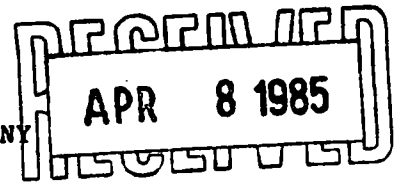


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JOIDES Tectonics Panel Meeting
Lamont-Doherty Geological Observatory, Palisades, NY
18-20 March 1985

Panel members present: Darrel Cowan (USA), Chairman
Rene Blanchet (France)
John Ewing (USA)
David Howell (USA)
Kazuaki Nakamura (Japan)
Robin Riddihough (Canada)
Peter Vogt (USA)
Jeff Weissel (USA)

In attendance: Garrett Brass (NSF)
Audrey Meyer-Wright (ODP)
Ralph Moberly (PCOM)

Absent: Karl Hinz
Bruce Marsh

DRAFT

AGENDA

1. Minutes of previous meeting
2. Recent membership changes
3. Reports from liaisons, PCOM, ODP, and NSF
4. Review and discussion of Indian Ocean proposals
5. Introduction to Lamont logging program
6. Voting and ranking Indian Ocean proposals
7. States of Chile triple junction leg
8. Recommendations for Co-chief scientists for Leg 110
9. Thematic interests in the Western Pacific
10. Future panel membership
11. Next meeting

EXECUTIVE SUMMARY OF TECTONICS PANEL MEETING
March 18-20, 1985; Lamont-Doherty, NY

I. RECOMMENDATIONS FOR INDIAN OCEAN DRILLING

We ranked targets using the voting system adopted in our September 1984 meeting in London. Eight members voting, awarding each target a score of 0 to 10. Score reported is the average, followed (for top four) by the spread. A very brief justification is provided for the top four:

- 1) Makran accretionary prism and slope basins (Leggett proposal) 8.75; 6-10.
Excellent opportunity to address: rates of deformation and uplift in clastic-dominated prism, and transition from slope-basin sediments to basement.
- 2) Intraplate deformation and fluid flow (Weissel et al.) 8.43; 7-10.
Innovative plan to determine timing and rates of deformation of long-wavelength flexures in an intraplate setting, and to address how fluid flow influences high heat flow.
- 3) (tie) Southwest Indian Ocean fracture zone (Dick & Natland) 7.0; 2-9.
Opportunity to document vertical sequence of rock types and fabrics, in a setting characterized by slow relative plate motions, for comparisons with deformed parts of ophiolites on land.
- 4) (tie) Bengal-Indus fans (Curry et al.) 7.0; 3-10.
Addresses a fundamental on-land tectonic problem, the uplift history of a collisional orogen, the Himalayas. Distal fan facies may reflect timing and rate of uplift as well as eustatic sea-level changes.

Targets 5-10 were ranked as follows. Comments in the minutes explain that drilling on Kerguelen (#7) and in the Red Sea (#10) would have ranked higher if proposals at hand had included specific tectonic objectives:

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|--|------|
| 5) Ninetyeast Ridge, Broken Ridge hot-spot targets | 6.50 |
| 6) Broken Ridge rifting and uplift (Weissel et al.) | 6.43 |
| 7) (tie) Chagos-Laccadive ridges (Duncan; Heirtzler) | 6.25 |
| 7) (tie) N. Somali Basin (old Tethyan crust) | 6.25 |
| 7) (tie) Kerguelen | 6.25 |
| 10) Red Sea (proposal of Red Sea W. G. presented by Cochran) | 6.20 |

II. PANEL MEMBERSHIP

Panel unanimously feels that our present size maximizes efficiency and that important thematic interests are adequately represented. We recommend no additional members at this time.

III. RECOMMENDATIONS FOR CO-CHIEF SCIENTISTS, LEG 110 (BARBADOS RIDGE)

In alphabetical order: J. Ladd, A. Mascle, C. Moore, M. Marlow

IV. NEXT MEETING

Either: a) St. Johns, Newfoundland in October to enable us to visit JOIDES RESOLUTION after Leg 105; b) Tokyo in October to facilitate briefings by Japanese scientists on Western Pacific tectonic problems. Actual dates await firmer ship schedule.

MINUTES

The meeting began at 8:45 a.m.

1. MINUTES OF THE PREVIOUS MEETING

The minutes of the last meeting were approved without changes.

