JOIDES TECTONICS PANEL MEETING

26-28 September 1989

Hawaii Institute for Geophysics
Honolulu, Hawaii

DRAFT MINUTES

Members:

I. Dalziel (Chairman), University of Texas
J. Bourgois, Université Pierre et Marie Curie
R. Buck, Lamont-Doherty Geological Observatory
D. Davis, S.U.N.Y., Stony Brook
D. Engebretson, Western Washington University
K. Klitgord, U.S.G.S., Woods Hole
E. Moores, University of California, Davis
Y. Ogawa, Kyushu University
R. Riddihough, Geological Survey of Canada
D. Sawyer, Rice University
T. Watts, Lamont-Doherty Geological Observatory
G. Westbrook, University of Birmingham
(Absent — M. Purdy, Woods Hole Oceanographic Inst.
K. Hinz, Bundesanstalt fur Geowissenschaften und Rohstoffa)

Liaisons:

S. Driess (SGPP), University of California, Santa Cruz
C. Mevel (LITHP), Université Pierre et Marie Curie
R. Moberly (PCOM), Hawaii Institute of Geophysics

JOIDES Planning Office:

P. Cooper
L. D'Ozouville

Tuesday Morning, September 26, 1989

1. Chairman Dalziel welcomed new members and liaisons.

2. Ralph Moberly welcomed TECP members and liaisons to Honolulu.

3. The Minutes of the Hannover, F.R.G. meeting (March 1989) were accepted.

4. Chairman Dalziel announced that the TECP White Paper is now in press and should be published in the JOIDES Journal in October 1989.

5. Report of PCOM Liaison (R. Moberly)

- TECP should submit priorities for FY 1991 program to the JOIDES Planning Office for consideration by PCOM at the JOIDES Annual Meeting to be held in late November 1989 at Woods Hole Oceanographic Institution.

- By its late winter meeting TECP should have priorities selected for a four-year plan to be decided on at the PCOM spring meeting.

- There will be a CEPAC DPG meeting in mid-November 1989 (November 16-17 at Lamont-Doherty Geological Observatory. Results from surveys now being conducted will be available for consideration of Cascadia margin drilling.

- There was a lengthy discussion of western Pacific drilling including Old Pacific Crust, Geochemical Reference Holes and Nankai with much emphasis on the status of downhole measurements for Nankai leg or legs. Considerable concern was expressed as to the value of Nankai drilling in the absence of suitable downhole instrumentation.

6. Report of SGPP Liaison (S. Driess).

- SGPP has prepared a White Paper.

- SGPP has rated sedimented ridges and the Oregon margin as top priorities for drilling.

- In response to a question about SGPP's rating of the Cascadia margin as a whole, Liaison Driess stated that the Oregon margin was rated particularly highly because a lot of work had been done there and the proposal specifically addressed geochemical themes. The Vancouver margin, on the other hand, did not go to the top because there was little new information (in thematic terms) and less geochemical emphasis.

- In response to a question about the Chile Rise Triple Junction, Liaison Driess indicated that this program did not get a top rating from SGPP because fluid flow was not specifically written in to the proposal and no submersible work was in sight. Also, the problem was regarded as a more complex case than a simple convergent margin.

7. Report of LITHP Liaison (R. Buck)

- Considerable LITHP concern was reported over the dropping of Geochemical Reference Holes. The Panel was also reported to be unhappy about the downplaying of a basement hole on the Ontong-Java Plateau.

- Liaison Buck also reported on LITHP voting on a long list of drilling priorities and discussed aspects of high temperature drilling in oceanic lithosphere that are of concern to LITHP.

- Chairman Dalziel reported that he has been in touch with LITHP Chairman R. Batiza concerning a plan for an overlapping TECP-LITHP meeting in the late winter.

Tuesday Afternoon, September 26, 1989 and Wednesday, September 27, 1989

8. Proposal review

   • The following material was made available to the TECP:

   - New data on Oregon margin (Proposal 271E (Rev.); Kulm)
   - Report on stress determinations (Moos and Zoback)
   - Response by M. Purdy to LITHP questions on Hawaiian geophysical experiment
   - Sedimented ridge crests prospectus
   - Preliminary Australian proposals for conjugate margin, lithosphere extension, and magma genesis drilling
   - Proposal 271E (Neogene upwelling, California current)
   - Proposal 355A for drilling gas hydrates (not yet circulated by JOIDES)

9. Proposals of interest to TECP were reviewed in detail. The decision reached by TECP is recorded below. Review forms will be written up in more detail and returned to the JOIDES Planning Office for distribution to the proponents.

