their deployment.

Three sites were drilled during Leg 156 (Figure 1), carefully located with respect to very detailed seismic images of the décollement [*Shipley et al.,* 1984]. These images show distinct regions of both positive and negative polarity of the décollement reflector, suggesting spatial variability in fluid pressures in and below the décollement. Sites 947 and 949 are located where the polarity of the décollement reflection is negative, suggesting high fluid pressures in the décollement. Site 948 is located in an area of positive polarity seismic reflection at the décollement. Results of logging-while-drilling at Sites 947 and 948 as well as packer tests at Sites 948 and 949 suggest that high fluid pressures of varying magnitude may exist all along the décollement. Accurate measurement of these fluid pressures, after recovery of borehole pressures from drilling disturbances, was an important goal of the CORK experiments deployed in Holes 948D and 949C. In addition, temperature measurements through the décollement were critical to document thermal effects associated with any episodic fluid flow along the décollement.

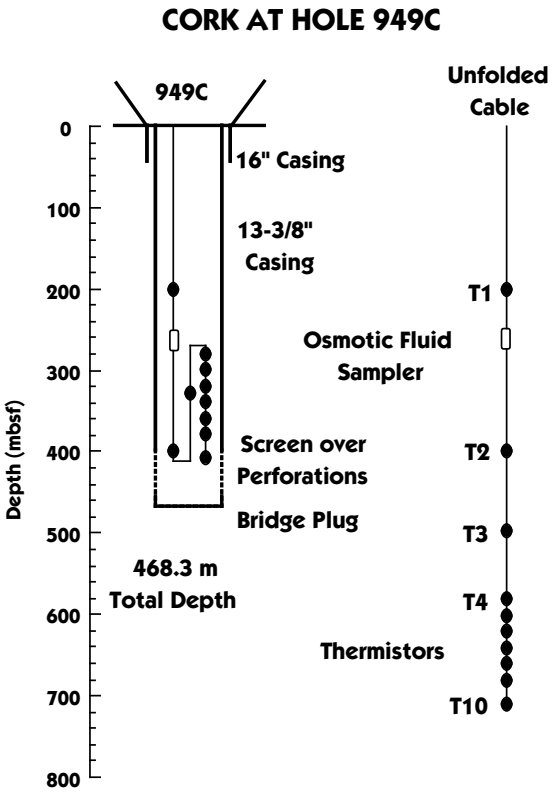


Fig. 2: U.S.-Canadian designed instrument string deployed in Hole 949C.

For the CORK experiment at Hole 948D, a French-designed instrument string was deployed down to a sub-bottom depth of 520 m, with the décollement at 500-530 m. This string is comprised of 20 sensor modules, 17 with dual temperature sensors and three with single temperature and pressure sensors. For the CORK at Hole 949C (Figure 2), a U.S./Canadian designed string with ten thermistors and two pressure transducers was deployed down to a sub-bottom depth of 450 m, with the décollement at 400-430 m. In addition, an osmotic fluid sampler was attached to the string deployed in Hole 949C. Each of the two instrumented holes was cased from seafloor to the décollement, where the casing was perforated and screened to allow hydrologic communication between the instrumented hole and the décollement. Thus, the experiments were designed to directly monitor fluid conditions in the décollement.

Keir Becker is professor of marine geology and geophysics at the Rosenstiel School of Marine and Atmospheric Sciences, University of Miami. For much of his career, his interests have been focused on the hydrogeology of the oceanic crust and sediments. In pursuit of these interests, he has spent nearly two years on the* Glomar Challenger *and* JOIDES Resolution *conducting special downhole experiments such as CORKs; to emplace even more CORKs, he will participate in his 13th leg this summer (Leg 168) and will serve as chief scientist on Leg 174B next summer. When not on big ships or inside submersibles, he spends as much time as possible on custom-made vessels investigating air-sea interactions at wind speeds greater than 20 knots.

