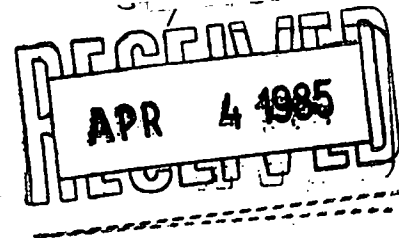


JOIDES LITHOSPHERE PANEL MEETING

February 26-27, 1985

at Scripps Institute of Oceanography

La Jolla, California



SUMMARY

1. MISCELLANEA

a) Strong support for TAMU drill pipe TV acquisition but recognize complexity of problem and urge TAMU take advantage of existing expertise within community.

b) LITHP continues strong support for both 504B drilling and for a higher priority to be set on lithosphere drilling within ODP. Community support will be solicited in an attempt to persuade PCOM of this.

c) LITHP reiterates the need to have Keir Becker appointed as a member.

2. PROPOSAL REVIEW

a) Batiza Volcanoes, Fox-MacDonald EPR (9-10°N), Bougault EPR 13°N and Francheteau-Hekinian EPR 13°N all considered as part of EPR focussed drilling effort.

b) Whitmarsh anelastic strain release: strong support for trials on 106 or 109 to at least determine if orientation problem is manageable with gyro magnetometer.

c) Indian Ocean - see later.

3. EPR DRILLING

a) All efforts focus on choosing best location between 9-13°N: final decision not possible until early 1986 because of crucial summer 1985 seismics acquisition. Request next meeting in France to permit full French participation in planning. Request immediate appointment of co-chiefs to facilitate planning (recommend Bougault and MacDonald).

b) Downhole measurements prospects look good. Panel approved EOS article to further stimulate interest. Yet again wireline reentry capability recognized as vital component of progress here.

4. MARK DRILLING

a) SeaMarc I survey delayed to May so final site selection not practical until summer.

b) Majority of panel preferred using 106-109 to get two holes started rather than concentrating on a single hole.

5. INDIAN OCEAN

Priorities are:

1. RED SEA: L1 (Working Group)
2. AUS-ANT DISCORDANCE: L6 (Langmuir)
3. SW INDIAN RIDGE FRACTURE ZONE: L4 (Dick and Natland)
4. CARLSBERG RIDGE: L2 (Natland)

If a good hot spot trace program is formulated we would place that second only to the Red Sea. If Brocher can show reasonable possibility of solving technical problems then Crozet Basin (L7) would be ranked below Dick and Natland but above Natland.

IMPORTANT: These are LITHP's priorities only WITHIN the Indian Ocean. We consider back-arc spreading center drilling in the Western Pacific to be a significantly higher priority than all of the above projects.

6. WESTERN PACIFIC

Major progress planned at next meeting when results of Hawkins' workshop are available.

1. TAMU REPORT

Andy Adamson reported on the drilling vessels shakedown cruise and the progress so far on Leg 101. Overall, the drilling vessel is operating well and although the drilling rate currently seems to be less than that of the CHALLENGER, predictions are that by 106 this will have increased to about the CHALLENGER level. Plans for the bare rock guidebase were presented and this triggered much detailed discussion especially with regard to its square four-legged configuration. Why not three-legged triangular? Andy informed us that tests of the TV frame and the Mesotech drill pipe sonar are planned for Leg 102B, 16-25 April in the FAMOUS area. Final decision on acquisition of TV system will be made on March 1st. The panel discussed the mounting and lighting of the TV system as concerns were voiced about the effective field of view. Much experience in deep ocean TV exists both in the oceanographic institutions and in the military and the Panel strongly recommends that TAMU taps into this: to achieve a system that will be effective in precise drill site selection is a non-trivial problem.

