

JOIDES TECTONICS PANEL  
MEETING, SEPTEMBER 24-26, 1992  
GRENADA SPAIN

EXECUTIVE SUMMARY

1. TECP notes with considerable approval the recent progress in devising a structural data sheet for onboard use. We hope to see this in use as soon as possible, and we look forward to further progress in transferring to a database package with spreadsheet and graphic capabilities.
2. TECP is concerned about the reliability of the PCS system in use on-board the JOIDES Resolution. Because of the importance of the PCS to TECP objectives, we recommend that appropriate engineering efforts be made to reduce the complexity of the design and to enhance the reliability of use. Alternatively, adequate training of ODP marine technicians in the use of the PCS could improve results from its deployment.
3. TECP consensus was that for now liaison with other large projects should be part of watchdog responsibilities.
4. TECP recognizes the need to internationalize sample collections, but cautions that the number of repositories should be kept at a minimum. Perhaps the U.S. repositories could be consolidated into one, to which one might add one in Europe and one in Japan-Australia.
5. TECP consensus was that the testing requirements for high-temperature borehole instrumentation should not be waived. Many on-land testing possibilities exist, such as at Los Alamos, Cajon Pass, or KTB. The matter should be referred back to DMP.
6. TECP views the Final Report of the Offset Drilling Working Group as a good summary of the major issues, which has been beneficial in focusing attention on new and exciting themes of ocean drilling. TECP looks forward to reviewing proposals for drilling that will shed light on the tectonic, igneous, and metamorphic processes associated with the creation of oceanic lithosphere and major exposures of deep crustal and upper mantle rocks.
7. TECP views the Report of the Sea Level Working Group as a comprehensive report with a clearly defined statement of the importance of the subject. The report is weak on the integral relationship between epirogenic movements, eustatic sea level changes, mantle dynamics, and Earth-axis instabilities.
8. Watchdog reports included: Transform margins-Alastair Robertson; Plate history, sea-level change, magnetic questions-Tanya Atwater and Steve Cande; Mid-ocean ridges-Jeff Karson, Marginal basins-Ken Tamaki, Convergent margins-Jan Behrman, Collisional margins-Phil Symonds, Stress and mid-plate deformation-Mark Zoback, Rifted margins, including NARM DPG-Phil Symonds. TECP watchdogs now include Paleostress and deformation mechanisms-Sue Agar, Collisional margins-Carlo Doglioni. Other changes are pending.
9. TECP thinks it would have been extremely useful to have had a DMP Liaison at the meeting or someone from ODP drilling that could have addressed issues of the status of the PCS, CORK, use of FMS in high-resistivity basement rock, and the hi-temperature tools planned for hole 504B.

## 10. NARM DPG-

A. In view of the prospect that the three priority sites on the Iberian Abyssal Plain will not be completed in 1993, TECP recommends that the second leg of NARM non-volcanic drilling in 1994 or later continue with the Iberian priorities, to include Galicia, if possible (as in NARM DPG).

B. In the second leg of NARM volcanic drilling, TECP wishes to see the 63° N transect of sites completed before beginning other transects

## 11. FY 1994 RANKINGS:

RANK	LEG	SCORE
1.	323 Rev 2 Alboran Sea	8.41
2.	330 Rev Mediterranean Ridge Phase 1	7.45
3.	369 Rev 2 MARK area	6.64
4.	376 Rev 3 Ivory Coast-Ghana transform margin	6.5
5.	NARM Non volcanic leg 2: Finish Iberian shallow hole transect and drill Gal 1.	6.42
6.	NARM Volcanic leg 2: Finish east Greenland 63°N transect	6.33
7.	376 Rev 2 Vema Transform	4.58
8.	334 Rev 2 Galicia margin S reflector	3.42
9.	NARM Non volcanic leg 3: Newfoundland basin	3.33
10	414 Rev N. Barbados accretionary prism	2.91

## 11. Nominations for new Panel Members:

To replace Tanya Atwater: Richard Gordon, Richard Pindell, Paul Mann

To replace J. Casey Moore: Greg Moore, Steve Lewis, Mark Cloos

## 12. Next meeting: Durham N.C. early March, or Davis, CA, late March/early April.

**JOIDES TECTONICS PANEL MEETING  
SEPTEMBER 24-26, 1992  
GRENADA, SPAIN**

- PRESENT:** Eldridge Moores, UCD, Chair  
Sue Agar, Northwestern  
Tanya Atwater, UCSB  
Jan Behrmann, Germany  
Jacques Bourgois, France  
Steve Cande, UCSD  
Carlo Doglioni, ECOD (Italy)  
Jeffrey Karson, Duke U.  
Alastair Robertson, UK  
Phil Symonds, Australia/Canada  
Ken Tamaki, Japan (alternate for Yujiro Ogawa)  
Mark Zoback, Stanford
- LIAISONS** Mathilde Cannat, LITHP  
John Firth, ODP/TAMU  
Hans-Christian Larsen, Brian Lewis, PCOM  
Charles Paull, SGPP
- HOST** Maria Comas, Universidad de Grenada
- APOLOGIES** J. Casey Moore, UCSC  
Alexander Peyve, Russia  
Uri Ten Brink, USGS, Woods Hole
- AGENDA** Welcome and Introductions  
Report of Liaisons  
    PCOM-Hans-Christian Larsen  
    ODP/TAMU-John Firth  
    SGPP-Alastair Robertson, Charles Paull  
    LITHP-Jeff Karson, Mathilde Cannat  
Report of ECOD Meeting--Moores/Larsen  
Discussion of Austin memo of 18 August  
Leg 141 Chile Triple Junction results and future  
Discussion and evaluation of Offset Drilling Working Group Report  
Discussion and evaluation of Sea Level Working Group Report  
Ranking of New Proposals  
Reports of Watchdogs  
    Transform margins-Alastair Robertson  
    Plate history, sea level changes, magnetic questions-Tanya  
    Atwater, Steve Cande  
    Marginal Basins-Ken Tamaki for Yujiro Ogawa  
    Convergent margins-Jan Behrman  
    Stress and mid-plate deformation-Mark Zoback  
    Mid-Ocean ridges-Jeff Karson  
    Rifted margins, including North Atlantic DPG-Phil  
    Symonds  
    Collisional margins-Phil Symonds  
Atlantic Prospectus discussion and rankings  
Development of RFP's(?)  
Panel Membership

Next Meeting  
Other?

## INTRODUCTION

The meeting opened with self-introductions. On a motion by Phil Symonds, the Panel formally thanked Maria Comas, official host for arranging the meeting and the field trip along the Betic Cordillera.

## LIAISON REPORTS

**PCOM**-Brian Lewis reviewed the PCOM deliberations leading up to the 1994 Prospectus. He also announced that the science advisory structure of ODP was undergoing review, and that a member of the review panel probably would attend the next TECP meeting. Hans-Christian Larsen reported that the program had been renewed for ten years, with partners re-joining for five. OPCOM money has evaporated with the departure of the Russians. The JOIDES office will be internationalized starting in 1994. The Dürbaum committee will review science advisory structure in 1994. The DCS engineering leg was a big failure. The Data Handling Working Group has found that the on-board computer is inadequate. Shipboard data entry is down because people have given up. The proposed renewal of the ODIN (Ocean Drilling INFORMATION Network) will cost US\$2.3. Leg 146 will spend one day in the Santa Barbara Basin. A new VSP will be deployed in hole 504B on Leg 148. A long discussion was held on Leg 149, which reversed an early decision to make its focus the deep Iberian hole, rather than the transect. Thus Leg 149 is back to the transect, but Co-Chiefs have been instructed to deepen basement penetration, which will probably make it impossible to finish the transect in one leg (see NARM DPG discussion below). EXCOM expressed the need to improve PR and raise more money, possibly from industry or attraction of new partners. Possible new partners might include Taiwan, Korea, South Africa, new European members. Improvements in educational links are possible. There is a need to focus and direct effort on superthemes. Maybe this is a task of the thematic panels, but the proposal-driven nature of the project needs to be preserved. Efforts are underway to connect ODP with Internet.