203/E	Cretaceous Guyots in the New Pacific
335/E (202/E Rev.)	Drowned Atolls of the Marshall Islands

While some of the goals of these proposals are of considerable interest to TECP, concern was expressed that the tectonic "signal" expressed in the stratigraphy will be ambiguous. This is because different factors (e.g., vertical tectonic motions and eustasy) may have influenced sedimentation. TECP recommends combining these two proposals into a one leg drilling program since the general goals are the same and the atolls and guyots appear to have originated in the same general area of the Pacific.

319/E	Proposal to Drill an Extinct Hydrothermal System
321/E	Drilling a Fast-spreading Mid-Ocean Ridge Crest
325/E	Proposal to Drill a High-temperature Hydrothermal Site
331/A	"Zero-age" Drilling on an Extinct Spreading Axis

TECP has considerable interest in the tectonic evolution of spreading ridges. It is not clear, however, that these proposals address the tectonic issues. Recent work on hydrothermal systems in ophiolites (e.g., Troodos) strongly suggests that a three-step process is involved in development and localization of hydrothermal deposits: 1) formation of an oceanic crustal section, 2) faulting and fracturing giving rise to brecciated fault zones that form the plumbing system of the hydrothermal system, and 3) re-intrusion into the fractured oceanic crust to provide the heat source that drives the hydrothermal system. The geometry of the fault-breccia zones thus exerts strong control upon the localization of hydrothermal vents.

Revised proposals that present images (GLORIA or SEAMARC) of all faults and fractures in the area(s) of the hydrothermal vent(s) and that address the question of their possible fault or fracture control would be more within the thematic interest of TECP. The proposals might address the three-dimensional geometry and temporal evolution of fault systems.

320/A To Drill in the Nordic Seas
336/A Arctic to North Atlantic Gateways

TECP has no great interest in these proposals although they do address some minor tectonic objectives. Tectonic targets could be incorporated into the drilling plans, for example the tectonic evolution of the complex topography, evolution of transform margins, etc. This would, however, considerably alter the original thrust of the proposals.

322/E Ontong-Java Plateau - Pipelike Structures

TECP has little interest in this proposal. It does not address a high priority theme.

323/E Neogene Evolution, Etc. in the Alboran Sea

The plate boundary deformation and orogenic processes discussed in the proposal are of interest to TECP. It is not clear, however, how the proposed drill sites will elucidate these processes. The proposal needs to be revised before it can be supported by TECP.

324/A Malta Escarpment

This proposal was judged to be mainly of local (i.e., Mediterranean) interest, although a "limited" tectonic theme concerning rifting of continental margins and distinction of Alpine/Tethyan models was recognized. Hence the proposal was not judged to address "high-priority thematic objectives."

326/A Continental Margin of Morocco/NW Africa

The proposal was judged by TECP to be of secondary interest if judged to be of high priority by another panel. The tectonic interest is largely of a regional nature in the absence of process-oriented goals related to transform margin development.

327/A Argentine Continental Rise

This is one of a suite of proposals to address problems of drilling on volcanic margins and was discussed in that context. 327/A certainly addresses TECP thematic objectives, but has major deficiencies. For example, penetration of 1900 m of sediments before reaching the seaward-dipping reflector sequence (SDR) may be unrealistic. Also, it is doubtful that penetration of 350 m of the SDR will add anything to the knowledge gained from drilling on the Voring Plateau. The proposal suggests (with similar proposals for drilling on the East Greenland margin) the need for an *ad hoc* group to formulate a drilling program for volcanic margins.

328/A Continental Margin of East Greenland

Again the proposal is addressing TECP thematic objectives. The proposal does not, however, indicate how the proposed drilling would discriminate between models of formation of SDR's. The question arises once more of where is the best location for SDR drilling.