2. PCOM REPORT

Jose Honnorez reviewed the highlights of the last PCOM meeting.

a) Drilling Plans: The major issues resulting from this were 504B (and the fact that despite the Panel proposal and our strongest recommendation it is not included in the drilling schedule); and secondly the whole problem of the priority of lithosphere drilling within ODP, and the Panel's judgement that unless more drilling time is devoted to lithosphere objectives it will not be possible to realize the primary COSOD goals. Clearly, LITHP is not being effective in persuading PCOM of the priority of lithosphere objectives: the discussion focussed on devising ways of correcting this. The only path that seemed reasonable was to lobby the community and show PCOM the strong, broad-based support that exists both for 504B specifically and more generally for an intensive crustal drilling effort. Several ways of doing this were discussed and much uncertainty was expressed as to whether the 504B and longer term issues should be separated or treated as one. Following tortuous deliberations it was decided that our 504B proposal be distributed to interested colleagues and their opinions solicited in writing. These comments would then be passed on to PCOM as a manifestation of community support. The longer term issue is complex: the Chairman will endeavor to formulate a LITHP policy statement to be reviewed at our next meeting and, if approved, it too could be circulated within the community in a similar manner to the 504B proposal. Unless major changes can be made in the drilling plans, LITHP objectives will not be achieved: this issue is thus a primary concern.

b) Panel Membership: Because UK and ESF are no longer in JOIDES, we have lost Bostrom and Saunders from our panel, both of whom were active members who we are sorry to lose. Discussion was held concerning whether replacements should be sought. Optimism concerning the return of UK and ESF to the fold, combined with a desire not to end up with a large panel caused us not to seek replacements. Our desire to have Keir Becker appointed to LITHP was reiterated. A general review of the panel make-up resulted in the recommendation that if Russ McDuff is our permanent PCOM liaison (and Becker is appointed) then no major gaps in expertise exist. If McDuff is not our permanent liaison then we would request Mike Bender of URI be invited to join.

c) Proposal Review: Some criticism of LITHP had been stimulated by its apparent concentration on the focussed drilling concept to the exclusion of adequate consideration of the lithosphere component of other proposals. The specific example of this was the perceived lack of LITHP input into the Galicia Bank Lierzolite issue. The more organized proposal review procedure now in place should prevent any such reoccurrence.

3. CORRESPONDENCE

The Chairman brought to the attention of the panel letters from the JOIDES office dated January 16, 18, and 22 as well as Jim Natland's letter to the JOIDES office dated November 20, 1984.

Concerning the request for co-chief recommendations in Larson's letter of January 22 the panel endorsed Mascle for 107 and suggests MacDonald and Bougault for EPR (see later these minutes).

4. PROPOSAL REVIEW

Two volumes of LITHP proposals had been distributed to the Panel in early February. The first contained the MARK and Kane proposals along with Indian Ocean proposals not previously reviewed. The second contained the EPR proposals along with Whitmarsh's anelastic strain recovery plans.

1. Central and East Pacific Ocean

JOIDES REFERENCE NO.	TITLE	P.I.(s)
130	Small Non-Hotspot Oceanic Volcanoes	Batiza
	EPR 9-10°N [PRELIM]	Fox MacDonald
14E	Zero Age Drilling: East Pacific Rise 13°N	Bougault
76E	Proposal for Drilling Oceanic Crust at the Axis of the East Pacific Rise	Francheteau Hekinian

2. Technical and Instrumental

66F	Principal Horizontal Stresses in the Oceanic Crust from Anelastic Strain Recovery	Whitmarsh
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1. Atlantic Ocean

122A	Kane Fracture Zone	Karson
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125A	Bare Rock Drilling MAR at 22°53'N	Bryan Thompson
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2. Indian Ocean

79B	Tethyan Stratigraphy and Ancient Ocean Crust	Coffin
1193B	History of the Early Opening of Aden, Resulting Rifting of Old Oceanic Lithosphere	Stein
120B	Oceanic Drilling in Atlantis II Deep, Red Sea	Zierenberg Shanks von Damm