**ODP/TAMU**-John Firth reported that ODP has received a 10-year renewal with a review after 5 years. Most non-U.S. participants have signed on or are doing so. on recent legs. Recent legs: Leg 143: Drilling included 800 m on Allison guyot, 1400 m on Resolution guyot. Resolution is more complex than Allison, including an Aptian-Albian hiatus. Recovery was low. Leg 144: Drilling in the Marshall Islands revealed a Cenozoic early Cretaceous hiatus. Hole 801C was logged. MIT Guyot drilling was into a karst surface on Aptian-Albian limestone, with a interbedded volcanic-limestone sequence near bottom. Leg 145 drilling included 2 deep sites on Detroit Seamounts, including 400 m of basement. The APC drilling was very successful. Staffing is complete on legs 146 and 147, and 90% complete on Legs 148, 149, 150. DCS problems resulted from bent secondary compensation cylinder, but with savings from ice boat and other funds, DCS can keep on schedule, and should be ready again for Leg 155. The revamp of the information network will go out to bid, rather than be done in house. Bob Musgrave has devised a structural geology data sheet for ship (barrel sheet form) (see below. It is now on EXCEL, but will eventually be transferred to a database package (4D type). It will have both spreadsheet and graphic capabilities.

Moores reported the following communication from Bob Musgrave: "Following the last TECP meeting, I spoke with John Coyne, the head of the ODP database group. John was keen on the concept of both the standardization of "prime data" structural VCD forms (to have the same status as lithostratigraphic VCD forms--*i.e.* not compulsory, but to be

archived as prime data when they are collected) and the recording of observations on an Excell-type spreadsheet, eventually to have direct translation from the spreadsheet into the computer database. John suggested I follow up by raising the issue with Ian Gibson (Chair IHP), with the aim of getting an IHP directive. Ian is interested and has also discussed my suggestions with Kate Moran (Chair DMP). We will be awaiting IHP response at its meeting (9-11 September). Further progress with TAMU is on hold, because of the close spacing of my two legs (141 and 146), a staff shortage within the database group, and the pending reorganization in the next few months of the database group with creation of the new Department of Information services. Tom Janacek will be the Manager of the new Department--as he won't be back until after Leg 145 (he is the staff scientist on that leg), and as it will take a few months to settle the new Department in, I think that it's unlikely that there will be much progress on the structural data handling before November or December. In the meantime we will be using the "Leg 141" structural forms on Leg 146, and I'll be soliciting feedback from the structural geologists on board and the database people at TAMU...."

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SGPP-Charles Paull reported that there was strong commitment to the pressure core sampler (PCS), to a gas hydrate leg, even though . Jan Behrman reported that on Leg 141 the PCS system did not work well. Although good fluid samples were obtained, it was difficult to maintain pressure, and no full-pressure measurements were obtained. The system appears to be too complex to function well.

**TECP is concerned about the reliability of the PCS system in use on-board the IOIDES Resolution. Because of the importance of the PCS to TECP objectives, we recommend that appropriate engineering efforts be made to reduce the complexity of the design and to enhance the reliability of use. Alternatively, adequate training of ODP marine technicians in the use of the PCS could improve results from its deployment.**

LITHP Mathilde Cannat reported that at the LITHP meeting, news about the DCS near failure during Leg 142 and about the unlikelyhood of this tool being ready for further testing during Leg 148, had led LITHP to recommend a return to 504B during Leg 148. LITHP, nevertheless, strongly supported continuation of development of the DCS system. Leg 142's disappointing results also influenced the ranking of proposals, as TAG dropped from 1st to 4th owing to the lack of a tool to drill into young basalt in the near future. Another change in ranking concerned the NARM volcanic margins, which dropped from 4th to 9th as a consequence of the Panel's decision to rank offset drilling proposals individually, rather than combine them into an Offset Drilling First Leg. LITHP has chosen to name watchdogs for individual proposals, rather than for themes as has TECP. Finally, LITHP stated its interest in seeing proposals to drill in the Red Sea.

LITHP is updating its White Paper at the next meeting. TECP will send the following letter to LITHP offering assistance in adding structural considerations, as appropriate, to its revised White Paper:

*To LITHP*

*From: TECP*

*Subject: Tectonics input for LITHP White Paper.*

*In light of the intimate linkage between magmatic, hydrothermal, and tectonic processes in the creation and modification of oceanic lithosphere, TECP offers its assistance in integrating a structural and tectonic perspective into the upcoming revision of the LITHP White Paper. To this end, TECP will forward to you copies of statements relevant to oceanic lithosphere tectonics that appear in the Tectonics White Paper and other documents. TECP liaison (Jeff Karson) will be happy to discuss these documents with you and to help review relevant parts of drafts of the LITHP White Paper. We look forward to continuing to develop a strong joint effort (begun in our joint meeting in Cyprus, October 1991) to investigate oceanic lithosphere through drilling.*

**OHP** TECP has no liaison at present. Tanya Atwater is our liaison to Spring meetings, Alastair Robertson to Fall meetings.

**TEDCOM** TECP has no liaison at present. Dale Sawyer has volunteered to attend the upcoming meeting for us. Mark Zoback has agreed to serve as liaison for meetings in the U.S. An European liaison is pending.

#### **AUSTIN MEMO OF 18 AUGUST**

1. Liaison with other large projects. Although it is essential, there is a danger of overlinkage, and it should not interfere with proposal-driven nature of ODP. There may be other groups. Mark Zoback reported that there will be a "Continental COSOD" in Potsdam in August 30-Sept. 2, 1993, with themes: basin evolution, volcanism, geothermal activity, climate change, faulting, metallogenesis, continental lithosphere evolution, continental margins, fluids, impacts and extinctions, subterranean; bacteria. Ken Tamaki reported on INTERIDGE activities--southern ocean ridges, macroscale processes, and natural seafloor laboratories. As INTERIDGE is only beginning activity, it is too early to establish formal liaisons. It would be more appropriate in one to two years. Brian Lewis suggested that such groups will automatically generate drilling proposals. Moores mentioned the possibility of on land-ODP cooperative arrangements, looking at areas such as arc-forearc regions, oceanic islands, etc. TECP consensus was that for now liaison with other groups should be part of watchdog responsibilities.

2. Core repository. Alastair Robertson said there was strong feeling that the repositories should be internationalized and place both within and outside of U.S. Charles Paull stated that the three places already are too many, making it difficult to do cross-studies, and leading to over-sampling. In general TECP recognizes the need to internationalize collections, but cautions that the number of repositories should be kept at a minimum. Perhaps the U.S. repositories could be consolidated into one, to which one might add one in Europe and one in Japan-Australia.

3. High-temperature borehole instrumentation. TECP consensus was that the testing requirements **should not** be waived. Many on-land testing possibilities exist, such as Los Alamos, Cajon Pass, or KTB. The matter should be referred back to DMP. Hole 504B is simply too valuable to jeopardize by premature deployment of an untested tool.

#### **CHILE TRIPLE JUNCTION**

Co-Chief Jan Behrmann presented a summary of results of Leg 141 drilling. Original objectives were: 1. the tectonics and hydrologic effects of spreading ridge subduction; 2, age and nature of Taitao Ridge, the fluid and gas discharge and their thermal signature, and 4. study gas hydrate stability by drilling through a BSR. Drillsites included 859, 860, and

861, a transect from forearc basin to mid slope to upper slope, 862 on Taitao ridge, and 863-atop the subducted spreading ridge. The transect revealed no sediment accretion but also no tectonic erosion. There has been no change in the accretionary prism since the late Pliocene. Thus about 150 km oceanic crust has been subducted without sedimentary accretion to the forearc. High temperature (40°C) fluids were obtained. Fluids in 861 had reacted with continental crust, 859 with oceanic crust. 862 on the northwest slope of Taitao ridge was drilled on a steep bare slope to a depth of about 100 m. Top of the Pliocene was reached at 24 m. depth. The lower part of the hole was in hydrothermally altered sediments with a continental provenance, basalts, and ochres. Deformation included normal faulting. Volcanic rocks were a bimodal suite, interpreted to be formed a lithospheric window setting in pre latest Pliocene time. Accomplishments: 1. Constrained temporal and spatial scales of accretion and erosion in the immediate vicinity of the collision zone, 2. Identified very strong hydrothermal flow in the accretionary prism. 3. Didn't penetrate and sample the continental basement. All objectives of the post-collisional rebuilding of the Chile accretionary margin remain to be addressed. The preliminary plan for a proposal for a second leg includes 1. Return to 861 to deepen to continental (?) basement. 2. More lower slope holes to give more constraints on fluid flow, 3. holes south of 863 to investigate the eroded forearc, and 4, the post-collisional transect in the Golfo de Piñas.