2. RECENT MEMBERSHIP CHANGES

Cowan reminded the panel that, regretfully, Jeremy Leggett and Jan van Hinte were no longer members because the United Kingdom and the European Science Foundation had not yet joined ODP. The panel welcomed two new members, David Howell from the USGS, and Peter Vogt from the Naval Research Laboratories, both of whom gave a short introduction to their research interests. Cowan explained that Marsh was absent due to a long-standing commitment to lecture in Switzerland, and Hinz was at sea. The panel fielded several questions from Howell and Vogt on how we operate, how proposals are processed, and the like.

3. REPORTS FROM LIAISONS, PCOM, ODP, & NSF

3.1 PCOM

Ralph Moberly summarized important aspects of the last PCOM meeting. Legs 102-110 are firm as far as general drilling objectives. Legs 111-113 are not yet firm but as tentatively scheduled include: 1) drilling on E. Pacific Rise; 2) Peru margin; and 3) Chile triple junction. The ship will begin its Weddell Sea leg on January 1, 1988. Because PCOM will work out a preliminary Indian Ocean plan at its April meeting, our primary task now is to rank drilling targets from a thematic standpoint and provide a brief justification for our rankings. We should envision about 1-1/2 years of Indian Ocean drilling--about 10 legs. The ship will enter the Western Pacific about September 1, 1988 (a crude estimate at this stage), be off Japan in Summer of 1989, and in the NE Pacific in the Summer of 1990. Moberly reminded us that we should consider COSOD priorities heavily in our deliberations. As for riser drilling, important targets in less than 4000' of water may be addressed in 1991, after the first circumnavigation by the RESOLUTION.

An important reminder for TECP: Western Pacific will probably be going thru an Indian Ocean-type review and prioritization by PCOM in the Summer of 1986, so they will need our rankings by then. The Western Pacific contains many problems of great tectonic interest. Finally, it may be appropriate, after Indian Ocean drilling, to set up another COSOD-type conference to review whether objectives have been adequately addressed or whether new goals need to be set.

3.2 ODP

Wright-Meyer reviewed the shakedown cruise of the JOIDES RESOLUTION and summarized lab facilities and the accommodations for up to fifty scientists and technicians. Leg 101 sailed on January 31 and just returned to Miami. Eleven sites were drilled--all that were

planned and then some. Some results of interest: Site 98 was redrilled and abandoned at 479m due to hole and recovery problems; this attempt to reach the mid-Cretaceous unconformity failed. Although it was earlier feared that drilling time would be slower than on CHALLENGER, speed has picked up and drilling rates on the new ship are probably comparable.

Leg 102 will be devoted to clearing out fish and to conducting downhole experiments, then on to the Galicia Bank, Leg 103.

Wright-Meyer reviewed requirements and expectations for bare-rock drilling, to be performed on Leg 106 on the Mid-Atlantic ridge near Kane fracture zone. Note: no core from upper 50 to 100' in holes planned for deep penetration; limit for logging took presently about 180°C.

Legs 102 and 103 are staffed; 104 nearly done; invitations sent for 105. We were reminded that PCOM nominates co-chiefs, but actual staffing is done by ODP.

3.3 NSF

Garrett Brass reported that NSF intends to fund the program for five years, but participation by non-USA partners is essential if the program is to continue. Four partners are the bare minimum. European Science Foundation should make a decision by Fall 1985; United Kingdom status is uncertain. Each non-USA member contributed \$2.5 million. Brass reviewed the procedures by which JOI and USAC sponsor workshops, field studies, and the like.

3.4 WESTERN PACIFIC PANEL

Nakamura summarized the panel meetings held last Fall at Lamont and more recently in January 1985 in Hawaii. Copies of the preliminary minutes of the January meeting were distributed to the panel together with the updated Executive Summary of major actions and recommendations that Eli Silver had handed to Cowan the week before. Nakamura described how priorities are assigned based on the theme or topic, the regional context, and the current state of knowledge. Important themes concern marginal basins, forearc tectonics, and collision tectonics. The preliminary top 16 priorities for drilling appear in the Executive Summary. The next meeting of WPAC is in August, when only proposals officially logged in with JOIDES will be evaluated and ranked.

Blanchet emphasized that our panel must establish a system for discussing and evaluating Western Pacific proposals, since these will be our major tasks at our next meeting.