- a) Whitmarsh anelastic strain recovery proposal: strong support was expressed for this idea. Requirement for core orientation is, of course, the key issue. Salisbury suggested that the gyro-oriented downhole magnetometer data might be used for this: the consensus was to try this out on 106 or 109. If the orientation problem can be solved then this idea could yield important results with very limited additional effort. Definitely worth trying. Action: refer to PCOM for approval and to TAMU and DMP for technical and logistics solutions.
- b) Batiza volcanoes proposal: clearly a first order problem but viewed by the panel very much as one component of a larger EPR program. Indeed, defined as a 'necessary part' of such a program. Only reservations were concerned with whether drilling was the right tool to address all the many stated objectives. Action: retain plans and Batiza involvement in planning larger EPR strategy.
- c) EPR proposals: Juteau informed us that the Francheteau-Hekinian proposal supersedes the original Bougault proposal. The apparent result is then to be left with the MacDonald/Fox idea for 9-10°N competing with the Francheteau/Hekinian proposal at 13°N. It was quickly determined that these should not be considered as competing proposals as their objectives are essentially the same. The only question before us was which location on the EPR was the best for attacking the basic problems of lithospheric accretion at a fast spreading ridge. Phone conversations between Purdy and Francheteau, Fox and MacDonald previous to the meeting obtained their agreement that this was the most productive way to proceed.

5. EPR DRILLING

a) Site Selection. Purdy reported that attempts to have Francheteau attend this LITHP meeting were not successful due to the lack of travel funds. It is the LITHP's intention to involve all the proposers and major holders of data in discussions to arrive at a consensus decision on which is the best location along the EPR. Because of the intensive data collection on the EPR this summer (four cruises, 2 ALVIN, one dredging, one MCS) this final determination will not be possible until early 1986, following work-up of the

MCS data. The LITHP hoped that, because the uncertainty was only where, between 9-13°N, the drilling would take place then staffing and logistics could proceed in a timely manner and not be delayed by decisions on the detailed plans. Indeed, it would be of considerable benefit if the co-chiefs could be appointed as soon as possible so they could take part in the planning with LITHP. The panel proposed Bougault and MacDonald with Francheteau, Langmuir, Batiza, Natland, Becker, Von Herzen and Thompson as alternates. LITHP requests a recommendation to be made to TAMU at the April PCOM.

Detailed presentations by MacDonald, Juteau and Bryan showed the data from around the Clipperton and from 13°N. Simplistically the results of these discussions can be presented as follows. In the southern region around the Clipperton, detailed dredging operations reveal simple, systematic, along-axis changes in basalt chemistry. The OSC's are separated by 50-70 km. However, no submersible coverage is available (one Fornari leg and a Fox leg to take place in May and June '85 though neither has active hydrothermal venting areas as their primary target). The 13°N area has excellent submersible and photo coverage but is on a short ridge segment between two OSC's separated by only 25 km. Surprisingly, sampling control is poor and it is not known if the simple along-axis patterns observed to the south exist here. Langmuir agreed to attempt to spend a couple of days dredging at 13°N during his April '85 New Horizon cruise. Thus, by fall '85 we should have ALVIN dives in the south and petrology at 13°N. By early '86 we should have MCS data perhaps from both regions: this is key data because of its potential for defining magma chamber locations. Any site selection before inspection of these data would be premature. Next meeting proposed for 29th and 30th August in Strasbourg, France hosted by Thierry Juteau to allow full participation by French colleagues in EPR planning.

Need for drill ship TV for collapsed lava lake recognition was emphasized. Attempts to define a specific drilling strategy did not succeed.

b) Downhole Measurements. Matt Salisbury reported on progress concerning availability of high temperature tools. He reported that considerable interest had been expressed by the groups at Los Alamos, Sandia, USGS and Lawrence Berkely. He also introduced the panel to the concept of a tool pusher that would allow fluid flow to cool conventional tools sufficiently that they could be used in hot holes. This appears to be an extremely promising approach that would allow e.g. borehole televiewer, sonic, caliper, 3-axis magnetometer, resistivity to be carried out using conventional equipment. Large scale resistivity or OSE would probably not be practical however and temperature, flow and water sample data would contain no useful information. Matt presented a table showing maximum operating temperatures for flow, water sampling and temperature equipment from the previously mentioned labs:

	Los Alamos	USGS	LBL	Sandia
Flow (impeller)	300°C	300°C	300 (+350°C)	-
Flow (injection)	300°C	-	-	-
Water Sampler	300°C	300°C	250°C	-
Temperature	400°C	300°C	-	600-800°C

The article for submission to EOS to stimulate interest in the community in carrying out downhole experiments in lithosphere holes was reviewed and

edited by the panel. The version submitted to JOIDES and JOI for approval is attached to these minutes.