### **OFFSET DRILLING WORKING GROUP**

TECP reviewed and discussed the Final Report of the Offset Drilling Working Group (ODWG). The report is a good summary of the major issues related to the development of the middle to deep oceanic crust and upper mantle that may be addressed by drilling following (updating) the COSOD recommendations. The report has been especially beneficial in that it has helped focus the attention of the drilling community on new and exciting themes in ocean lithosphere drilling and in helping to encourage and improve revisions of existing proposals. In addition TECP hopes that the published report will attract additional proposals for drilling in short-listed areas and stimulate site surveys in these and other areas with exposures of plutonic rocks. TECP notes that tectonic processes related to seafloor spreading and the creation of oceanic lithosphere were considered. However, little attention was given to the structural and tectonic processes responsible for gabbro and serpentinized peridotite exposures away from spreading axes, *i.e.* fracture zone transverse ridges, propagating rifts, and other intra-oceanic exposures. TECP looks forward to reviewing proposals for drilling that will shed light on the igneous, metamorphic, and tectonic processes associated with the creation of oceanic lithosphere and major exposures of deep crustal and upper mantle rocks.

### **SEA LEVEL WORKING GROUP**

TECP reviewed and discussed the Final Report of the Sea Level Working Group. It is a comprehensive report with a clearly defined statement of the importance of the subject. There is considerable room for melding of sea-level drilling objectives and those of such areas as continental margin drilling. The report was weak on the integral relationship between epirogenic movements, eustatic sea level changes, mantle dynamics, and Earth axis instabilities. (See R. Sabadini, et al, 1991, "Glacial Isostasy, Sea Level and Mantle Rheology", Kluwer, and Gurnis, M., 1992, Long-term controls on eustatic and epirogenic motions by mantle convection, *GSA Today*, v. 2, # 7, p. 144 ff.).

### **RANKING OF NEW PROPOSALS**

Proposals were ranked and are reported in thematic clusters:

## Convergent and Collisional Margins

### 323 Rev 2 Tectonic evolution of an extensional marine basin in a collisional setting: the Alboran Sea

TECP was very pleased to see this proposal, which is a significant revision and integration of earlier proposals 323 Rev (Comas et al, 1991) and 399 (Watts et al, 1991). The proposal is now well presented, succinct, and well focused. It examines the collapse of collisional orogens resulting in extensional basins surrounded by arc-shaped orogenic belts--an important collision-related tectonic objective, as outlined in TECP's White Paper. The significance of this style of tectonism within the Mediterranean region is clear, as outlined within the proposal, but it is also of global significance. For example, tectonism of this type also in present within regions such as the Appalachian-Caledonide-Hercynian system, the Alps, the Carpathians, the Hellenides, the Himalaya, and in Indonesia.

The proponents have gone to considerable effort to collect an enviable variety of onshore and offshore data in the Alboran Sea region. TECP noted that SSP now feels that from a data-availability viewpoint, the Alboran Basin could be scheduled for drilling in FY 1994. The strength of the proposal lies in the integration of a wealth of information--onland geology, extensive commercial and academic marine seismic data, a deep (20 second record) seismic profile across the Betic Cordillera and Alboran Sea, commercial exploration wells near the coast, and a variety of multi-beam and sidescan bathymetric data. The Alboran Basin appears to be a good example of the tectonic style to be investigated and probably has the most extensive data set of any such feature. The proposed ODP drill sites are intended to fill critical gaps in knowledge, and to enhance interpretation of the above data.

Many of TECP's suggestions, criticisms, and comments with respect to the original proposals for the Alboran Sea have been considered in the preparation of the revised proposal. However, TECP feels that consideration of the following comments/questions will further improve and refine the proposal. Our remaining concerns mainly relate to aspects of some of the sites, as outlined below, and we urge the proponents to continue to search for even better sites, in order to optimize the chances of fully meeting drilling objectives.

1. Subsidence curves derived from existing commercial wells should give an indication of the extent to which drilling will constrain the subsidence history of the extensional basins, as well as the relationship between collision and extension.
2. TECP notes that the preparation of structure contour and isopach maps of the major mega-sequences in the Alboran Basin is currently underway.
3. Can or has basement been dredged on the scarps in the vicinity of sites AL3 and AL4, perhaps negating the need for basement penetration?
4. Are there any better sites equivalent to AL-1 and AL-4, at which the full "syn-rift" section could be penetrated, thus constraining the initiation of extension? Sites AL-1 and alternate AL-1A appear to require drilling through at least 3000 m of section to intersect the top of unit VI. These are very deep sites. Will AL-4 and AL-4A reach basement? It appears there could be substantial section below TD at both sites.



5. Check depth to TD at all sites. A quick calculation using RMS velocities above the seismic section suggests 3400 m of penetration may be required at AL-1 and about 1700 m at AL-2.
6. Can a backup plan to meet site AL-1 objectives be developed in case current choices do not meet technological or safety requirements?
7. Site AL-2A does not appear to be a simple alternate to basement site AL-2. At AL-2A location, what could be a volcanic pile or carbonate build-up appears to overlie basement.
8. Can estimates of drilling time be checked using information from commercial wells near the coast? Given time problems, TECP's priority is for "syn-rift" subsidence sites (particularly AL-1, 1A) and the basement characterization site (AL-2, 2A), rather than the post-extension deformation site (AL 3, 3A).

In conclusion, this proposal clearly attacks high-priority TECP objectives. Consideration of the above comments will further enhance the proposal.

TECP watchdog for this and other "collisional margins" proposals is now Dr. Carlo Doglioni.

Box checked: 5.

330 Rev Time-progressive continental collision: the Mediterranean Ridge Accretionary complex in the eastern Mediterranean (Phase I Shallow Drilling).

TECP found this proposal to be exciting and well-presented. It is vastly improved over the previous version--the proponents are to be congratulated. The background data base is quite complete and well-presented. We judge it to be ready to drill in 1994, and thus we included it in our deliberations for that year's drilling program. While the proposed program is of great local Mediterranean interest, it also addresses important global problems. The result from this small-basin, evaporate-inclusive, continent-dominated collision will help characterize the histories of many of the continental sutures of the Alpine-Himalayan and other orogenic belts. Thus the proposal has broad interest for the continental geological community. The Mediterranean ridge also has special interest for studies of accretionary processes, since it represents the high-pore-pressure, high-sediment-input, low-taper-angle endmember of the accretionary ridge spectrum. The proposed work encompasses more than can be drilled in one leg, so that the proponents will need to make some choices. TECP recommends the following order of priorities: 1. The Africa-Mediterranean; ridge collision: Katia transect; 2. One pre-collision transect, either the Sirte or the Ionian transect; and 3. the Eratosthenes-Cyprus transect. We note that the objectives of the Mediterranean sapropel proposal (391-Rev) could be partially met by piggy-backing on the sites in this proposal, and we urge collaboration to this end.

Box checked: 5.

386 Rev 2 California Margin Drilling

Much of this proposal is not clearly within the mandate of the Tectonics Panel. Tectonic objectives include: 1. the rate of deformation of the Gorda plate, an exciting prospect if it can be done; and 2. the rate of northward movement of the Mendocino triple junction, and 3. investigation of magnetic reversal events.

Box checked: 3.