3.5 CENTRAL & EASTERN PACIFIC PANEL

Cowan summarized the panel meeting in Menlo Park held the previous week. The panel reviewed and reaffirmed its priorities for sites 111-113 as: Peru margin; 2 legs devoted primarily to hydrothermal processes on EPR; and Chile triple junction. Cowan informed the

panel of tectonic objectives in the North Pacific and NE Pacific that we will have to evaluate in the future, including: Bering Sea (trapped old oceanic crust); Aleutian forearc and accretion; origin of the Emperor trough; displacement history of the Zodiac and Baranof fans; and accretionary processes along the British Columbia-Washington-Oregon subduction zone.

Riddihough summarized the INPAC workshop held in Seattle in February. Participants were divided into 3 groups based on general thematic problems: lithosphere (primarily concerned with ridge processes); tectonics (exclusively concerned with subduction and accretion); and ocean history and paleoenvironments. The first major contribution by the workshop will be a preliminary drilling document containing a proposed drilling program encompassing all the sites of interest to the thematic groups.

4. REVIEW & DISCUSSION OF INDIAN OCEAN PROPOSALS

Our major task for this meeting was to prioritize drilling targets in the Indian Ocean for PCOM. To facilitate the discussion, Cowan had divided the targets geographically and assigned regions to panel members who would be present at the meeting; each member was responsible for summarizing the proposals in his area, fielding questions, and making recommendations. This procedure was used successfully in previous meetings. In the following sections, only points that were especially significant or that precipitated extended discussions are noted.

4.1 RED SEA & GULF OF ADEN

J. Cochran from Lamont kindly agreed to summarize the results and recommendations of the Red Sea Working Group, which had met just prior to our panel. [On March 20, he gave us a copy of the report, which was distributed to all panel members.] The three major problems the W. G. wants to address are: 1) Evolution of basaltic magmas during the rifting process; 2) hydrothermal processes and metallogenesis; and 3) sedimentary history of fresh crust. After Cochran's illuminating presentation, the panel had a long discussion about whether the drilling as proposed by the W. G. will adequately address tectonic problems, or indeed, whether tectonic problems can be addressed in the Red Sea. Proposed drilling will clearly be concentrated in deeps to sample basalt and metalliferous sediments. One of our important global thematic objectives is to determine the nature of "transitional crust" formed where continental crust is rifted and thinned. We had until now viewed the Red Sea as an attractive area for addressing this problem. Judging from the most recent proposal by Pautot et al., however, it seems that possible crust of this type is too deep; concern was also expressed by some panel members that poor-quality seismic data from the region impede definition of the sediment-basement contact.

Nakamura reviewed proposals for drilling in the Gulf of Aden.

4.2 MOZAMBIQUE & SOMALI BASINS

Ewing reviewed several proposals on hand for drilling on Davie Ridge, off Somalia and Madagascar, and in the N. Somali basin.

- 4.3 Riddihough reviewed diverse proposals, grouping them into series addressing hot spot traces, evolution of the Indian Ocean basin, and how the Bengal and Indus submarine fans may record the evolution of the Himalayas. Weissel summarized his proposal addressing intraplate deformation, and a soon to be submitted proposal for the evolution of Broken Ridge.

4.4 KERGUELEN; SW, S, SE INDIAN OCEAN; ANTARCTIC MARGIN; AGULHAS PLATEAU

Blanchet reviewed a large number of proposals concerning these areas. Our discussion focused on the Kerguelen-Heard plateau. From a thematic standpoint, important objectives are: 1) the nature of basement on the plateau; 2) the age and environment of sediments beneath the probable Eocene unconformity; and 3) a comparison of the rifting history of the NE margin of the plateau with that of its conjugate margin, Broken Ridge. From the proposals at hand, it seems that only objective (2) will be addressed. We would recommend combining this objective with drilling on Broken Ridge through the mid-Eocene unconformity, and drilling one or preferably two deep holes into basement on both the northern and southern parts of the plateau.

Blanchet noted that drilling on the Melville fracture zone (SW Indian Ocean ridge), advocated in a recent proposal by Dick and Natland, could provide tectonically significant results. Our panel agreed that information from oceanic fracture zones would be useful for comparison with on-land ophiolites and could aid in the interpretation of their internal structures and fabrics. Moberly pointed out that drilling in the Kane fracture zone is possible on Leg 106 depending on the outcome of the proposed deep hole in ocean-floor basalt.

As for the Agulhas plateau, Blanchet noted that proposed drilling concerns paleo-oceanographic objectives. Our panel decided not to advocate drilling in the Agulhas region unless it is deep enough to determine basement.

