

JOIDES Tectonics Panel Meeting  
London, UK  
10-12 September 1984

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Panel members present: J Leggett (United Kingdom), Chairman  
K Becker (USA)  
R Blanchet (France)  
D Cowan (USA)  
J Ewing (USA)  
K Hinz (Germany)  
B Marsh (USA)  
R Riddihough (Canada)  
J Van Hinte (European Consortium)  
J Weissel (USA)

In attendance: A Meyer (ODP)  
Visitors: L Kulm (Monday afternoon)  
T Shipley (Monday afternoon)  
G Westbrook (Tuesday morning)

AGENDA

- I. Minutes of last meeting
- II. Reports on PCOM and other panel meetings
- III. System for prioritizing proposals
- IV. Review of sites with tectonic objectives under consideration for Legs 111-113
- V. Panel recommendation concerning site surveys
- VI. Review of Legs 101-110
- VII. Review of Indian Ocean proposals
- VIII. Other business

## MINUTES

The meeting began at 8.30 a.m. at Imperial College.

### I. MINUTES OF LAST MEETING

The minutes of the last meeting were approved without changes.

### II. REPORTS ON PCOM AND OTHER PANEL MEETINGS

Leggett reviewed the minutes from recent PCOM and EXCOM meetings, and Meyer added up-to-date information on ODP operations. Several points of interest to our panel emerged. There will be a substantial overrun (about \$4 million) on the conversion costs of the drilling ship: some of this deficit has been made up, and the remainder will be alleviated if two more countries join ODP. R Kidd was hired as Science Operations Manager. It appears base-rock drilling will not be tested for about 18 months. Using a riser requires about 3 weeks on site before drilling can commence: day-rate costs go up by about 60%. The ship can deploy a maximum of 7.3 Km of drill string. This may be erroneous information. L Garrison from ODP told Cowan on 13 September that since the drill ship uses tapered drillstring, it can deploy up to 30,000 feet.

Becker reported on meetings of the Lithosphere Panel. Leg 106 will be the first test of base-rock drilling. Drilling zero-age crust is the panel's top priority. The panel favours three lithosphere legs as candidates for Legs 111-113, including deepening Hole 504 -B to sample the boundary between oceanic layers 2 and 3.

Weissel reported on the meeting of the Southern Oceans panel held last week. Their priorities are paleoenvironments and the history of Antarctic glaciation. They will recommend drilling during two of the forthcoming austral summers: A major transect along the Kerguelan plateau and a series of sites on the E. Antarctic margin. This margin is conjugate to E India so it is of some tectonic interest. Sampling of heterogeneous mantle on Broken Ridge is another potential target.

Meyer said that the Indian Ocean Regional Panel met last week and considered 62 proposals. They devised two years of drilling devoted to 10 legs of "Priority A", including Agulhas, S Somali basin, Makran Red Sea, Arabian Sea, Owen Ridge, Oman Margin, distal Indus fan (record of Himalayan uplift rather than fan processes), Chagos-Laccodive ridge, Rodrigues triple junction.

### III SYSTEM FOR PRIORITIZING PROPOSALS

One of our primary objectives is to prioritize proposals for PCOM. Leggett earlier had compiled a comprehensive list of thematic problems, that are considered of interest by panel members. The list was compiled from suggestions by several members. Leggett suggested a matrix system whereby each proposal was evaluated against individual entries in the list. Cowan suggested alternatively that each proposal simply be awarded a score of 0-10, 10 signifying highest priority, by each panel member. The average score for a proposal would determine its ranking with respect to all proposals considered. The panel adopted Cowan's procedure for ranking proposals. Each score will be forwarded to PCOM with a few summary comments concerning key features that influenced our ranking.

- IV. REVIEW OF SITES WITH TECTONIC OBJECTIVES UNDER CONSIDERATION FOR LEGS 111-113. Before reviewing sites for 111-113, we quickly discussed those legs among 101-110 with tectonic objectives: Tyrrhenean Sea and Barbados North (Becker said that a drill-string packer will be ready to go for this cruise - good news in light of the prime importance of measuring fluid pressure at site LAF- 1). We felt it is probable that drilling LAF -1 will take 20-30 days and there may not be enough time for completing all sites.

Recommendation to PCOM

From a thematic standpoint, sites LAF 1 and 2 have the highest priority, if time remains drill LAF -3 if more time, drill LAF -4 and 5.