#### 424 JOIDES proposal to "CORK" hole 395A

This proposal does not address high-priority objects of TECP. While water circulation into young ocean crust is of secondary interest, Hole 395A is not a good place to study this because of excessive perturbation of its natural hydrologic state. If the proponents think this is not so, they should present some simple models to support their case. This said, Hole 395A is an excellent place to continue CORK development, which is critical to a broad range of TECP and ODP objectives. The use of CORK technology on leg 139 demonstrates some obvious problems. For example, the thermistor data from holes 857D and 858G are extremely noisy (as presented in the Initial Reports Volume) and there is no discussion in this proposal about whether the source of the problem has been identified and rectified. Perhaps more troubling are the results from Hole 858G. While the authors of the report in the Leg 139 Initial Reports Volume argue that fluid is moving down a nearby exploratory hole, might there be a leak past the packer in the CORK? Also, are seal problems likely in potentially overpressured holes? TECP strongly recommends further CORK development. Hole 395A may be a good place to do it, but there are probably many other holes which are also suitable which may not possess the hydrologic uncertainties. We suggest an appropriate proposal be prepared along these lines. For further information contact Mark Zoback, TECP watchdog for this matter..

Box checked: 2

#### 400-Add Proposal to NSF: Fluid flow paths in the Costa Rica accretionary wedge

This is a proposal to NSF requesting funds for a site survey. It is geared at improving both the data base for ODP drilling, as well as the understanding of the structure and kinematics of the Costa Rica accretionary margin. TECP welcomes the effort, especially the re-processing and re-interpretation of the reflection seismic data. SeaMARC, ocean floor photography, and surface heat flow studies offer the possibility of identifying fluid discharge zones and establishing their structural control in conjunction with the seismic imaging of active fault zones.

Box checked: None.

#### 414-Rev Rates, effects, and episodicity of structural and fluid processes, northern Barbados ridge accretionary prism.

TECP recognizes the importance of measuring in situ fluid conditions in accretionary prisms. The acquisition of 3D seismic survey data makes the Barbados Accretionary Prism a particularly attractive place to carry out these experiments. Our main reservations are technological. The Panel continues to have concerns about how well the borehole seal technique will function. For example, the CORK pressure seal may not hold if the decollement is at approximately lithostatic pressure. We note that in hole NBR5 about one km of penetration is needed to reach the decollement. If the decollement is at approximately lithostatic pressure, the pressure below the CORK will be about 10 MPa (100 bars) higher than that above the CORK. In 11 3/4" casing, this results in an upward force of about 2 x 10<sup>5</sup> lbs (approx. 10<sup>4</sup> kg) Will hole NBR5 blow its CORK?

Box checked: 5.

#### 421 Alkali-Acidic rocks of the Volcano Trench

This is a proposal to drill "sub-aerially" formed mid-Jurassic alkali and acidic volcanics and volcanoclastics in the forearc next to an oceanic trench (the Bonin forearc). As it stands the proposal lacks a data package, and there is no model formulated that could be tested by drilling. We encourage the author to submit a more complete proposal for review. We recommend that the JOIDES office send the proponents copies of the Costa Rica and Barbados proposals (400, 414, 414-rev) as models for future submission.

Box checked: None

### **Rifted Margins**

#### **079 Rev Tethys and the birth of the Indian Ocean**

This proposal is interesting to TECP because of the possibility of constraining early breakup plate motion and the state of stress in the African plate east of the East African rift. However, the primary objectives of the proposal are not particularly relevant to TECP. The need to reach basement for dating of the magnetic anomalies is clear. If this is not possible, then our interest would be appreciably less.

Box checked: 3.

#### **086 Rev 2 A proposal for ODP drilling in the Red Sea**

This is an ambitious plan to study the petrological and tectonic aspects of the opening of a new ocean basin and the nature of the transition between oceanic and continental crust. The proposal is immature and will require substantial modifications and additions before it could be considered as a viable ODP target. The proposal clearly has the potential to become a multileg program and should be expanded to include a wider range of tectonic and petrological problems. The increased political stability of the Red Sea region makes it appropriate to encourage development of such a program. Preliminary site selection focuses on the axial zone, as well as the oceanic-continental crust and oceanic-continent mantle transitions. Most of the sites are poorly constrained and will benefit from the survey work planned for 1993. Some doubt exists about the interpretation of the nodal deeps in the transitional region. Are these really representative of initial emplacement geometries or could other interpretations such as transform fault-related structures be controlling the topography and basement exposures? Another question concerns the nature of the peridotites of Zabargad Island (site 3). Are these representative of the upper mantle in the ocean-continent transition, or are they part of a much older orogenic feature (such as a Neoproterozoic Pan-African ophiolite).

Although the proposal is in an early stage of development, TECP encourages the proponent to develop it into a mature proposal including other investigators to ensure that the required multi-leg program will address comprehensive world-class themes.

Box checked: 4.

#### **334 Rev 2 Galicia margin S Reflector**

This is an ambitious proposal to drill through the "Enigmatic Terrane" through the "S" reflector into basement. The proposal is for one site--1800 m drill hole in 4500 m water. The proponents make a plausible case that this is the best place to drill, and that S' really is a continuation of S further south. TECP has consistently been enthusiastic about this subject and is gratified to see that a possible feasible site has finally been found. It is an

expensive site, however, and the seismic imaging can be improved through further processing.

Box checked: 4 (9 votes); 5 (2 votes)

365 Add 2 Geothermal measurements along the Newfoundland and Iberia conjugate passive margin transects

This addendum emphasizes that the proposed heat flow measurements will be used in conjunction with other geological and geophysical data to constrain models for the evolution of passive margins. Using examples from the Galicia Bank and Goban Spur, the proponents have attempted to relate patterns of heat flow to "pure" or "simple" shear models for rifting. Given the scatter in the data, the uncertainties in the measurements, and the small differences in heat flow features that need to be distinguished, the existing data sets do little to distinguish between proposed models. The Panel was not convinced that collecting more heat flow data, even with improved resolution for crustal radiogenic heat production, would help to distinguish between these models, either. There is, however, a significant lack of well-constrained heat flow data for both the Newfoundland and Iberian Margins, and any comprehensive investigation of passive margin evolution should include these data. Borehole sample acquisition for estimating crustal radiogenic heat production will provide an important refinement to existing data. If the proponents' surveys proceed as planned in 1993, the fluid flow patterns and their relations to faults are clearly an important aspect of heat flow data interpretation and could link well with drilling. As the proponents indicate, the detailed heat flow measurements which need to be detected probably would require dedicated HPC and WSTP runs for the best possible results. At present, though, it seems as if only the RCB is planned and the proposed HPC and WSTP runs could add considerable time to drilling operations. Some reduction in this schedule for heat flow measurements may, therefore, be necessary.

The proponents have not specified what they consider to be an "adequate" supply of samples for crustal radiogenic heat production measurements. Given the destructive techniques involved, some clarification of sample numbers is needed.

Despite the expected inability of heat flow data to distinguish between different rifting models, an adequate heat flow data set should exist for these margins as a part of a comprehensive data base for detailed rifted margin studies.

Box checked: 5 (8 votes), 4 (3 votes)

### **Mid-oceanic ridges**

300 Rev Return to Site 735-B: The temporal and spatial variability of the lower crust at a very slow spreading ocean crust.

TECP recognizes the success of previous drilling efforts at Site 735-B and the contributions derived from post-cruise studies of the gabbroic material cored. This site is one of several in the oceanic crust that could warrant detailed studies to place the existing hole and core in a better constrained geologic context and to evaluate the compositional and fabric heterogeneity of mid-crustal rocks. The panel noted a number of ambiguities and deficiencies in the present proposal, as follows:

1. Lack of presentation of video camera data;

2. Lack of adequate description of gravity modeling which might shed light on crustal thickness at the drill site(s);
3. Lack of constraints on the consistency of the inferred crustal block-tilting along the proposed transect;
4. Inadequate employment of balanced cross-section analysis;
5. Lack of constraints on the dip of foliation and major shear zone in the hole with bears directly on the interpretation of the transverse ridge;
6. Lack of geophysical documentation of the site and placing that documentation in a geologic framework

In general the proposal is viewed as rather immature and in need of additional documentation. The proposal needs additional site survey information, including high-resolution imaging and submersible studies, as recommended by the Offset Drilling Working Group for such settings.