Jean-Paul Foucher is a geophysicist with the Department of Marine Geosciences at IFREMER - Centre de Brest. He has a long-lasting interest in marine heat flow studies, and has led the development of several temperature and heat flow measuring devices for IFREMER. In recent years, he has become strongly involved in the design and use of seafloor and borehole monitoring experiments that address fluid flow processes and their associated thermal effects in marine sediments.

ODPNaut Results

The ODPNaut cruise was unfortunately cut short by mechanical problems with the A-frame used to deploy *Nautile,* but not until after the primary data had been recovered from both CORKs. In Hole 948D, the temperature data are concave downward but consistent with a uniform heat flow of 87 mW/m**2 from seafloor to the base of the décollement, as measured during ODP Leg 156. These data showed no evidence for thermal transients associated with fluid flow in the year and a half since deployment. Likewise, in Hole 949C, the temperature data are consistent with a linear gradient of 82° C/km, as measured during Leg 156, and show no evidence for any thermal transients due to fluid flow (Figure 3).

Hole 948D had been filled with heavy mud at the time of drilling, complicating the interpretation of its pressure data, whereas Hole 949C had been filled with seawater. Pressures in the upper part of Hole 948D equilibrated at hydrostatic values, confirming the failure of the sealing mechanism suspected at the time of deployment. Nevertheless, pressures in the deeper, mud-filled section of the hole equilibrated after a year with a value greater than hydrostatic. Assuming that the mud forms a perfect seal, this value represents some combination of mud weight plus equilibrium with formation pressures. If there is any leakage across the mud column, these data provide a lower bound on the *in situ* pressure condition.

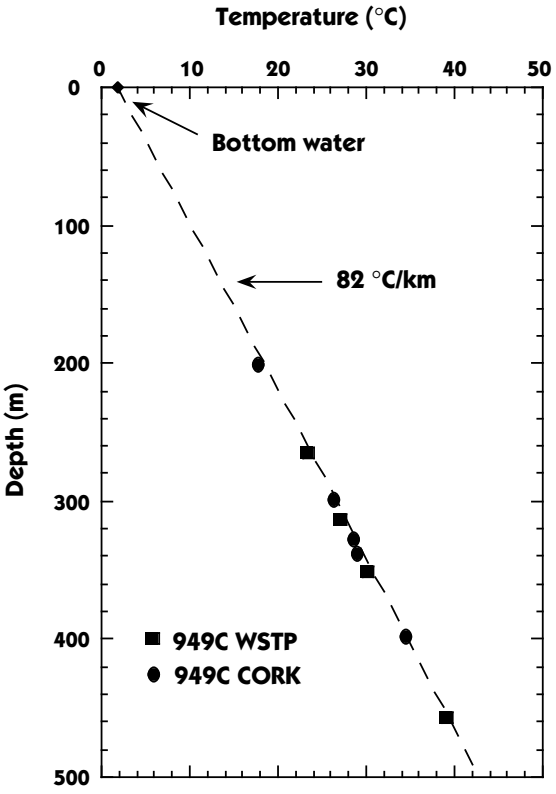


Fig. 3: Plot of downhole temperatures in Hole 949C. These data provide no evidence for any thermal transients due to fluid flow.

Closer to the toe of the prism, the seawater-filled Hole 949C equilibrated to a pressure of 1 MPa above hydrostatic; this confirms the seismic indication of high fluid pressures as well as an estimate for the magnitude of this pressure as determined with packer experiments during Leg 156 [*Fisher and Zwart,* in press]. Two aspects of the pressure data are particularly interesting (Figure 4): First, the pressures in Hole 949C clearly show a transient event from 170-250 days after deployment, when the overpressure rose in an irregular step-wise fashion from a stable value of 0.9 MPa to a stable value of 1.0 MPa (less than one-third the predicted lithostatic pressure). This may be interpreted as a possible minor fluid flow event — minor in that very little volume of fluid was introduced into the hole, and temperatures measured in the hole were not appreciably affected. (This is the only indication in the data from both CORKs for any kind of fluid flow event along the décollement.) Second, although the measured overpressure was otherwise very stable, indicating a robust seal at the CORK, the tidal signal seen in the sealed hole had near-full amplitude and very little phase lag compared to the reference signal from a seafloor gauge outside the CORK seal. The attenuation and phase lag of the tidal signal depend in a complicated way on elastic and fluid-transport properties of the sediments [*Wang and Davis,* in press]; the results at Hole 949C are consistent with the nature of the muddy sediments, which have high porosity but relatively low permeability except where fractures are "opened" by high fluid pressures.