Moved: Hinz  
Seconded: Blanchet  
Unanimous

- A. NW AFRICA: Mesozoic objectives  
Hinz reviewed his and Winterer's proposals. The main objectives are 1) to finish Leg 79 targets by drilling MAZ -8 on the Mazagan Plateau to determine subsidence history of the plateau and the development of a carbonate platform: 2) Complete Site 547, drilling into Triassic redbeds and basement and logging: and 3) drilling near the S -1 anomaly into possibly the oldest Atlantic oceanic crust. 1 and 3 have higher priority, 3 highest. Drilling near S -1 would require a very deep (3KM) hole and probably 100 days on site. This site would be challenging test of the capabilities of the new drill ship.
- B. BARBADOS SOUTH  
Cowan reviewed the remaining sites (LAF 7-15) in the Caribbean Working Group proposal by Speed et al dated 18 August 1984. Blanchet favoured sites 13 and 15 to explore the deformational history at the inner deformation front. Weissel and Ewing felt that LAF 7 a-d would be most interesting, since they are in a part of the Barbados Ridge where thick turbidites are being accreted rather than the thin pelagic section at LAF -1,2,3. Hinz showed some interesting reflection profiles from Palawan for comparison. Further discussion of proposed lesser Antilles drilling is under F below.
- C. PERU TRENCH  
L.Kulm (Oregon State University) distributed and summarized a new proposal dated 6 September 1984 for drilling in the Peru forearc. Although actual sites were not specified, pending results of the site survey to be held in early 1985, the general objectives include: uplift and subsidence history of forearc basins: nature and age of the transition zone between accretionary prism and metamorphic basement: style and history of subduction erosion and diverse problems important to on-land and offshore geology.
- D. COSTA RICA (MIDDLE AMERICA TRENCH)  
T Shipley (University of Texas) summarized a proposal on drilling in the forearc off Costa Rica. The primary objective is to drill through the slope sediment section, across a zone of prominent reflectors, and into presumed accreted material to determine the mechanism of accretion. The proposal presents a "duplex" model of accretion that will be tested by drilling. Further, deep drilling at site CR-1 will determine whether the slope sediments are underlain by accreted sediments or basement rocks as off Guatemala. Other sites will be located near the toe of the trench slope, and further upslope to study slope facies, sedimentary procedures and the like.

The panel discussed this proposal in detail. We have serious reservations about the applicability of the duplex model to this margin, and we suspect that the overall structure of the margin off Costa Rica may not be different enough from that farther north to warrant drilling it.

E. CHILE TRIPLE JUNCTION

Marsh reviewed the volcano-tectonic setting of the region. The proposal by Cande contains several objectives that are very attractive from a thematic standpoint. The main goal is to determine the effects of subducting a ridge, such as lower-slope erosion, metamorphism of accreted sediments, near-trench magmatism, and uplift/subsidence. We agreed that S. Chile is an excellent area to address these problems, and that this is a major topical problem that has yet to be addressed by drilling. We felt that drilling sites could be better and more creatively located in some cases. The need for a site survey is clear. Drilling in the zone of modern ridge subduction should have highest priority; next is drilling to the south to assess an area where subduction has already occurred; and third, to the north, in a pre-ridge-subduction setting.

F. CARIBBEAN

G. Westbrook (University of Durham) presented the recommendation formulated at a meeting of the Caribbean working Group held 3-4 September 1984. He basically reviewed again the "Barbados North" and "Barbados South" site described in an earlier proposal from the working group. Proposal sites for Leg 109 are LAF 1-6 (6= former site 12A). They recommend a second Lesser Antilles Leg for 111-113 to include LAF-7 (several holes along outer deformation front), and diverse sites on the upper slope and structural high. This leg would also include CAR-2, on the west flank of the Grenada Trough to sample the basement of Aves Ridge. Another leg proposed for 111-113 includes one hole in the Venezuela Basin (CAR-4) and one in the Columbia Basin (CAR-5); a third leg includes two sites in the Yucatan Basin.

G. IONIAN BASIN

Blanchet noted that this proposal includes drilling on the Malta escarpment, and a transect across the Mediterranean Ridge. He reviewed alternative hypotheses for the origin of the ridge. Some workers have suggested it is actually an accretionary prism, forming in response to the collision of Africa, in which case the Hellenic trench may lie arcward from the outer structural high. This interpretation was new to most panel members. There may be evidence for arcward thrusting along the north of the ridge - a situation reminiscent of the inner deformation front on the Barbados Ridge. In any case, Blanchet recommended a multichannel site survey prior to any drilling, and it was suggested by some panelists that conventional HPC rather than ODP drilling could address the origin of the ridge.

After we reviewed the proposals for each of the potential legs for 111-113 with primary or partial tectonic objectives, we ranked candidates in the following way. Each of the ten voting members present awarded a leg, and individual targets within the leg, a score of 0-10, using 10 for the highest priority. Figures represented below are simply average scores; the spread is given in parentheses. For each leg, a short summary of the most important positive or negative aspects that surfaced in our discussion are included. These rankings were sent out by Telex to Honnorez on Wednesday, 12 September.