330/A Mediterranean Ridge

The proposal addresses TECP themes with considerable deficiencies. The Panel believes that the overall tectonic architecture and context of the Mediterranean Ridge is not sufficiently clear to justify the proposed drilling. Lack of deep seismic data confirming the current interpretation of the ridge is particularly critical. The proponents need to justify drilling the Mediterranean Ridge in the context of other accretionary prisms of the world.

333/A A Drilling Transect Across the Cayman Trough

TECP has strong interest in the proposed objectives of:

(1) constraining the kinematics of Caribbean plate motion;
(2) drilling structures at a singular (cold) ridge crest;
(3) looking at "pull-apart" basin evolution; and
(4) determining the stress field associated with transform faulting.

Nevertheless it was felt that aeromagnetic, MCS and seismic refraction data are needed for thorough evaluation of this proposal. It is well organized and cogent and TECP would be eager to review it again when additional data are available.

334/A The Galicia Margin

TECP feels that drilling to and through the S-reflector is a very high priority thematic objective for rifted margins. The Panel looks forward to strong evidence correlating the S-reflector where it is proposed for drilling in 334/A with S further south where it is better known. TECP believes it is critical to have high-quality refraction data to Moho available before new drilling is planned. TECP would also like to see arguments as to why the Galicia margin is better than that of Armorica for S-reflector drilling. TECP is skeptical about the importance of peridotite drilling.

340/B North Australian Foreland Basins

TECP has major concern as to whether the proposed drilling belongs in the ODP or industrial realms. The panel was also skeptical that single holes would supply the required information and whether the problem is of local Australian or general concern. TECP did not see how the proposed drilling program would distinguish between different models. Hence the proposal was viewed as addressing thematic objectives but with serious deficiencies.

342/A Barbados Accretionary Prism

High priority TECP themes are addressed with excellent survey data. TECP would like to review a revised version of the proposal that is more explicit about the relationships between the various components and explains more fully the choice of individual sites.

343/A Drilling a Caribbean "Window"

The tectonic history of the Caribbean plate and its interaction with adjacent major plates is of thematic interest to TECP. The proposal does not, however, adequately explain how it will address these objectives. It does not explain why the basement will be different from that penetrated at Site 151.

344/A Jurassic Quiet Zone

As presented, the proposal does not address high-priority thematic objectives. It could be resubmitted after M-series anomaly calibration in the "Old Pacific."

346/A Equatorial Atlantic Transform Margin

The evolution of transform margins is of major thematic interest to TECP. The area proposed does look like an excellent location for the pursuit of this objective. The panel would like to see additional data to justify the specific sites identified in the proposal.

349/A Clastic Apron of Gran Canaria

This proposal, although well thought out, is of only marginal interest to TECP. To gain major TECP interest it would have to address:

(1) response of the oceanic lithosphere to loading; and/or

(2) the relationship of early magmatic activity in the Canaries and tectonic changes caused by mid-Tertiary spreading center reorganization in the Atlantic Ocean.

350/E Gorda Deformation Zone

The internal deformation of plates is of interest to TECP. TECP has concern about the core-orientation technique proposal, the accuracy of the rotations that can be derived, and the ability of the results to distinguish between various deformation models. Similar observations have not always been diagnostic on land.

351/C Bransfield Trough

The proposal addresses numerous issues of thematic importance to TECP including the kinematics and dynamics of back-arc basin formation and the study of convergent margin processes in general. Major deficiencies include:

(1) additional MCS data are required before final site selection can proceed;

(2) there are inconsistencies in the "roll back" model and questions as to how drilling can resolve them;

(3) there is need to compare Bransfield with other back-arc basins (e.g., Ryuku); and

(4) the proposal was viewed by several panel members as being of only local significance. A stronger case needs to be made for its broader application and/or its uniqueness for quantifying tectonic processes.

Thursday, September 28, 1989

10. After up-dates on the Chile Triple Junction (G. Westbrook) and the Cascadia margin (G. Moore, H.I.G.), TECP voted on priorities for FY 91 drilling. The result was:

	Points
Chile Tripe Junction, Leg #1	39
Cascadia Margin, Leg #1	36
Chile Triple Junction, Leg #2	30
East Pacific Rise Bare Rock	27
Sedimented Ridge Crests, Leg #1	25
Cascadia Margin, Leg #2	21
Return to Site 509B	20
Sedimented Ridge Crests, Leg #2	12
North Pacific Neogene	11

The vote was preceded by a discussion leading to a consensus that spreading ridge proposals need to have tectonic input wherever possible and that a message be conveyed to proponents of proposals in hand that they will receive more support from TECP if they address problems such as fault control of mineralization and stress in the lithosphere.