In addition to collecting long-term borehole data, the ODPNaut team conducted an abbreviated series of short hydrologic tests in Hole 949C, at relatively low fluid pressures. The information gleaned from these tests will be added to the packer data set from Leg 156 to elucidate the permeability-effective stress relationship for the Barbados plate boundary fault. Unfortunately, the planned full-day and multi-day hydrologic

testing could not be completed because of the failure of the ship's A-frame.

After data were recovered from both CORKs, the French logger and sensor string were retrieved from Hole 948D, where the CORK had not sealed properly on deployment. The CORK experiment in the fully sealed Hole 949C is probably the most successful of the four CORKs deployed thus far in accretionary prisms, and it was left in place, logging continuous data until some future data recovery exercise. (The batteries should allow another year or two of data logging, with a backup memory battery preserving any logged data for several years.) When the ODPNaut cruise was cut short, some objectives were left unfulfilled in Hole 949C, particularly the program to conduct active hydrogeological tests and sample the borehole fluids. At press time, negotiations continue among NSF, the French ship operators, and the PI's to reschedule the lost dive time. Finally, we note that ODP drilling plans for 1996-1997 include the deployment of seven new CORKs; these are all in a different setting — young oceanic crust — where the hydrogeology is as active as at accretionary prisms.

Acknowledgments

The ODPNaut scientific team consisted of J.-P. Foucher, J. Crozon, J. Dupont, L. Floury, F. Hermegnies, and P. Henry with support from IFREMER, as well as K. Becker, A. Fisher, D. Haffner, L. Holloway, M. Kastner, and E. Screaton with support from NSF. In addition, B. Carson, E. Davis and J. Martin were essential shore-based contributors. We thank the engineers and pilots of the submersible *Nautile*, and the captain and crew of the support ship *Nadir*. Several of the ODPNaut team had participated on Leg 156, and we realize we also owe great thanks to the entire scientific party of Leg 156, particularly the co-chief scientists, Y. Ogawa and T. Shipley, for their support of the time and resources required to deploy the two CORK experiments.

References:

Davis, E.E., K. Becker, T. Pettigrew, B. Carson, and R. MacDonald, CORK: a hydrologic seal and downhole observatory for deep-ocean boreholes, 1992.

Fisher, A.T. and G. Zwart, Packer experiments along the décollement of the Barbados accretionary complex: measurements of *in situ* permeability with changes in fluid pore pressure, *Proc ODP, Sci. Results, 156*, submitted.

Shipley T.H., G.F. Moore, N.L. Bangs, J.C. Moore, and P.L. Stoffa, Seismically inferred dilatancy distribution, northern Barbados Ridge decollement: implications for fluid migration and fault strength, *Geology, 22*, 411-414, 1994.

Shipley, T.H., Ogawa, Y., Blum, P., et al., *Proc. ODP, Init. Repts., 156*, 1995.

Wang, K. and E.E. Davis, On the propagation of tidally induced pore pressure variations in layered subseafloor formations, *J. Geophys. Res.*, in press.