Recommendation to PCOM: rankings of potential legs 111-113 (Text of Telex)

- A. We ranked candidates for Legs 111-113 in the following way. Each of the ten voting members present awarded the leg, and individual targets within the leg, a score of 0-10, using 10 for highest priority. Proposal proponents did not vote for their proposals. Figures reported below are average scores:, the spread is given in parentheses.
1. Peru, 7.7(5-10 spread):, truncation, 7.8(5-10):, upper slope drilling, 7.4(2-10). Peru is our highest priority because it offers an excellent opportunity to determine the extent of subduction erosion through time:, effects of this subduction style on uplift/subsidence in the forearc, and the nature of the transition from accretionary prism to continental crust.
  2. Chile Triple Junction, 7.1(4-9):, modern collision area, 7.3(3-9):, older collision effects, 6.2(2-9):, pre-collision situation, 5.4(1-8). We consider this a very attractive opportunity to assess the effects of a subducting ridge, such as lower slope erosion, metamorphism, near trench magmatism, uplift and subsidence.
  3. Barbados South, 6.8(2-10). First priority in the group<sup>of</sup> targets is LAF-7 with 6.9(1-10), to assess rates of deformation, structural styles, and physical properties where a thick turbidite sequence is accreted:, next is LAF-4 and 5 with 6.4(1-10), to study possible out-of-sequence thrusts upslope. The remaining targets are not considered as important from a thematic standpoint: Grenada Basin 6.2(2-10):, inner deformation front 5.8(3-9):, outer structural high 4.4(1-7), Tobago Trough 4.5(1-8).
  - Equal 4. NW Africa 6.4(4-10):, Mazagan Plateau 5.7(2-9):, S-1 magnetic anomaly 6.1 (0.10). Venezuela Basin 6.4(2-10). <sup>Although the scientific problems at these 2 locations</sup> were appreciated, there was some concern about the amount of drilling time that would be required at this stage of the program.
  6. Ionian Sea, 4.2(1-9):, Mediterranean Ridge 4.4(1-10):, Malta Escarpment 4.3(2-8). Not favoured because of uncertainty as to whether shallow (HPC Capability) holes could really address the origin of the Mediterranean Ridge, and because drilling on the Malta Escarpment is of uncertain significance with regard to thematic problems in general.
  7. Costa Rica, 4.0(2-6):, upper slope basement drilling 5.1 (2-7):, test duplex model 2.5(0-7). Downgraded because of widely held suspicion that duplex model based on misconception on this margin, and because the margin is too similar to Guatemala, drilled on legs 67 and 84, to justify a new transect.
  8. Yucatan Basin, 2.8(0-7), we so not consider that the leg as planned addressed general thematic problems.
- B. Other Matters
1. Our panel strongly feels that drilling decisions should be based primarily on priorities established by thematic and regional panels, and we are concerned that site survey decisions may be arrived at prior to scientific decisions from thematic panels. We request clarification from PCOM on the sequence of events in decision-making procedures.

2. We recommend that a Sunda-Banda Arc working group be established because the region has a variety of important tectonic problems and cuts across the geographic boundaries of regional panels. We suggest the following members: Katili (Indonesian Representative), Karig (USA), Wanneson or Le Pichon (France), Jongsma (Netherlands), Barber (UK), Curray (USA), Meyer (ODP Liaison).
3. Regarding Tyrrhenean sea drilling, we award highest priority to sites 1B, 3 or 4, and 5. In our view, the most important problems to be addressed are the nature of pre-rift and syn-rift sediments, and the nature and age of the basement.
4. We do not consider that a December meeting is urgent. We anticipate can field any immediate problems by mail. If PCOM disagrees, we prefer the following options:
  - 1) East coast us, preferably Lamont so that we can review logging facilities.
  - 2) West Coast US (preferably San Francisco or Scripps-so that we have access to proponents after 15th March, when K. Hinz returns from sea, in Texas or at Scripps.
5. When do PCOM wish to see our IORP proposal ratings? Most of us only received the large batch of US proposals at the meeting and so could not consider them carefully, but we can if necessary use our new voting system by mail within the next few weeks.

#### V PANEL RECOMMENDATION CONCERNING SITE SURVEYS

During our meeting, we were informed that the proposals for site surveys in the region of the Chile triple junction had not been funded. This is of obvious concern to our panel, because this proposal leg received our second highest voting. There seemed to be a general lack of understanding on the part of panel members about how decisions regarding site surveys are made, and we felt it is advisable to avoid situations where highly ranked drilling proposals run the risk of not being consummated because of the lack of a site survey.

#### Repeat for information from PCOM

We strongly feel that drilling decisions should be based primarily on priorities established by thematic and regional panels, and we are concerned that decisions on site surveys may be made prior to scientific decisions from these panels. We request clarification on the sequence of events in the decision making procedure.

