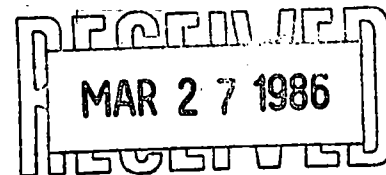


JOIDES LITHOSPHERE PANEL MEETING

January 15-16, 1986

at College Station, Texas



SUMMARY

Atlantic Drilling:

1. Leg 106: This was a great success: sadly this perception does not exist throughout the community. Recommend an active and wide publicity campaign.
2. Recommendations for Leg 109: Primary program should consist of deepening 648B as far as possible given that 11 days be spent on logging 648B and logging and downhole experiments in 395A. Back-up program to be unsupported bare rock spud-ins (μ bars) in Snake Pit hydrothermal area and Kane Fracture Zone. Final back-up to be deepening 418.

Pacific Drilling:

1. Leg 111: Recommend emplacement of bare rock guide base on EPR at 13°N. Co-chiefs should be appointed soonest so they can work with French photos to produce specific site location. Predictions for single leg penetrations are 150-300m. Experience gained in working in hydrothermal area must be gained early in the program. A temporary hole plug is perhaps feasible. Full suite of 300°C downhole tools available. Back-ups are μ bars in well-mapped sulphide deposit and, of course, 504B.
2. W. Pacific Drilling and Beyond: Swamped by proposals. Anticipate proposing (in the long-term) three transects to attack the primary themes of: ophiolite comparison; mass balance; magma, hydrothermal and crustal generation processes; evolution of fore arcs. This time around anticipate needing 4-5 legs for one transect plus a few key components of a second. Oceanic plateaus and Hawaiian swell are important targets before returning to E. Pacific.

Indian Ocean:

1. Drilling Plans: full concurrence with Red Sea Working Group's lithosphere objectives. Specifically agree with lower priority placed on Zabargad peridotite drilling. Full concurrence with 90°E Ridge package put together by Indian Ocean Panel. Very strong support for Dick-Natland-Stephen-Von Herzen SWIR Upper Mantle-V. Slow FZ-Physical Properties package.
2. South West Indian Ridge Drilling: Recommend devoting a full leg to these objectives. Success of μ bars is important component of this decision. SEABEAM-precision dredging site survey is crucial. Possibility of bare rock guidebase drilling if justified by site survey results. Back-up would be (expanded) fossil trace of Rodriguez triple junction proposal (new) from Natland, et al.

Panel Membership:

Appoint Keir Becker. Need global geophysicist to replace Sclater, suggest Watts or Detrick. Suggest Honnorez to replace Purdy (or MacDonald or Detrick or Sinton).

Lithosphere Drilling:

If 111 is EPR, then drill ship will leave until 1991 four of the best possible drilling targets for advancing our knowledge of the earth's crust. 648B, 418, 504B, EPR. No logistical, technical or financial reason exists for this: this is purely a planning decision. Unless planning priorities within ODP are changed, none of the first order lithosphere drilling objectives will be achieved in the foreseeable future.

INTRODUCTION AND MISCELLANEOUS

MacDuff reported PCOM's deliberations at their November meeting in Rhode Island and defined the areas within which LITHP opinions were solicited. Purdy presented Larson's letter of October 18, 1985 and opened discussion of Panel membership and ODP Panel structure. A need was expressed for a global geophysicist to replace John Sclater who has resigned: suggestions were Tony Watts or Bob Detrick. We have a continuing need for expertise in downhole measurements and have, during the past 18 months, repeatedly requested the appointment of Keir Becker to LITHP. Yet again, we make this request. Suggestions for the replacement of Purdy as Chairman were Honnorez with alternates of MacDonald or Detrick or Sinton. A critique of the existing ODP panel structure resulted in the not surprising conclusion that the thematic-process oriented issues were not receiving the emphasis they deserved. Margaret Leinen described the views expressed in a letter from herself and Mike Arthur (ex-chairman, SOHP) to Larson. LITHP strongly supported the notion that the drilling plans be driven by the thematic panels with regional 'working groups' to aid in leg planning. A discussion was held concerning LITHP's lack of effectiveness in persuading PCOM of the high priority of lithosphere objectives (given that only three legs in the first several years of ODP are devoted to the LITHP's primary objectives). To change this situation Andy Saunders suggested that LITHP produce a document that defined in specific terms the problems that can be solved by lithosphere drilling. Although this was done in an overall sense in the COSOD document, the consensus was that a more precise statement was needed. A Subcommittee of three consisting of Saunders, Malpas and Delaney were charged with the task of preparing this document based on input solicited from panel members and their colleagues. This group should meet the day before our next meeting to prepare a first draft.