4.5 NORTHWEST & SOUTHERN AUSTRALIAN MARGINS

Weissel summarized a recent proposal by von Rad and others for drilling on Exmouth and Wallaby plateaus and in the Argo abyssal plain. We noted that the region is similar in some respects to the Galicia margin and Voring Plateau in that pre- and syn-rift sediments, and dipping reflectors, respectively, are targets. Weissel reviewed again proposed drilling on the southern margin of Australia.

Vogt suggested that it would be easier to evaluate the tectonic significance of some proposals if they included illustrations of appropriate plate-tectonic reconstructions (e.g. separation of Australia from Antarctica).

4.6 CONVERGENT MARGINS: MAKRAN & SUNDA/BANDA

Cowan reviewed proposals for drilling off the Makran coast, off Sumatra and Java, and Southwest of Timor. We decided to evaluate and rank proposals in the Sunda-Banda forearc at this time even though we may be asked to consider them again along with Western Pacific proposals.

Vogt suggested that, when we evaluate drilling at convergent margins, we consider certain plate-tectonic parameters in addition to our usual concern with the structure and evolution of the accretionary wedge. Parameters he listed include: rate and angle of convergence; age and thickness of the descending plate; thickness of sediments on descending plate; and basement topography, including features such as aseismic ridges and seamounts.

5. INTRODUCTION TO LAMONT LOGGING PROGRAM

After lunch on Tuesday, Dave Goldberg briefly explained programs underway at Lamont to develop downhole instruments Lamont's role in supervising logging operations on-board the ship. Unfortunately, the logging truck was unavailable for inspection.

6. VOTING & RANKING INDIAN OCEAN PROPOSALS

We ranked Indian Ocean drilling targets using the voting system adopted in our September 1984 meeting in London. Eight members voting, awarding each target a score of 0 to 10. Score reported is the average, followed by spread.

The panel agreed to provide some justification for the high priorities we assigned to the top four targets;

- 1) Makran accretionary prism and trench-slope basins (Leggett) 8.75; 6-10.

A series (transect) of shallow (~300 m) holes provide an excellent opportunity to document rates of deformation and uplift in a clastic-dominated prism and to address the nature of the transition from slope-basin sediments to their basement of accreted sediments. Major advantages are the opportunity to tie drilling results to onshore geology, and the excellent existing and planned reflection seismic data from the prism.

- 2) Intraplate deformation and fluid flow (Weissel et al.) 8.43; 7-10.

Innovative plan to determine the timing and rates of deformation of long-wavelength flexures in an intraplate setting. In addition, drilling will address the possible role that fluid flow plays in producing high heat flow near seismically active faults also documented by reflection data.

- 3) (tie) Southwest Indian Ocean ridge fracture zone (Dick & Natland) 7.0; 2-9.

High ranking reflects the panel's view that fracture zones are an important tectonic feature of the oceanic crust. It is necessary to document the vertical sequence of rock types and fabrics for comparisons with deformed parts of ophiolites on land. The slow relative plate motion and large fracture zone offset appear to characterize an end-member of plate behavior and are therefore important for models relating crustal structure to rates of plate motion. Sites on the Melville fracture zone are interesting because a high proportion of ultramafic rocks have been dredged up.

- 4) (tie) Bengal-Indus fans (Curry et al.) 7.0; 3-10.

This program provides an opportunity to address a fundamental on-land tectonic problem, the uplift history of a collisional orogen, the Himalayas. Distal fan facies of the Bengal submarine fan may reflect the timing and rate of Himalayan uplift as well as eustatic sea-level changes.

Remaining targets were ranked as follows:

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| 5) Ninetyeast Ridge, Broken Ridge hot spot targets | 6.50; |
| 6) Broken Ridge rifting and uplift (Weissel et al.) | 6.43; |
| 7) (tie) Chagos-Laccadive ridges (Duncan; Heirtzler) | 6.25; |
| 7) (tie) N. Somali Basin (Tethyan crust) | 6.25; |
| 7) (tie) Kerguelen | 6.25; |

The panel feels that determining the nature of the basement of oceanic plateaus like Kerguelen is an important thematic problem. We would have ranked drilling on the Kerguelen-Heard plateau higher if proposals on hand had included definite plans to sample basement, particularly on the southern part of the plateau and ideally on both the southern and northern parts.

- 10) Red Sea (proposal of Red Sea Working Group presented to us by Cochran) 6.20;

We would have ranked Red Sea drilling higher if there were some assurance that holes would determine the nature of transitional crust formed during rifting of continental crust. It is unclear to us from existing data whether basement objectives can be realized. Tectonic problems could be better addressed by drilling on saddles between the deeps and in the crust flanking the axial zone, although better reflection data would be required to define objectives. We feel that the hypothesis that initiation of spreading is associated with transitional basalt types should first be tested by dredging in deeps where spreading has just begun, provided basalt outcrops exist.