11. TECP then addressed the issue of Oregon vs. Vancouver margin proposals for Cascadia and decided to have a postal vote in mid-November based on up-dated input from the proponents.

12. Robin Riddihough was elected as liaison to the CEPAC DPG meeting at Lamont-Doherty in mid-November 1989.

13. The following were proposed as replacements for "retiring" U.S. members of TECP:

T. Atwater (University California, Santa Barbara)
J.C. Moore (University of California, Santa Cruz)
G. Moore (Hawaii Institute for Geophysics)
E. Silver (University of California, Santa Cruz)
R. Detrick (University of Rhode Island)
M. Zoback (Stanford University)
J. Karson (Duke University)
R. Speed (Northwestern University)

The Chairman is to communicate the names of these scientists and the number of votes they received to PCOM.

14. A. Watts presented an up-date on the drilling proposed for the Hawaiian flexural moat.

15. The next TECP meeting will be held overlapping that of LITHP in New Orleans, Louisiana, the week of March 5, 1990 (subject to coordination with LITHP Chairman R. Batiza and approval of PCOM).

16. Finally TECP considered PCOM's request for a prioritization of drilling programs for the four years following FY 1991. This prioritization has been requested for consideration with those of the other thematic panels by the PCOM meeting in the northern spring of 1990. It must therefore be completed by the TECP late winter meeting early in 1990.

    Reviewing TECP's Long-Range Planning Document/White Paper, and comparing likely drilling through FY 1991 with goals through 1995 led to the following analysis that is set out by TECP themes:

    • CONVERGENT MARGINS

    - Likely Drilling Through FY 1991

      Nankai (1 leg) — Accretionary Prisms
      Cascadia (1 leg) — Accretionary Prisms
      Vanuatu (1 leg) — Collision Processes

    - Needed Through 1995

      Three more legs on accretionary prisms

    - Action Required

      TECP agreed to reinstate its earlier request to PCOM for establishment of an *ad hoc* group (?Working Group) to address strategy for drilling accretionary prisms in the medium- to long-term.

    • INTRAPLATE DEFORMATION

    - Likely Drilling Through FY 1991

      ?Hawaii (1 leg)

    - Needed Through 1995

      One additional leg — no program yet

    - Action Required

      A. Watts to consider this matter and foster a suitable program(s).

- DIVERGENT PLATE BOUNDARIES

  - Likely Drilling Through FY 1991

    East Pacific Rise etc., requiring liaison with LITHP and proponents for enhanced tectonic input.

  - Needed Through 1995

    Three legs on rifted continental margins (including transform margins)

  - Action Required

    Consideration of existing proposals and fostering of additional options led by:

    D. Sawyer (non-volcanic margins)
    H. C. Larsen (volcanic margins)
    K. Klitgord (transform margins)

    In addition TECP is to recommend to PCOM that an *ad hoc* group (?Working Group) be established to formulate a reasonable plan for drilling volcanic margins for existing and future proposals. This group should, TECP believes, convene a workshop (seeking support from USSAC and equivalent non-U.S. bodies) on the whole scientific problem of magmatism associated with supercontinental break-up. The specific drilling plan could be formulated in the context of input from the entire community, terrestrial- and well as marine-oriented. TECP sees this move as an excellent way for ODP to reach outward beyond the ocean science community towards elucidation of a major earth science process by ocean drilling.

- PLATE KINEMATICS

  - Likely Drilling Through FY 1991

    Old Pacific (1 leg)

  - Needed Through 1995

    Three legs — no programs yet in sight

  - Action Required

    E. Engebretson to foster appropriate proposals in part through advertising.

- PLATE DYNAMICS

  - Likely Drilling Through 1991

    Installation of geophysical observatory off Oahu and stress determinations.

- Needed Through 1995

  Three legs devoted to stress determinations to determine drilling forces, dynamics of transform faults and to install geophysical observatories; no proposals in hand.

- Action Required

  M. Purdy to foster appropriate proposals.