We welcomed Andy Saunders back to the panel in consequence of the UK's return to ODP. Al Sutherland gave a generally optimistic report from NSF but we should expect no immediate financial impact on ODP in consequence of the UK's return. U.S.S.R. has been invited to join but no response has been received. Optimism concerning ESF continued to be expressed.

ATLANTIC DRILLING

A joint meeting was held with DMP to hear the reports of Leg 106 and discuss plans for Leg 109. Detailed presentations were made by 106 Co-Chief Detrick and by ODP engineers. The considerable success of this leg was clear. The new technology proven on 106 will have a major impact on future drilling plans. The video coverage from the drill pipe TV was crucial to the success of the leg: extremely impressive excerpts of the re-entry operations were shown to the Panel. Detrick enumerated a number of minor difficulties: a) inability to navigate camera frame relative to drill ship; b) dynamic positioning system errors introduced by changes in ship's head (weather related); c) inability to view ocean floor immediately beneath guidebase during deployment; and d) no usable conventional echo sounder above 4 knots. Detailed discussions of the drilling and recovery problems were held, a simple conclusion of which was that considerable advantage lay

in drilling small diameter holes (9-7/8"). A major difficulty was jug-sized pieces of rock jamming against drill pipe above the drill bit. Indeed, this was so bad that in many cases there was more wear on the outside of the drill pipe than on the bit cutting surface. The exciting concept of unsupported bare rock spud-ins (successfully attempted around the Snakepit hydrothermal area during 106) was introduced. An important statistic bearing on 106 was that out of 26 drilling days the bit was at the bottom of the hole for only 69 hours. Running out of drilling jars was the primary cause of leaving 648B. Mud motors were not used in 648B.

Based on this experience the Engineers were quizzed as to what we could realistically expect to achieve during 109 if 684B were reoccupied. Best estimate was based on rate at which the last 18m of the existing hole was drilled (i.e. 8-9m per 1 to 1-1/2 days). Specific steps to be taken during 109 to improve situation over that on 106 are: i) have more expendables on board, ii) use 9-7/8" bit and, iii) double bit weight. Quickly a consensus was reached that deepening 648B as far as possible should be the primary target for 109. Not only would this make a good start on establishing a deep zero age hole on a slow spreading ridge to be the focus of further drilling efforts in the future, but also the possibility existed of sampling the frozen magma chamber beneath Serocki Volcano, and of penetrating the 'old' median valley floor upon which this volcano was built. A discussion of the downhole measurements to be carried out during 109 was led by Matt Salisbury who described the proposed program in both 648B and in 395. The Panel quickly reconfirmed its previous recommendation that 395 be an integral part of 109 (not a back-up), the Co-Chiefs being requested to carry out DMP's list of measurements at 648B and 395 up to a maximum of 11 days. It was recommended that the decision of when during the leg to carry out the experiments on 395 be left to the Co-Chiefs. The back-up program should be carrying out systematic transects in the Snakepit hydrothermal area and drilling the Kane Fracture Zone. The Panel wished the Co-Chiefs to have flexibility in the specifics of these plans so they can react to new discoveries and to drilling successes/difficulties. The major back-up (if 648B is lost at the start of the leg) is to deepen 418. Consideration was given to the allotment of the second guidebase to 109 should 648B be lost, but this was rejected. Two other possible back-up programs were considered and rejected i) the deepening of 395A (not possible because the drill bit was dropped in the hole), ii) Rona proposal to drill two sites on eastern wall of median valley to test correlation of central magnetic anomaly amplitudes with hydrothermal alteration of basalts. Several Panel Members found this correlation unconvincing and thought that samples from 648 and 649 along with the detailed MARK site survey magnetics could be just as well used to address this question.

Rob Kidd introduced question of personnel for 109 expressing concerns with over-manning. A discussion with Bryan and Juteau brought no concrete conclusions.

PACIFIC DRILLING

The question of whether 111 should be EPR or 504B was re-examined. The first question being to solicit the ODP engineers for input on what we could expect for penetration given the 106 experiences. The major thing that would be done differently would be to avoid a large diameter hole and use

the 9-7/8 bit as soon as possible. Penetration estimates of 150m or more were quoted. The Panel consensus was that 111 should be EPR. The logic was previously stated in Strasbourg: although the science of EPR and 504B is of equal priority we need to get started on the EPR to begin learning of the technical and engineering problems associated with guidebase emplacement and drilling in a hydrothermal area. Keir Becker expressed concerns over usefulness of hole for downhole measurements given the disturbance it would introduce into the circulation of fluids in the upper crust. The possibility of sealing the hole with a plug that could be removed and replaced by a wireline re-entry vessel was introduced and the ODP engineers considered this to be not impossible. The location was reconfirmed as the French area at 13°N. PCOM and TAMU are requested to appoint co-chiefs as soon as possible (recommendations: MacDonald and Bougault) and charge them with the task of synthesizing the available data and proposing a specific site. Back-ups to this would be unsupported bare rock re-entries specifically into the known large sulphide deposits or, given failure very early in the leg, a return to 504B. A full program of downhole measurements should be planned for 111, though concerns were expressed from DMP about possible difficulty with obtaining commitment of borrowed high temperature tools given the likelihood of only very limited penetration on EPR. An impressive suite of 300°C tools is, in principle, available.