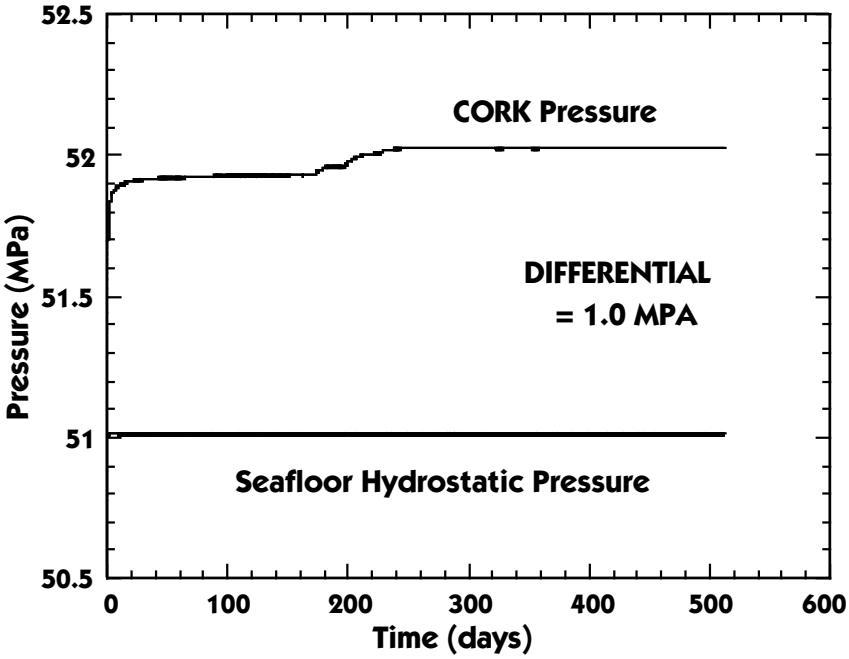


Fig. 4: Plot of pressures versus time at ODP Hole 949C. The overpressure rose 170 to 250 days after deployment, and may be interpreted as a minor fluid-flow event.

NSF REPORT

International review gives ODP a thumbs up

Contributed by J. Paul Dauphin, Associate Program Director, NSF/ODP

As mentioned in previous newsletters ODP is now seeking funding commitments from ODP partners for the period 1998 to 2003. National ODP committees are conducting internal reviews of the Program and assessing their commitment to renewal. This five-year funding will fulfill the ten year renewal commitment, made in principle, by most of the ODP partners in 1993.

As part of the renewal process, the ODP Council requested a midterm review of the program. Gordon Greve, chair of the Review Committee, presented their report to a joint session of the ODP Council and the Executive Committee in late January in Chantilly, Virginia. The report was very positive but also contained constructive suggestions for improvement. The report dealt with the impending renewal and also the future of scientific ocean drilling into the 21st century. Two of the major conclusions in the draft report state that, "the long record of achievement by the ODP coupled with the 1996 Long Range Plan, which accurately describes an important and vital future role for scientific drilling into the next century, justifies the continuation and enhancement of the program," and, "the transition from the current program to the program after 2003 is complex and planning for the transition must begin immediately."

The U.S. Science Advisory Committee to the Ocean Drilling Program and the U.S. scientific drilling community will need to play a very important and central role in these planning activities. Stay tuned and check future issues of the USSAC newsletter to find out how you can contribute to this process.

In conjunction with this activity, JOI will be submitting, in early summer, a three year proposal for the extension of the USSSP. This proposal will be reviewed by NSF and submitted to the National Science Board of NSF for final review and approval in the Fall.

The past several months in Washington have been a bit unusual. The federal government has been partially shut down twice and many federal workers sent home; most NSF employees were furloughed. The largest impact of all these activities has been that NSF and several other portions of the federal government still do not have an approved budget for fiscal year 1996. We have been operating under various "continuing resolutions" since October 1 which have allowed us to carry-on, between partial government closures, at reduced FY 95 levels.

This situation hampers our ability to make decisions on some grant commitments, but it has not affected the funding of ODP opera-

NSF supported field programs

D. Christie (Oregon State) and J.C. Sempere (Washington):
Petrologic and geophysical study of the Antarctic Discordance in support of JOIDES Proposal 426. Scheduled on the *Melville* in late January.