Box checked: 4

#### 361 Rev 2 Drilling an active hydrothermal system on a slow-spreading ridge: The TAG Hydrothermal system

The current proposal for shallow drilling of hydrothermal deposits and logging at the TAG area does not directly address TECP objectives. As previously noted, the high permeability of the crust at the hydrothermal outflow area is likely to be the result of faulting. However, the proponents have persisted in ignoring TECP's recommendations for the best possible geological or tectonic mapping of the area surrounding the vent sites. These recommendations are consistent with those embodied in the Offset Drilling Working Group Final Report (ODWGFR), as well. Such a map and a more in-depth discussion of the role of faulting in the TAG area could possibly attract more support from TECP, especially if couched in terms of the role of crustal fluids in faulting and the mechanical evolution of oceanic crust. If the proponents feel insecure with meeting this need, they might consider adding personnel with the appropriate qualifications to their team to make it into a truly world-class proposal with broad appeal.

An additional concern is that the drilling will irreversibly alter the permeability structure of the mound. If this type of mound is rare (or unique) on the Mid Atlantic Ridge, drilling may destroy its suitability for a "natural laboratory" as envisioned by the RIDGE program. Proponents should consider instrumentation and monitoring of the mound before and during drilling. TECP agrees with the proponents that because of the very thin sediment cover, surface-ship 3.5 kHz seismic data is unnecessary in the proposed study area. We reiterate our desire to support a proposal in this area that is adequately formulated and documented in geologic and tectonic terms, along the lines of the ODWGFR recommendations, as well as our previous comments.

Box checked: 3.

#### 369 Rev 2 Generation of oceanic lithosphere at slow spreading centers: drilling in the western wall of the MARK area

The proposal has been improved markedly over the previous version. In particular, a large amount of new site survey data has been obtained, the sites are better defined, and the drilling objectives are tied to tectonic models. TECP still has some concerns, however: 1. gravity and magnetic data over the sites are still not analyzed; we expect that there would be a major difference in the predicted gravity field between models one and two; 2. the peridotite block may be a diapir; and 3. it would be of considerable interest to us if one of the sites could be located on the hanging wall so that it would penetrate the master fault. However, we recognize that this latter desire is a risky proposition. Overall, TECP opines that this is a very well-surveyed site, with a well thought-out drilling plan, and it represents the best place known at present to examine questions related to the generation of lithosphere at slow-spreading centers.

Box checked: 5

#### 420 Evolution of oceanic crust

This proposal is a long and thorough coverage of the evolution of hydrothermal systems and seismic properties in the upper oceanic crust. It is not as comprehensive as the title suggests. Some panel members expressed concern about the location of the planned legs. Is the Clipperton fracture zone segment really the best place for such a study? Would segments further north, such as the Murray fracture zone, where magnetic anomaly patterns are found, be a better choice? It was felt that more justification for site selection was needed.

The structural evolution of the oceanic crust is discussed as an integral part of this project, but the significance of deformation in the evolving patterns of hydrothermal alteration and seismic velocities is not well-addressed. The proponents plan to drill through an abyssal hill-bounding fault in the upper 200-500 m. The chances of recovering any fault rock at these shallow depths may be minimal, and possibly more attention should be paid to the potential results from studies of pore-fluid pressure variations, stress and strain histories, and fluid flow histories in the hangingwall and footwall of such a fault. Little attention has been paid to interaction of fluid flow and deformation and their influence on strength variations which are important aspects of this study (e.g. it is surprising that discussions of fracture fill textures, reaction-softening mechanisms, subcritical fracturing were not incorporated. Perhaps the proponents did not feel that such detail was necessary at this stage.) Much background information is provided as supporting evidence for drilling strategies, but the details of how drilling will help to address specific problems in the selected area are unclear. For example, a discussion of how figure 6 would be tested is needed--otherwise why include it? The proposal is currently too generalized and reads as a series of wish lists.

When sufficient survey data are available for a well-justified site and the locations of faults are well-constrained, the proposed program promises to be an excellent study. It should promote an unusually detailed view of the spatial and temporal variations in the ocean crust.

Box checked: 4.

#### 425 Mid-Atlantic Ridge at 15°37' N: crust generation at a magma-poor mid-ocean ridge

TECP is very interested in the tectonic processes that lead to extensive exposures of plutonic mafic and ultramafic rocks along slow-spreading ridges. Exposures of such rocks on both the east and west sides of the median valley make this a particularly interesting area. We note that substantial site survey effort will be required to clearly define both

petrological and tectonic objectives. We look forward to considering a more mature proposal for drilling in this area.

Box checked: 4

### **Transform Margins**

346 Rev 3 Transform (translational) margin: the Ivory Coast-Ghana transform margin

TECP reaffirms once again its belief that the study of translational transform margins is of fundamental significance. The present proposal is apparently mature, and SSP was satisfied that required site survey data now exist. The proponents have now addressed TECP's requirement to produce a viable one-leg drilling program. While still strongly supporting the proposal, TECP raises the following comments and questions:

1. Drilling the deep Ivory Basin (site IG1) appears essential to constrain the rift history (currently not included).
2. Conversely, how important is it to drill 2 relatively deep holes into the marginal ridge (IG 2 bis, IG 5)? Could the objectives of these two holes be largely achieved by drilling one relatively deep marginal ridge site?
3. TECP was disappointed that the additional migrated MSC and details of other new data (e.g. submersible sampling) have not yet been fully incorporated into the revised proposal.
4. In the future TECP would like to see: a) overlays of seismic profiles to illustrate inferred structure; b) more discussion of the possible nature and tectonic evolution of the marginal ridge; c) discussion of sedimentation in relation to the rift-transform history.

Finally, the proponents should reconsider whether all the necessary expertise is available within the present group, or if additional proponents should be included and the project further internationalized. Other proposals have clearly benefitted from a similar approach.

Box checked: 5

376 Rev 2 Drilling at the Vema Fracture Zone in the Atlantic

This is a very well focussed proposal to drill three sites on a transform fault in the central Atlantic. The proposed holes are in peridotite, dike-gabbro transition, and the limestone cap on the transverse ridge. The new MCS data in the limestone cap make it a good eligible site in which to test the DCS system. The proposal is mature, ready to drill, and a reasonable offset drilling area. Some frustration was expressed that it was not clear from the proposal how drilling would eliminate any hypotheses for origin of the transverse ridge. Nevertheless the proposal addresses high-priority objectives of TECP.

Box checked: 5

419 Convergence of oceanic lithosphere--Azores-Gibraltar plate boundary

This proposal presents a good idea, but it is too immature and incomplete to be seriously considered at present. TECP notes that a substantial number of other studies (with submersibles and other instruments) have been performed across Gorrington bank, and the results of those studies must be integrated with the proponents' MCS data when it has been processed.

TECP is enthusiastic about the potential of the proposed program to acquire information concerning the Africa-Eurasia plate interaction in this relatively simple oceanic environment. In addition, this program promises information about the ophiolite emplacement process, in general, a world-class tectonic question. We look forward to receiving a more mature proposal on this subject.

Box checked: None  
**Caribbean Region**

314 Rev 2 The connection between the Pacific and Atlantic Oceans: the Venezuela basin and Aruba gap

TECP continues to be excited by the potential of the Aruba gap site, C 1, to reveal the early history of the Caribbean plate crust and, hopefully, to resolve the argument concerning its "native" or "exotic" origin. This resolution, in turn, has far-reaching implications concerning such questions as large volcanic provinces, Pacific basin plate histories, and global ocean circulation.

The objectives of the other proposed sites, C2 and C3, seem to concern more local problems and need to be better justified as to their broader significance. It is possible that the objectives of these sites might be accomplished in sites addressing the K/T objectives of proposal 415 Rev. The possible combinations should be explored.

This proposal is still quite immature. Processed MCS lines need to be included. Faunal provinciality and more paleomagnetic studies need to be presented for on-land sections to explore their feasibility in characterizing the Aruba gap materials. The proposal text is often extremely unclear, almost undecipherable in places. A major rewrite with a co-proponent or editor whose native language is English is needed.