Again, the importance of wireline reentry to the progress of downhole experimentation was emphasized.

6. MARK DRILLING

The SeaMarc I survey from the CSS HUDSON has now been delayed until May and thus final site selection must be delayed to the summer. A one-day meeting with the co-chiefs on June 4 in Woods Hole was proposed (postscript: Site Survey Team cannot meet this deadline. Suggest meeting later in summer not involving LITHP but only the 106-109 co-chiefs and the Site Survey Team. GMP)

Bill Bryan discussed the main features of the SEABEAM data and a very active discussion ensued regarding the drilling strategy. Should the two legs, 106 and 109, focus on drilling one hole as deep as possible or should they get two shallower holes started thus doubling experience with bare rock spud in, providing two holes for wireline reentry mode downhole experiments and giving choice in 1990 (or whenever) as to which one should be deepened. Major concern was if two holes are drilled they could both be uninterestingly shallow. View was expressed that minimum useful depth is to the top of the dykes (395 might just have got there). The majority of the panel preferred the two hole option but no depth recommendations were made. The panel hopes to hear details of the co-chiefs' plans at the August meeting.

7. INDIAN OCEAN

As an introduction to our deliberations Sclater reviewed the highlights of the last Indian Ocean Panel meeting. In order to respond to the PCOM's request for specific priorities we first look at the additional proposals and new data, then reviewed our deliberations at our November '84 meeting when the bulk of the detailed review process took place.

a) New proposals:

- i) Ancient Ocean Crust: Coffin. Not judged to be a primary lithosphere proposal, but sufficient interest in basement samples to warrant a Grade A. (i.e. highest grade in non-primary lithosphere category).
- ii) Gulf of Aden: Stein. Not suitable for LITHP consideration, no grade or priority given. Mostly a regional problem.
- iii) Red Sea: Zierenberg et al. Needs to be looked at as part of overall plan being devised by Working Group. No grade or priority given.
- iv) Rodriguez Triple Junction: This proposal had not been circulated to the Panel. However, it was clear from Juteau's presentation that without dredging results and basic petrologic analysis from the three ridge segments it was not worthy of consideration. LITHP recommends that until this data is available this proposal not be considered: it is however, potentially a very exciting proposal.

b) Review of our November '84 grades. These discussions focussed on four issues:

- i) An expanded version of the Dick fracture zone proposal that won stronger support for this end member effort to sample the upper mantle formed at a very slow (0.86 cm/yr) spreading ridge.
- ii) Concern over the lack of a well-thought out hot spot trace program: although we considered 90°E as a very attractive target to look at changes in upper mantle source with time with some deeper holes along the ridge, unless some good plan and proponents emerge we cannot continue support. Sclater agreed to stimulate such an effort.
- iii) Red Sea is still our first priority though we would like to see some coordinated program from the Working Group as soon as possible.
- iv) Brocher Crozet proposal remains a worry because of technical uncertainties. Jim Hawkins formally objects to this proposal because of its dependence on the continued underground testing of nuclear weapons.

c) The Priorities. We consider we have four primary lithosphere programs in the Indian Ocean that are sufficiently well-defined to warrant prioritization. In order of priority they are:

1. RED SEA: L1 (Working Group)
2. AUS-ANT DISCORDANCE: L6 (Langmuir)
3. SW INDIAN RIDGE FRACTURE ZONE: L4 (Dick and Natland)
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If a good hot spot trace program is formulated we would place that SECOND only to the Red Sea. If Brocher can show reasonable possibility of solving technical problems then Crozet Basin (L7) would be ranked below Dick and Natland but above Natland.

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8. WESTERN PACIFIC

Margaret Leinen reported the existence of a fundamental philosophic difference with the W. Pacific Regional Panel who believe the controls are not sufficiently well understood to allow the intelligent planning of a focussed drilling plan in a back-arc region. Hawkins hopes his proposed June workshop (maybe June 25-27 at Scripps) will address this issue: obviously LITHP is open to the possibility that this is not an appropriate strategy in this case. Hawkins expects to be able to report at our August meeting.