#### IV REVIEW OF LEGS 101-110

Since we have discussed these legs exhaustively at earlier meetings, we quickly canvassed members to see if we needed to make any recommendations regarding tectonic objectives.

- A. Tyrrhenean Sea: Blanchet reminded us of the thematic importance of this leg, which will study a back-arc basin in a rifting phase. We agreed with him that the most important objectives are to sample pre-rift and syn-rift sediments and to determine the nature and age of basement.

Recommendation to PCOM

We consider sites 1B, 3 or 4, and 5 to<sup>be</sup> the highest - priority sites for this leg.

- B. Stress measurements in Norwegian Sea. We discussed a proposal by Stephanson<sup>5</sup> to attempt in-situ borehole measurements in the Norwegian Sea. Hinz questioned the need to attempt these on the Iceland-Faroe ridge. Marsh noted probable technical problems with the hose required for generating high borehole pressure, and Becker felt that the experiment could be tried instead with a drill-string packer. We concluded that we could not recommend including this proposed experiment on the Norwegian Sea leg at this time.
- C. Gulf of California proposal  
Becker briefly presented a proposal from Scypps dated August 1984. It includes three objectives: a transect across the mouth of the Gulf, longitudinal transect, and hydrothermal studies. Becker said that it was partly intended as a fall-back in case of drilling problems on other eastern Pacific lithosphere legs scheduled for 111-113. We decided to postpone any discussion until we more fully consider Pacific proposals scheduled later in the decade.

VII REVIEW OF INDIAN OCEAN PROPOSALS

- A. Somali Basin region. Ewing reviewed proposals by Coffin for drilling in the region. A consensus suggested the view of Ewing and Hinz that although there are good problems in the area, the proposals are too vague and incompletely documented to allow us to make scientific judgement on actual drilling objectives. Similar criticisms leveled at a proposal for drilling on the Davie fracture zone. In view of the views above and Weissel's comment that drilling in this region is not essential for solving major problems on the history of the Indian Ocean, the panel cannot encourage further development of proposals in this area.
- B. Sunda and Banda Arcs. Van Hinte gave an overview of the tectonics of the Sunda and Banda arcs. He summarized a brief proposal by Huchon on drilling to document extension in the Sunda Straits in response to changing relative motion along the arc. Other brief proposals by Karig and Moore would document the effects of along-strike variation in relative motion (convergence) from Sumatra to Java. A consensus emerged that these are excellent tectonic objectives in this region, and we want to encourage the development of these and other proposals.
- C. Andaman Sea. Blanchet reviewed a proposal by Pelitzer et al. This back-arc basin is opening, and there are major transform faults connecting spreading segments because of the highly oblique convergence along this part of the Sunda system. An interesting alternative hypothesis is that strike-slip in the Andaman-Sunda region is accommodating the "extrusion" of part of SE Asia in response to the collision of India. Blanchet suggested that drilling could help to document the timing of the opening of the Andaman Sea and hence aid in evaluation of these hypotheses.
- D. Australian margins. Weissel reviewed the two-stage evolution (early rifting and major subsidence, post-rifting break-up) of the Australian passive margins. A proposal by Mutter and Cande would test the origin of the magnetic quiet zone. There are two hypotheses for the origin of this

zone, which almost certainly has a heterogeneous crust: 1) it may have formed during the Cretaceous long-normal interval, or 2) it may be due to complex stretching and rifting of continental crust at slow spreading rates at this preliminary stage. We were concerned about how 1 hole can test the origin of this heterogeneous zone; more dredging and dating could address the problem.

#### Recommendation to PCOM

We are very interested in tectonic problems along the Sunda-Banda arc. Since the region has a number of topical tectonic problems and cuts across the boundaries of regional panels, we suggest that a working group be formed to direct the preparation of proposals. Possible members: Katili (Indonesian government representative); Karig (USA), Wanneson or Le Pichon (France), Jongsma (Netherlands), Barber (UK), Curray (USA), Meyer (OMD liaison).

#### VII. OTHER BUSINESS

1. Leggett asked whether we should use our 0-10 ranking system to prioritize our comprehensive list of thematic objectives for public distribution. The consensus is that we should not, because we run the unfortunate risk of influencing the kinds of proposals that could be omitted for our consideration. Some very worthy objectives not in the "top ten" might not be formally proposed.
2. Options regarding our next meeting: 1) No meeting before next PCOM meeting (December) if there is not enough new business; 2) East coast USA, preferably Lamont so we can be briefed on logging procedure; 3) West Coast USA at San Francisco or Scripps, after AGU meeting so we can have access to proponents at AGU and/or Indian Ocean Regional Panel meeting.

Meeting adjourned at 11.30 am, 12 September.