Box checked: 4

403 Rev 2 K/T boundary drilling in the Gulf of Mexico

This proposal is quite well written and documented. The targets are to drill the K/T boundary to the north of the Chicxulub impact crater, looking for ejecta generated by the proposed meteoritic collision. K/T boundary sediments around the Yucatan peninsula are re-sedimented deposits, however, complicating determination of the original stratigraphic setting, even if tsunami or other deep mass-flow transport has been responsible for ejecta sedimentation. Little attention has been paid to K/T plate kinematic reconstructions. There has been no attempt at addressing any other tectonic questions. TECP split on voting--4-4 votes, 3-5 votes, 1-2 votes. Better integration of this proposal with 415 Rev (below) and other Caribbean proposals, addressing the impact, its oceanographic and climatological effects, as well as the tectonic evolution of the region, would have made this a more attractive proposal to TECP. It is recognized, however, that this is an exciting question, and that in order to characterize the impact fully, it is necessary to document the proximal region, as this proposal outlines.

415 Rev Caribbean ocean history and the K/T boundary impact event.

The main focus of this well-presented proposal--further understanding of the K/T boundary impacted associated with the Chicxulub structure in the Yucatan, its environmental effects, and the distribution and depositional processes of the impact ejecta--is of general interest to TECP, but not specifically within its mandate. TECP continues to be impressed with the



way this proposal concentrates on the environmental effects of the impact rather than simply examining the distribution of ejecta in an attempt to prove that Chicxulub is its source. We were pleased to see that in the revised version of the proposal, a figure was included illustrating the proposed drill sites in their pre-dispersal locations, as recommended in our previous review. However, comment was made that proposed Site 2 may not be as old as 65 Ma, and thus may not have experienced the effects of the impact.

Secondary objectives of the proposal that could be achieved by recovery of basement at the proposed sites, such as the origin of the Caribbean oceanic plateau (large igneous province) and the nature of "normal" oceanic crust (rough horizon B") in the eastern Venezuela basin, are within TECP's mandate. These objectives were comprehensively examined in proposals 343 (Mauffret et al, 1989), 411 (Donnelly et al, 1991) and 384 Rev 2 (Mauffret et al, 1992). In their present form, many of the objectives of these proposals are only of secondary interest to TECP.

Caribbean proposal proponents need to coordinate their efforts, as a number of objectives can be examined at proposed sites, as recognized within this proposal. In particular, TECP hopes that other JOIDES panels (SGPP, OHP) with primary interest in K/T boundary problems will encourage the proponents of this proposal and 403 Rev 2 (Alvarez et al, 1992) to better coordinate and integrate their efforts.

Box checked: 3

### **Sediments and other**

338 Add Sea level fluctuations--Marion Plateau carbonates, NE Australia

This proposal to drill into the Miocene plateau is not really mature. We await the fully-developed proposal that the proponents state will be submitted in early 1993.

Box checked: 1.

380- Rev 3 Drilling into the clastic apron of Gran Canaria and the Madeira abyssal plain

This proposal reflects the combination of previous proposals 380 Rev 2 and 059 Rev 3, without significantly changing the drilling program and geological rationales. TECP agrees that both areas (the surroundings of Gran Canaria and the Madeira Abyssal Plain) are prime targets for the study of the evolution of large mid-plate volcanoes and turbidite deposition due to changes in sea level. The proposal is mature, except for the fact that objectives regarding question of lithospheric loading, subsidence, and re-heating associated with volcanism remain unaddressed. The expected results can only be obtained by drilling, and they can be integrated successfully to test models described in the Madeira abyssal plain project, but interpretation of the results in terms of a quantitative model in the case of the VICAP (Gran Canaria) will be difficult.

Box checked: 3

391 Rev The formation of sapropels in the Mediterranean Sea

TECP continues to feel that this is outside its mandate. However, we note that at least 3 of the proposed shallow drilling sites are in the areas of proposed drilling in the Alboran Sea (323 Rev 2) and the Mediterranean Ridge accretionary complex (330 Rev), which have emerged as high-priority TECP objectives. Thus we wonder if scope exists for combining the sapropels drilling with one or both the Mediterranean Ridge and Alboran Basin drilling

proposals. We note that the sapropels drilling originally was conceived as being piggy-backed onto tectonics-related objectives.

Box checked: 1 if stand alone, 5 if integrated into other proposals

#### 405 Rev Amazon deep-sea fan growth pattern

The ability to date sediments resulting from erosion of the Andes is important for dating uplift history. Thus the tectonic implications of this study are an important by-product to the principal scientific objectives.

Box checked: 3

#### 416 Glacial history of the high European Arctic: Svalbard margin

The proposal objectives are not within the mandate of this panel

Box checked: 1

#### 417 Gas hydrate formation and distribution...Okhotsk Sea.

We recommend that the JOIDES office send these proponents a copy of Proposal 423, the community Gas Hydrate Proposal.

Box checked: 1.

#### 418. Biomagnetostratigraphic reference section...western Mediterranean

This proposal addresses tectonic themes only in the briefest fashion. Although the proposal mentions that the early rifting of the basin could be addressed by extending the hole to basement, we note that the tectonic framework of the site is not discussed, and that the early rifting problems would only have a regional focus.

Box checked: 2

#### 422 A site proposal for ocean drilling...Santa Monica basin

TECP recommends that the proponents coordinate their proposal with that of proposal 386.

Box checked: 3

#### 423 Gas hydrate sampling on the Blake rdige and Carolina rise.

TECP was interested to note this emergence of a firm proposal to drill gas hydrates. While we feel that this topic is outside the mandate of the Panel, it was questioned as to whether the porosity/permeability characteristics of gas hydrate host sediments might be more conducive to greater gas hydrate stability (and hence safety for drilling) in coarser-grained sediments typical of active margin-tranch settings, rather than fine-grained (mainly contourite) sediments of the passive margin locations proposed.

Box checked: 3.

### LETTERS OF INTENT

We encourage the proponents to submit proposals.

## WATCHDOG REPORTS

### TRANSFORM MARGINS--ALASTAIR ROBERTSON

TECP continues to express considerable interest in translational (transform) margins. The equatorial Atlantic proposal (346-Rev 3) is now a mature one-leg proposal. However, the proposal's competitive position would be improved by the inclusion of recently collected data (MSC, diving, etc., ) and possibly by increasing the number of proponents with specialized expertise. Without continuing to work to improve this proposal, it may lose ground.

Other current proposals address transform processes as a subordinate part of overall programmes:

079 Rev. Tethys/Indian Ocean: transform processes have played a role in opening of the Somali Basin;

0860-Red Sea: young spreading axes offset by transforms (including basement ridges), which could be studied by drilling;

323 Rev 2 Alboran Sea: on-land geology and offshore seismic data suggest that opening of the Alboran Sea was in part, translational, an aspect that should not be overlooked;

386-Rev 2 California margin Neogene: promises to provide information about northward translation of oceanic crust adjacent to the California margin.

Caribbean proposals (especially opening of Gulf of Mexico) all involve translational tectonics. Proposals could place more emphasis on this aspect in general.

TECP also is interested in translational active margins (e.g. W. Aleutians, Indonesia, northern South America, etc., ), and we hope to see proposals that could investigate, for example, the problem of strain partitioning in oblique strike-slip margins.

### PLATE HISTORY-SEA LEVEL CHANGE, MAGNETIC QUESTIONS-TANYA ATWATER, STEVE CANDE

Proposal 420 (Evolution of oceanic crust) proposes to drill several deep holes into the oceanic crust in order to examine questions of the aging of the oceanic crust. These deep basement holes could potentially acquire important constraints in the source of magnetic anomalies.. However, for the magnetic data to be of greatest use, the sites should not be near the paleomagnetic equator. We note that as now planned, the older sites will be located at very low paleolatitudes. We strongly urge the proponents of the sites to move the flowlines to a higher latitude so that useful paleomagnetic inclination data can be obtained. If the old sites are situated in the middle of long intervals of uniform polarity (e.g. between anomalies 26 and 27), then the occurrence of alternating polarity within the drill hole would have important geomagnetic implications.