INDIAN OCEAN

Russ McDuff reiterated PCOM's latest Indian Ocean plan and John Sclater reported the Indian Ocean Regional Panel's latest views. The three legs of primary LITHP interest are Red Sea, 90°E and the Dick-Natland South-Western Indian Ridge fracture zone proposal (SWIR). Thierry Juteau reported the Red Sea Working Group's deliberations and defined their lithospheric priorities that received overall LITHP endorsement.

John Sclater described the new 90°E ridge plans which are a composite of several proposals and in which Bob Duncan is involved. A discussion of the specific scientific objectives led Andy Saunders to present an excellent primer on the importance of Dupal anomalies. The 90°E ridge plans as devised by IOP were endorsed by LITHP.

The SWIR drilling received strong support that was emphasized by the addition of the auxiliary heat-flow-permeability proposal from Von Herzen and downhole seismics proposal from Stephen. Strong panel recommendation that one complete leg be devoted to this package. A discussion of site survey requirements resulted in the unanimous view that SEABEAM coverage and perhaps precision dredging be deemed necessities, and without them the drilling should not be carried out. Given a high quality site survey, consideration should be given to assigning a bare rock guide base to this leg if needed. Dick should be invited to a future LITHP meeting, along with the site survey data, for a detailed discussion of the relative priority of specific drill sites. Consideration of back-ups to SWIR led to consideration of the new Natland et al. 'Fossil trace of the Rodriguez triple junction' proposal that received very strong support: in fact recommendations were made that it be expanded into a more thorough test of the model and that two or three sets of three holes be drilled along the fossil trace to reliably define any time dependence. Although this was defined as the primary back-up to SWIR little was known of the site survey

requirements. Mascarene Fossil Ridge was chosen to be LITHP's next priority following 'Fossil trace of the Rodriguez triple junction'.

WESTERN PACIFIC

The two objectives of this discussion were to make a first pass at the review of more than twenty-five proposals that had been circulated to panel members, and to devise a general LITHP strategy for W. Pacific drilling that could be forwarded to PCOM for its next meeting. Some aspect of the following proposals was considered sufficiently relevant to our objectives to warrant more detailed review: 50/D; 83/D; 131/D; 126/D - Australian proposal covering many aspects - it is almost impossible to review in its present state; 130/D - mostly tectonic; 149/D; 151/D; 164/D - very local and tectonic; 155/F - downhole seismic experiments requiring total of 6 kms penetration (!) should be merged with other projects; 27/D - mostly regional tectonics; 166/D - Japan Sea - good high priority lithosphere problems but wrong place (?); 168/D; 179/D; 180/D; 184/D - Papua-New Guinea only one site penetrating basement; 189/D - mostly sedimentary-tectonic with no main lithosphere objectives - Hawkins' companion proposal expected; 191/D.

One proposal was considered to be of such little interest that further review was not recommended: 156/D - inappropriate use of the drill ship as a sulphide exploration tool.

A number of proposals were very highly rated: the leaders being 171/D - Brian Taylor's ambitious Bonin proposal and 172/D - Pat Fryer's Mariana proposal that shares many of Taylor's objectives. In terms of transects these proposals clearly compete, but both are primary lithosphere objectives. Second to these is 170/D - Janet Morton's Valu Fa seismically imaged magma chamber; 167/D - Uyeda's Okinawa Trough back-arc rifting; 161/F - deepening of 442B with downhole magnetic and permeability experiments; 181/D - primarily ophiolite comparison objectives that could be included as part of one of the primary transects; 187/D - Lawver and F. Taylor New Hebrides good generic 'consumption of ridge' problem; 190/D - Fisher et al. Central New Hebrides Arc-Ridge collision.

Discussion was then held to define LITHP 'philosophy' in the Western Pacific. The Strasbourg meeting list of focal points (ophiolite comparison; global mass balance; magma/hydrothermal processes and their comparison with MOR; fore-arc evolution) received criticism, the point being made that many of these problems and their components are intimately interrelated, and that more correctly a matrix of objectives and processes should be constructed. The need for temporal coverage was stressed, looking at and comparing incipient and mature older systems. All the identified components of a plate collision system need study thus the 'transect' strategy seems logical. The need for 'temporal' sampling necessitates multiple transects extending from the back-arc spreading center (where zero age drilling could be carried out), across to the undisturbed plate about to be consumed. An estimate of four legs would be needed for each transect. Tentatively, we recommend carrying out one of these transects in this round of drilling plus one or two components of a second transect to allow some key comparisons to be made immediately. Two points were repeatedly made: existing models of plate consumption processes are extremely vague so the determination of optimum drilling strategy is difficult and certainly should not be focussed

in a single system. Secondly, the comparison of different systems is seen as a key to the understanding of the whole.