D. Hodell (Florida), L. Burckle (LDEO), P. Froehlich (Georgia Tech), and C. Charles (Scripps):
Paleoceanographic and sediment study of the southernmost Atlantic in support of JOIDES Proposal 464. Scheduled on the *Thompson* in February.

S. Bloomer (Oregon State):
Petrologic and geophysical study of the Tonga convergence zone in support of JOIDES Proposal 451. Cruise is scheduled on the *Melville* in May.

S. Webb (Scripps):
Seismic monitoring during Leg 169 drilling of Sedimented Ridges to examine potential changes in hydrothermal circulation and seismicity. Deployment and recovery of OBS's scheduled for *Wecoma*. This project is being jointly supported by the NSF Ocean Drilling Program and the Marine Geology and Geophysics Program as part of the RIDGE Initiative.

Cooperative field programs

ODPNaut CRUISE:
Used the Nautile to return to sites 948 and 949 to recover data from the corked holes in the Barbados prism and to undertake additional fluid and heat flow studies. U.S. participation in the project is being led by Keir Becker (Miami) and Bobb Carson (Lehigh). Although data recovery from both corked sites was successful, additional studies were curtailed due to ship's equipment problems. See article on page 12 of this newsletter.

BEATA RIDGE NAUTILE PROGRAM:
To better define drilling targets for JOIDES Proposal 411 which would examine igneous processes which formed the Caribbean crust. U.S. participation is being led by Bob Duncan (Oregon State).

Instrumentation and development grants

Support for completion and deployment of seafloor, buried and borehole seismometers for the Ocean Seismic Network pilot experiment near Hawaii. The project is under the leadership of John Orcutt (Scripps), Ralph Stephen (WHOI) and Tak Yamamoto (Miami). Instrument deployment is scheduled for early 1997.

Fabrication and deployment of CORK instrumentation at sites to be drilled on LEG 168 (Juan de Fuca Hydrothermal Program) and Leg 169 (Sedimented Ridges II). This is a cooperative Program involving Keir Becker (Miami) and Earl Davis (Canada).

Development of a higher resolution Gamma-ray logging tool to improve core-log comparisons. The tool development is under the direction of Carlos Pirmez and Dave Goldberg (LDEO).

tions and management. This is because ODP activities are supported by U.S. and non-U.S. funds.

Support for unsolicited grant proposals, at NSF, will remain approximately level with 1995 ($6.2M) funding assuming a final overall Program budget approximating the 1995 level. Four field programs are presently scheduled (see top box, p. 16). Two shorter field programs have been supported in 1996 as part of cooperative programs with French scientists (see bottom box, p. 16). FY 96 support for instrumentation and development included three grants (see box to left).

As we reported in the last newsletter, Sandy Shor has extended his rotation at NSF until December of 1996. We expect to start recruiting for Sandy's replacement in spring.

ODP CALL FOR PROPOSALS
1999 AND BEYOND

Based on the newly published Long Range Plan (LRP) for the Ocean Drilling Program, JOIDES anticipates new opportunities for ocean drilling in ODP Phases III (1999-2003) and IV (beyond 2003).

To accomplish some of the LRP's scientific goals identified under the themes of the Dynamics of Earth's Environment and the Dynamics of Earth's Interior, JOIDES encourages submission of proposals or letters of intent for programs requiring:

- **multiple drilling legs,**
- **drilling from an alternate platform in which ODP operations would contribute to a part of the overall strategy, and**
- **more than one platform.**

ODP Phase III operations will continue with *JOIDES Resolution* as the primary drilling platform. In Phase IV, JOIDES anticipates the addition of a deep drilling vessel equipped with a riser system, and encourages submission of proposals now to begin planning for these operations.