### MID-OCEAN RIDGES-JEFF KARSON

There remain about 20 active mid-ocean ridge or transform fault drilling proposals. Seven proposals were reviewed at the Fall 1992 TECP meeting, including five revised proposals. Two of these are included in the FY 94 prospectus: 1) drilling at the MARK area, and 2) the TAG area. The revised MARK proposal was highly rated by both TECP and ODWG

and nearly all site survey data have, or will be, submitted. This proposal was ranked # 3 by TECP in the context of the FY 94 drilling. Drilling at the Vema Fracture Zone, although not formally in the Prospectus, was also ranked (# 7).

Three types of proposals, for which sufficient active proposals do not exist, have been discussed. These include: 1) generic proposals (Hess Deep II and Sedimented Ridges II); 2) proposals for targets identified in the "Short List" of the Offset Drilling Working Group (Pito Deep, King's Trough, Oceanographer Fracture Zone); and 3) proposals for drilling in the Red Sea.

TECP discussed potential ways to develop linkages with the RIDGE and InterRIDGE programs. TECP considers these organizations to be important potential sources of exciting research proposals related to the long-term investigations and monitoring of tectonic, magmatic, and hydrothermal processes along mid-ocean ridge spreading centers.

#### MARGINAL BASINS-KEN TAMAKI (SUBSTITUTE FOR YUJIRO OGAWA)

Although activity marginal basin regions is very quiet, they still are not understood. Drilling has happened in the Mediterranean, the Japan Sea, the Lau Basin, and the Celebes Sea. A forthcoming meeting (January 1993, Monterey?) organized by Brian Taylor will start to organize new proposals in the western Pacific. (The Letter of Intent from Patricia Fryer was the first action in this regard). A major problem to be addressed is crustal thinning in forearc and backarc regions. The process is very consistent and different from continental margins, but the nature is still unclear.

#### CONVERGENT MARGINS (NORMAL SUBDUCTION-JAN BEHRMANN)

Of many proposals, several are now active--421 Volcano Trench, which is very immature, 414 Barbados, discussed previously, in which hydrogeology and instrumentation are strongly connected with the thrusting and 400 Costa Rica, which is similar to Barbados. Mediterranean Ridge is mixed tectonic and hydrogeological. There is never a shortage of proposals in this subject. Possible subjects of future proposals are: Peru, where the process seems to be more erosional than accretionary, southern Chile, with temporal and spatial heterogeneity in forearc tectonics, and the early development of arcs, such as Zenisu Ridge, and the southeast Indian Ocean, in the region of compressional faulting.

#### COLLISIONAL MARGINS-PHIL SYMONDS

There are seven active proposals that fall within this theme as of 1 June 1992, six in the Mediterranean region and one on the north Australian margin. The status of these proposals is summarized below:

No.	Title	Contact	TECP rating	RANKING 9/92
323-Rev 2	Alboran Sea	Comsa/Watts	5	1
324	Med. tectonic evolution	Cita-Sironi		
330 Rev	Mediterranean Ridge (1)	Camerlenghi	5	2
340	N. Austral Margin	Symonds	4-immature	
364	Sardinia-African strait thrusting	Torelli	2-immature	
379	Mediterranean Sea	Mascle	3-immature	
383	Aegean Sea (continent/continent collision)	Kastens	immature	

Two of the above proposals (324, 364) were not highly rated by TECP, and there have been no new developments for two of the other proposals (379, 383) since the last watchdog report. These four proposals will not be discussed further.

323-Rev 2: Evolution of an extensional marine basin in a collisional setting: the Alboran Sea

In line with TECP's recommendations the proponents of this proposal have integrated and rewritten the two original Alboran Sea proposals-323Rev (Copmas), and 399 (Watts). TECP was pleased to see the revised proposal and now considers it to be well presented, succinct, and well focused. The revised proposal was rated highly by TECP during its review and was ranked as TECP's top proposal for drilling during FY 1994. During its August 1992 assessment of the proposal the Site Survey Panel (SSP) indicated that from a data availability point-of-view, 323 Rev 2 could be scheduled for drilling for FY 1994. The Alboran Sea region now contains a large amount and variety of data of good to excellent quality, and the proponents have deposited much of the data in the ODP data bank.

330-Rev: Time progressive continental collision: the Mediterranean Ridge accretionary complex in the eastern Mediterranean (phase 1--shallow drilling).

This completely revised proposal presents the first of a two-phase drilling program aimed at understanding the processes associated with accretion at an incipient continental collision on a salt-bearing accretionary complex. The first phase is proposed to consist of about five shallow hole transects positioned at various locations along the entire collisional margin. TECP rated the proposal highly during its review, but expressed some concern at the amount of drilling proposed. The proposal ranked second on TECP's list of drilling priorities for FY '94. SSP has indicated that some required data do not yet exist for this proposal, but that the necessary data could be available by the end of 1993. The proposal flags three cruises in the region in 1993, and one in 1994, to collect a variety of seismic reflection and refraction, Hydrosweep, side-scan, TV, heatflow, coring, TOBI, and dive data.

340-Evolution of foreland basins: a record of tectonic, climatic, and oceanographic change from the northern Australian margin.

A revised, but still immature version of this proposal will be submitted to the JOIDES office early in 1993. It will respond to previous TECP criticisms, and present new information and future plans for data acquisition in the region.

**STRESS AND MID-PLATE DEFORMATION-MARK ZOBACK**

Last year's drilling in Hole 504B produced additional information concerning the state of stress, and Leg 148 drilling should as well. In fact, it may even produce data that constrain hypotheses concerning the origin of high horizontal stress in young oceanic crust. In the Prospectus, the deeper holes associated with the Iberian Abyssal Plain should also yield useful information related to assessing the source of NNW compression in western Europe (ridge push?).

Useful stress data may come from proposed deep drilling in the western Somali Basin (079 Rev), helping to fill an important gap in crustal stress data and helpful for constraining models of processes related to East African rifting. The same is true if Hole 735B is deepened (300 Rev).

## UNANSWERED QUESTIONS

Technical questions arose during the meeting that panel members were unable to answer. These included:

1. Status of pressure core barrel and prospects for use in accretionary prisms for pore pressure measurement;
2. Status of CORK and its potential use in zones of severe overpressure where substantial upward force would be exerted; on the packer;
3. Use of FMS in high-resistivity basement rocks for oriented fabric and planar structures encountered in cores. FMS works well in land holes drilled in such rocks, but does it work with such low-resistivity borehole fluids?
4. More detailed information would have been useful on the high-temperature tools under development for Hole 504B.

In view of the above questions, it would have been extremely useful to have had a DMP Liaison at the meeting or someone from ODP drilling that could have addressed these issues.

## RIFTED MARGINS, INCLUDING NARM DPG--PHIL SYMONDS

This report combines watchdog reports for both young and old rifted margins, which have previously been presented separately. There are twelve active proposals that fall readily within this them, as 1 June, 1992, as listed in the JOIDES Journal:

- 265/265 Add Woodlark Basin (Scott)-highly ranked by TECP
- 362-NW Africa margin (Hinz)- not highly ranked by TECP
- 327 Argentine continental rise (Hinz) interesting but thick sediments
- 333/333Add - Cayman Trough (Mann) - interesting, but new data required
- 344 NW Atlantic Jurassic magnetic quiet zone (Sheridan) - as presented does not address high priority thematic objectives.
- 363/363-Add - Grand Banks/Iberia plume volcanism (Tucholke) - not included in NARM-DPG because of secondary interest as it stands
- 365-Add2 - N. Atlantic transect/geothermal (Louden) - addresses high priority objectives but TECP is not convinced of priority of downhole heatflow measurements, particularly if they interfere with other transect drilling priorities. Basement radiogenic heat production measurements could be interesting, and TECP encourages surface heatflow measurements along NARM-DPG transects.
- 392 Labrador Sea volcanism (Larsen) Considered by NARM-DPG - addresses high priority objects with deficiencies. Immature at present.
- 394- Pre- and syn-volcanic extensional basins (Kiørboe) - Considered by NARM-DPG - does not address high-priority thematic objectives and appears to be only of local/regional interest.

397 - North Atlantic multiple rifting (Gudlaugsson) - addresses high priority objectives but with deficiencies. Interesting complexities with respect to magmatism and rifting.

NARM-DPG transects - highly rated by TECP, ranked very high in global and prospectus rankings in 1991/92. Further consideration by TECP is outlined below.