OTHER PACIFIC DRILLING

PCOM requested input on planning beyond the Western Pacific. LITHP emphasizes three general areas before return to Eastern Pacific ridge process drilling: oceanic plateaus, Hawaiian Swell and seamount drilling.

MISCELLANEOUS PROPOSAL REVIEW

160/F: Kaminuma et al. - Weddell Sea heat flow, water circulation and downhole magnetic field. High latitude basalt for paleomagnetic studies considered very high priority and planned Weddell Sea drilling seen as ideal opportunity to recover unique samples. This proposal as it stands is too ambitious (it requests five holes penetrating more than several hundred meters into basalt) however, should be strongly considered as an auxiliary program to existing plans.

162/F: Stephen - SWIR downhole seismics - strong support as described earlier in these minutes.

185/C: Coffin et al. - Kerguelen - seems 'out-of-date' of existing drilling plans. However, LITHP restates its high priority on three basement penetrations at Kerguelen.

92/B: Bulter - Crozet Basin Seismic Observatory - LITHP restates its strongest support for this exciting project. If technical problems can be solved this proposal should be given high priority.

188/F - Salisbury - Alternate for 109 - dealt with earlier in these minutes - basically endorse as a backup.

86/B: Bonatti - Red Sea - most objectives included in existing Working Group plans.

LITHP

G.M. Purdy
J. Delaney
T. Juteau
N. Peterson
M. Leinen
T. Fujii
J. Malpas
A. Saunders
J. Sclater

ODP

B. Harding
S. Serocki
S. Howard
T. Brittenham
L. Garrison
R. Kidd

Liaison

R. McDuff (PCOM)
A. Adamson (TAMU)

Guests

R.S. Detrick (106 Co-Chief)
W.B. Bryan (109 Co-Chief)
A. Sutherland (NSF)

LITHP Members Absent

K. MacDonald
J. Hawkins
J. Sinton
C. Langmuir

DEC 23 1985

1. MARK Drilling

To begin on a positive note, it is clear that this was the highlight of the year. The exceptionally high quality site survey work in the MARK area, the successful planning for this leg capped by the trouble-free first bare rock guidebase emplacement were all a promising start to this first high priority lithosphere leg. The slow drilling problems are still being assessed as this is being written and cannot be commented upon here.

2. EPR Drilling

EPR drilling site should have three characteristics: seismically defined magma chamber, full photo coverage, and active hydrothermal activity but locate first site in downflow zone in order to minimize high temperature problems. Consensus was 'French' 13°N area probably best meets these requirements. However, limitation of only two guidebases made EPR drilling questionable and this awaits planning decisions on 109 and review of 106 before progress can be made. Strong panel support exists for 'having a go' at hydrothermal drilling so technical difficulties can be assessed early in the program.

3. 504B

The Panel considers the deepening of 504B to be an essential part of the first two years of drilling. To emphasize the priority placed on this a formal drilling proposal was submitted on behalf of the Panel.

4. Bare Rock Guidebases

The lack of funds for more than two guidebases was a dismaying occurrence: that planning for such a high priority drilling target should be dominated by funding concerns so early in the program was a source of considerable concern to Panel Members.

5. Indian Ocean

Many active discussions and careful proposal reviews led to setting our first four Indian Ocean priorities as: 1. Red Sea, 2. 90E Ridge, 3. Aus-Ant. Discordance, and 4. SW Indian Ridge fracture zone. However, again it must be stated that these are LITHP's priorities only WITHIN the Indian Ocean. The Panel considers back-arc spreading center drilling in the Western Pacific to be a higher priority than all of the above projects.

6. Western Pacific

Planning for this is in early stages but got off to an excellent start with Jim Hawkin's successful workshop. Proposals totalling almost six inches of double-sided xeroxes have recently been mailed to Panel Members: some concern exists as to whether such a volume of text can be reviewed adequately given existing procedures.

7. Lithosphere Drilling within ODP

Planning is sufficiently well-advanced that it seems clear that LITHP's number one objective - crustal generation and magma processes - will receive only three legs worth of effort during the first four years of the drilling program. The Panel repeatedly expresses its frustration at this; and at its perception that ODP is not adopting the philosophies of COSOD; and at its concerns that the valuable and very limited drill ship resource is being used as a globally wandering miscellaneous problem solver.