9. INPAC

John Delaney presented a brief report on the recent INPAC Workshop.

ATTENDEES:

G.M. Purdy

J. Delaney

K. MacDonald

M. Leinen

R. Emmerman

T. Juteau

T. Fujii

J. Sinton

J. Sclater

J. Hawkins

C. Langmuir

P. Robinson

A. Adamson (TAMU)

J. Honnoret (PCOM)

M. Salisbury (DMP)

K. Becker (DMP)

W.B. Bryan (109 Co-chief)

OPPORTUNITIES FOR IN SITU DOWNHOLE PHYSICAL AND CHEMICAL

MEASUREMENTS WITHIN THE DEEP OCEAN CRUST

During the next few years several drill holes planned for deep penetration into the igneous ocean crust will provide an opportunity for the emplacement of instrumentation for short and long term in situ monitoring of many important physical and chemical parameters of the sea floor. The drilling will take place as part of the Ocean Drilling Program (ODP) operated by Texas A&M University under the scientific direction of the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES). The purpose of this brief announcement is to alert the scientific community to the potential of these innovative measurements and to stimulate the formulation and planning of experiments and proposals to take advantage of this new opportunity.

Deep drill holes (several hundred meters to more than one kilometer) into the igneous ocean crust are a valuable resource that should be tapped beyond the level of sample recovery and conventional wireline logging (the latter being carried out routinely under contract to ODP by Lamont-Doherty Geological Observatory). It is widely recognized that downhole measurements will provide the means by which major advances can be made in our understanding of the processes of accretion and evolution of the ocean lithosphere. This progress will be achieved both by the in situ measurement of parameters that would be impossible without the access provided by the drill hole as well as by long term monitoring of in situ physical and chemical properties (perhaps, but not necessarily, as one component of a larger scale ocean floor observatory) to study and quantify time-dependent processes. Tentative plans exist to greatly simplify the logistics of such experiments by the development of a wireline re-entry capability that would allow research vessels other than the drill ship JOIDES RESOLUTION to emplace, service or replace downhole instrument packages.

It is planned to drill a series of holes on zero age crust on the Mid-Atlantic Ridge south of the Kane Fracture Zone and in a region of active hydrothermal venting on the East Pacific Rise (EPR) between latitudes 9°N and 13°N during Legs 106, 109 and 111 starting in November, 1985. Although the precise sites of this intended drilling are still to be chosen, they will clearly provide a unique opportunity for the real time observation of the hydrogeology, geochemistry and petrology of active hydrothermal systems. From previous drilling and submersible studies, it is expected that temperatures in excess of 350°C and perhaps corrosive conditions will be encountered. These problems can be overcome in a timely manner only if early initiatives are taken which will provide the experience, precedent and new discoveries necessary to stimulate growth in what we believe to be an area of fundamental scientific interest. The JOIDES Lithosphere and Downhole Measurements Panels specifically encourage investigators to propose research projects to use these holes and in doing so, pioneer this exciting new field.

Although specific mention of mid-ocean ridge drilling is made in this article, we anticipate that the drilling proposed by the JOIDES Lithosphere Panel (LITHP) throughout the first ten years of ODP will provide numerous excellent sites for a wide range of downhole measurements. Although other crustal objectives will require different drilling strategies, a primary objective of the Lithosphere Panel is to focus crustal drilling in a small number of carefully selected locations in order to study magmatic processes and the creation of ocean lithosphere. Only in

this way can the limited drilling resource be effectively applied to the solution of such difficult problems. Thus the sites chosen for intensive study will be revisited repeatedly, providing many opportunities for new downhole experiments to be carried out. As recommended by COSOD, we plan to use the drill holes as windows into the earth's interior to measure and monitor parameters and processes to which we have never before had access.

Information concerning drilling plans may be obtained from the JOIDES Office at the Graduate School of Oceanography, University of Rhode Island, Narragansett, RI, 02882. The chairman of the JOIDES Lithosphere Panel is G.M. Purdy, Department of Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, MA, 02543. The Chairman of the JOIDES Downhole Measurements Panel is M.H. Salisbury, Department of Geology, Dalhousie University, Halifax, NS, B3H 3J5, Canada.