Drilling proposals or letters of intent may be submitted by individuals, by groups of investigators, or by national or international geoscience programs of ODP member countries. The scope of proposals may vary from individual sites to multi-leg drilling programs. Proposals must document scientific rationale and a drilling plan, including information on proposed site locations. All proposals should focus on a scientific theme, themes or initiatives, in the context of the Ocean Drilling Program Long Range Plan.

All proposals must identify a lead proponent, as a primary point of contact with the JOIDES advisory structure. Multi-leg programs should identify lead proponents responsible for logistically manageable parts of the drilling package. Proposals will be ranked by the JOIDES thematic panels, and selected service panels. Ranking is based on scientific quality, relevance to the ODP LRP, feasibility, and readiness in terms of surveys, safety, equipment availability, etc.

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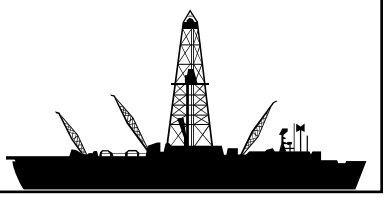


Dr. Roger Larson is Professor of Marine Geophysics, Graduate School of Oceanography, University of Rhode Island.

Should U.S. PCOM membership be broadened?

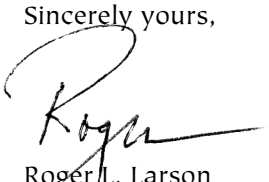
Since the inception of the Deep Sea Drilling Project in 1968, the United States has always been represented at PCOM by scientists from the major oceanographic schools, which now number ten and are called the JOI institutions. In the early days this made complete sense because almost all the marine geoscience and geoscientists that drove the drilling program came from those labs. However, participation from non-JOI (sorry to use a negative here) institutions has grown steadily, and a survey of the past three years shows that 64% of the scientists onboard the *JOIDES Resolution* during Legs 147-164 were from non-JOI institutions, while only the remaining 36% were from the JOI institutions. These statistics drove home a point that many of us have suspected qualitatively for some time. Further, they led USSAC at its January, 1996 meeting to request the JOI Board of Governors (BOG) to open PCOM membership to the entire U.S. ODP community. Although affiliation with a JOI institution was eliminated several years ago as a criterion for U.S. membership on PCOM, no one from a non-JOI institution has ever been appointed. In recommending this change, USSAC desires "that the best U.S. scientists are available to make important planning decisions, and to avoid even the perception that these major decisions are made exclusively by a restricted set of U.S. institutions." In addition, USSAC hopes that a new mechanism for selecting U.S. PCOM members will ensure a thematic balance and expertise consistent with the ODP Long Range Plan.

JOI BOG has responded to USSAC by agreeing that PCOM should be staffed by the "best and brightest minds" the U.S. can muster, but they raise an additional concern of institutional support for ODP. That is, the JOI schools always have been the traditional advocates for ODP in the U.S. I believe JOI BOG fears that a loss of guaranteed representation on PCOM will translate to a loss of political support from the JOI schools. If this were true, could we reasonably suppose that some of that political slack could be taken up by the non-JOI schools who have a significant involvement with ODP? After all, there are nearly twice as many non-JOI scientists working in the program now, but they are spread over a much broader landscape than just ten JOI schools, so we might instead assume that their potential political impact would be correspondingly diluted.

Because I am an optimist, I'd like to believe that we can have our cake and eat it too in this situation, but we shall have to work for it. First, I note that the ESF has maintained a consortium of 11 countries that each somehow manage to maintain support for the program in the "off" years when they are not represented on either PCOM or EXCOM, and if they can do it I'll bet we can too. Second, it is completely reasonable to ask for additional political support from the non-JOI institutions with ODP involvement if membership on PCOM becomes available to everyone. And I'll also bet that some of them will be able to muster that support if we ask for it.