- 11) Magnetic quiet zone, S. Australian margin 6.00;
- 12) Timor collision (Karig & More) (see comment under #14) 5.62;
- 13) Old ocean crust, S. Aust. margin 5.50;
- 14) Nias-Java accretionary prism 5.38;

The Sunda-Banda area potentially provides a number of tectonic thematic targets, and we would be pleased to reevaluate drilling plans when further data and/or proposals are available.

- 15) Exmouth plateau 5.25;
- 16) (tie) Wallaby plateau 4.62;
- 16) Agulhas plateau 4.62;
- 18) (tie) Argo 4.25;
- 18) (tie) Gulf of Aden (Stein) 4.25;
- 20) Adelie margin 4.12;
- 21) (tie) SE Indian Ocean "cold spot" 3.62;
- 21) (tie) Davieridge 3.62;
- 23) South Somali Basin/Madagascar 3.25;
- 24) S. E. Indian Ocean hot spot 2.88;
- 25) Stress measurements (Forsyth) 2.50;
- 26) (tie) Monsoon 2.38;
- 26) (tie) Avery Basin/Davis Sea 2.38;
- 28) Arabian Sea basalt (Natland) 1.62;
- 29) Rodriguez triple junction 1.12.

7. STATUS OF CHILE TRIPLE JUNCTION LEG

Cowan announced that proposed drilling in this region had been briefly discussed at the CEPAC meeting the previous week. The general feeling, prompted partly by comments by Buffler, the PCOM representative, is that it appears increasingly unlikely that a full leg of drilling will occur. There are still difficulties in scheduling the required site surveys.

In response to a request by Roger Larson, Cowan asked that we be prepared to offer suggestions for fine-tuning the drilling sites proposed for Legs 110-113 at our next meeting.

8. RECOMMENDATIONS FOR CO-CHIEF SCIENTISTS FOR LEG 110 (BARBADOS RIDGE)

In alphabetical order: John Ladd, Mike Marlow, Alain Mascle, Casey Moore.

9. THEMATIC INTERESTS IN THE WESTERN PACIFIC

Our next major tasks will be to discuss the thematic interests that can be addressed in the Western Pacific region, and to begin evaluating drilling proposals. As Nakamura told us earlier, the Western Pacific panel will begin ranking mature proposals at their next meeting in August. It was suggested that we continue our usual system of dividing the region up geographically and appointing "watchdogs" who will be responsible for reviewing and criticizing proposals at future meetings. We used, for a geographical base, a modified version of a map Moberly had prepared after the last WPAC panel meeting.

Areas of responsibility at this stage are: Japanese Islands and environs, Izu-Bonin arc and vicinity - Nakamura, Riddihough; Okinawa, Taiwan, S. China Sea - Blanchet, Ewing; Sulu Sea, Palawan - Hinz; Sunda-Banda arc, Timor - Cowan; Philippine Sea, Molucca, Palan - Vogt; Mariana arc, W. Mariana - Marsh; Coral Sea - Hinz; Solomons, New Hebrides, Lord Howe, Fiji, Tonga - Howell, Weissel.

Cowan will make copies of officially logged-in proposals that are received from the JOIDES office and send them to each panel member.

10. FUTURE PANEL MEMBERSHIP

We briefly discussed whether we need to expand the panel membership to include thematic specialties that are not represented at present. We are, of course, hopeful that Leggett and van Hinte can rejoin the panel soon. Meanwhile:

The panel unanimously feels that our present size maximizes efficiency and that important thematic interests are adequately represented. We recommend no additional members at this time.

11. NEXT MEETING

We agreed that it would be worthwhile to hold our next meeting in the interval between the forthcoming August and December meetings of WPAC so that we will have their rankings of mature proposals (August) and will be able to inform them of our preliminary thematic priorities in the region. Two possibilities were suggested. First, in St. John's, Newfoundland in October so we can visit the JOIDES RESOLUTION during its port call after Leg 105. Second, in Tokyo, also after October 1st, to take advantage of Japanese experts who could brief us on drilling targets in the Western Pacific. Our choice of venue and time will await a firmer ship schedule for late Autumn which should be established at the April PCOM meeting.

The meeting was adjourned at 12 noon, Wednesday, 20 March.