JOI BOG has asked for USSAC's advice on how we can best balance a need to supply PCOM with our best scientists against our need to maintain at least our traditional level of political support. And perhaps a stickier, but related question is, what mechanism should we use to select some or all U.S. PCOM members from the complete U.S. ODP community? We shall be pleased to respond. I am sure that working together, USSAC and JOI BOG will be able to create a system that will lead to a stronger U.S. component of PCOM, able to lead ODP into the next century.

Sincerely yours,



Roger L. Larson
Chairman, USSAC

****USSAC Executive Committee***

Membership term is three years.

LIAISONS

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JOIDES Resolution Schedule for Legs 166-176

Leg	Region	Co-Chiefs	Start Port	Begins	Scientific Objectives
166	The Bahamas Transect	Eberli Swart	San Juan	2/96	To investigate sea-level and fluid-flow changes in the Bahamas carbonate platform and oceanic circulation and climate changes from the mid-Cretaceous to recent times.
166T	Transit to Acapulco		Panama	4/96	----------
167	California Margin	Koizumi Lyle	Acapulco	4/96	To study variability in strength and heat/salt transport capacity of the California Current due to climatic and tectonic changes in the Pacific Basin, and its relationship to fluctuations in upwelling and primary productivity, and CCD changes in the NE Pacific.
168	Juan de Fuca Hydro. Circ.	Davis Fisher	San Fran	6/96	To investigate the nature and consequences of hydrothermal circulation in oceanic crust: specifically, lateral gradients in fluid composition, formation pressures/ temperatures, formation-scale permeability, and circulation vigor.
169S	Saanich Inlet	Bornhold	Victoria	8/96	To study the Quaternary climate history of the Pacific Northwest region of N.America.
169	Sedimented Ridges II	Fouquet Zierenberg	Victoria	8/96	To study the interrelationships of tectonic, igneous, and sedimentary processes in controlling fluid flow, energy and mass flux, and formation of sulfide deposits at sediment-dominated rift environments.
170	Costa Rica Accret. Wedge	Kimura Silver	San Diego	10/96	To study the mass- and fluid-flow patterns through the accretionary prism to establish the mechanical and chemical behavior of accretion and under-plating, tectonic erosion, and deformation and dewatering distribution.
171A	Transit to Barbados		Panama	12/96	----------
171B	Barbados LWD	J.C. Moore	Barbados	12/96	To understand the interrelationship of deformation, fluid flow, seismic imaging, and physical properties.
171C	Blake Plateau/ Nose	Norris TBN	Barbados	1/97	To reconstruct the watermass chemistry and circulation of ocean waters during the Cretaceous and early Cenozoic to examine the sediment record following the bolide K/T impact, the hydrographic structure of the low latitude Cretaceous ocean, and the evolution and biostratigraphy of Cretaceous microfossils.
172	NW Atlantic Sedi. Drifts	Keigwin Rio	Charleston	2/97	To analyze geochemical proxies for nutrient content, temperature, and salinity in order to reconstruct a high resolution deep- to intermediate-depth hydrographic reconstruction for the western subtropical North Atlantic during the last glacial maximum.
173	Iberia Margin	Beslier Whitmarsh	Lisbon	4/97	To better understand the history of this non-volcanic rifted margin, including the timing and nature of melt generation during breakup and the earliest generation of "normal" oceanic crust.
174A	New Jersey Shelf	Austin Christie-Blick	Halifax	6/97	To investigate the Oligocene-Holocene history of sea-level change by determining the geometry and age of the Oligocene-to-Miocene depositional sequences.
174B	CORK 395A/ Engineering	Becker	New York	7/97	To CORK Hole 395A and to conduct engineering tests.
175	Benguela Current	Berger TBN	Las Palmas	8/97	To reconstruct the history of the Benguela current and coastal upwelling of the region between 5 and 32° S.
176	Return to 735B	TBN	Cape Town	10/97	To deepen hole 735B and investigate the nature of magmatic, hydrothermal, and tectonic processes in the lower ocean crust at a slow spreading ocean ridge.