Two other proposals (328, 396) that were considered by NARM-DPG but not included within its transects should also still be listed as active ODP proposals:

328 - E. Greenland margin (Hinz) - addresses high-priority TECP volcanic margin objectives, but not considered as optimum location for seaward-dipping reflector drilling.

396 - Hotspot model for volcanic margins (Anderson) - of secondary interest to TECP as presented, and immature.

Three revised proposals relevant to the rifted margin theme were presented to TECP at this meeting:

079 - Rev - Tethys and birth of Indian Ocean (Coffin) - of secondary interest to TECP if of high priority to some other panel. Lacks high priority TECP thematic objectives - largely of regional interest.

086 - Rev 2 - Red Sea drilling (Bonatti) - addresses high priority TECP rifted margin objectives in a region of great interest, but immature at moment.

334-Rev 2 - Galicia S reflector (Boillot) - addresses high priority TECP non-volcanic margin objectives. Update of 334-Rev that was considered by NARM-DPG and objectives were partly included in Iberian margin drilling recommended within the NARM-DPG report as site GAL 1. The objectives of GAL 1 are to drill into the top of the 'enigmatic terrane' lying above the S' reflector, which is proposed to be equivalent to the areally extensive S reflector thought to be related to a major detachment fault. Every effort has been made to show that the S' reflector is the same as S - this was considered to be a deficiency of previous versions of the proposal. One wonders how much further the proponents can go in this direction at this location, and begs the question if drilling the S reflector 'detachment remains an important objective. Is this the best (and only) site at which this is feasible? TECP is still very interested in the original objective of this proposal--to drill through the enigmatic terrane and the S reflector equivalent. This proposal was included within the voting for TECP priorities for FY 1994 drilling and ranked eighth out of ten. It is considered mature and drillable at present.

In all there are currently 17 rifted margin proposals on the books, and nine of these have been highly ranked. A new proposal examining the continent/ocean transition and margin development off southern Australia is expected to be submitted in early 1993 in time for review at the next (Spring) meeting. TECP is very interested in seeing revised and updated proposals for young rifted margins in the Woodlark Basin and Red Sea regions, and further consideration and amendment of the other highly ranked proposals as outlined above

#### UPDATED LIST OF TECP WATCHDOGS

Paleostress and deformation mechanisms: Sue Agar

Collisional margins: Carlo Doglioni

Rifted Margins, including NARM DPG-Phil Symonds

Consuming margins: Roland von Huene (new German member)

Stress and mid-plate deformation: Mark Zoback

Transform margins: Alastair Robertson

Plate history, sea level changes, magnetic questions: Steve Cande

Mid-ocean ridges: Jeff Karson

## **DISCUSSION OF ATLANTIC-EAST PACIFIC PROSPECTUS (FY 94 DRILLING)**

### **NARM-DPG QUESTIONS**

TECP began its discussion of FY 94 drilling with consideration of the NARM-DPG follow-on from FY 93 drilling. PCOM's expression of uncertainty about NARM non-volcanic leg I has complicated these considerations significantly. As a result of PCOM's decision to extend basement penetration, it now seems unlikely that all three sites originally planned for Leg 149 (IAP-2, IAP 4 and IaP 3C) can be completed on the Leg, as an extra 10 days of drilling may be required. What then of NARM non-volcanic Leg II? The possibilities seem to be as follows:

1. Complete drilling of the three priority Iberian sites IAP-2, 4, and 3C, but add in extra drilling on the Iberia Abyssal Plain to make up the second leg, such as GAL-1 (perhaps with full penetration to S, as proposed within 334-Rev2, or make a start on IAP-1.

2. Complete drilling of the three priority Iberian Sites IAP-2, 4, and 3C, but add in extra drilling as per NARM-DPG's second stage priority by making a start on the Newfoundland Basin Site NB-4A.

3. Do not complete drilling of the three Iberian sites, but go straight to Newfoundland Basin Site NB-4A for Leg NARM Non-volcanic Leg II. This could mean not drilling or completing Site IAP-3C at this stage.

4. Do not complete drilling of the three Iberian sites, but drill deep Iberian syn-rift Site IAP-1. This would have to be at the expense of Site IAB-3C, or certainly substantial basement penetration at the site. However, it could mean completion of priority drilling on the Iberia end of the transect, albeit in a less than optimum manner.

There was an involved discussion about the wisdom of the conjugate margin approach, the relative merits of various possibilities for a NARM non-volcanic leg. There was general consensus that TECP supported the desirability of the conjugate margin approach, and



reaffirmed its support for the goal of the production of a balanced section across two conjugate rifted margins. The NARM non-volcanic transect (IAP-NB) is the best place known to produce such a transect.

TECP favors completion of priority drilling at the three Iberian ocean-continent transition sites, as per NARM-DPG proposal, with fill-up drilling in nonvolcanic leg II also on the Iberian end of the transect. Final decisions on the actual sites and objectives should, if possible await the results of Leg 149. Leg III non-volcanic should then follow NARM-DPG priorities and drill NB-4A in the Newfoundland Basin. This approach seems consistent with PCOM's attitude to complete NARM volcanic margin drilling on the 63°N SE Greenland transect before commencing drilling at another location.

Such an approach would also allow time for better seismic definition of the deep sites on the Newfoundland-Iberia non-volcanic transect, *i.e.*, IAP-1, NB-4A, and NB-1. We understand that new seismic data have been collected over some of these sites, but we have not seen them.

Questions have arisen concerning the nature and thickness of 'syn-rift' section at these sites, particularly IAP-1 and NB-4A, and whether all sites on the transect lie within the same extensional compartment, and thus that the Newfoundland and Iberia sites are truly conjugate of each other. If objectives such as the symmetric or asymmetric nature of rifting are to be effectively examined on this transect, then ideally conjugate sites should lie within the same extensional compartment. Existing geophysical data certainly appears to indicate that the Newfoundland and Iberia sites are very close to conjugate positions are probably characteristic of a reasonable segment of margin on each end of the transect. That is, they lie on margin segments that are grossly conjugate, and within the same major extensional compartment, and are adequate for broad comparison of sites from one margin to the other. There does not appear to be a major transfer fault or accommodation zone separating both ends of the transect, and thus the general primary rift character and relationship of the conjugate margin segments have been preserved within the transect. Clearly if there were not the case and there was a switch in margin style across a major transfer zone such that the conjugate margin segments did not preserve the primary -re-breakup rift architecture, then conclusions regarding styles of rifting (symmetric or asymmetric) would be invalid.

At a different scale, however, it is not clear that the groups of sites on each end of the transect actually lie within one extensional compartment. This may be necessary when comparing the group of sites on one margin, and using them to characterise the nature of the change from extended continental crust to normal spreading oceanic crust. For example, there is some indication on seismic data in the NARM-DPG report that sites IAP-1 and 5 on the Iberia Abyssal Plain are separated by a transfer fault or accommodation zone, which suggests a more complex history for this end of the transect than inferred in the report. Also, Fig. 4.4 of the NARM-DPG report implies that Sites NB-1, 4A, and 7 A are not within the same compartment, *i.e.*, they are separated by transfer faults. To maximize the benefit from drilling these sites, especially deep ones costing about \$7 million, the exact relationship between adjacent sites, especially those with similar objectives, needs to be well-understood. Perhaps a grid of seismic lines, rather than just crossing lines, are needed to provide a better appreciation of the structural relationship between the sites.

In summary, effective comparison of the conjugate margins may not require precise positioning of sites within one extensional compartment, but comparison of sites from one margin and characterization of the ocean-continent transition would be enhanced if all sites at each end of the transect lie within one compartment. At present, it appears that some of

the seismic lines linking sites do not have optimum orientations with respect to the extensional transport direction, and thus they cross transfer faults. This fact will probably complicate the interpretation of the drilling results. It is a problem that will be with us in any conjugate rifted margin drilling. Perhaps the NARM-DPG non-volcanic transect is the best that we can hope for.

TECP also discussed the desirability of including site GAL-1 in the Leg 149 prospectus, apparently in line with NARM-DPG's original thinking on the Iberia drilling. This would give the Leg 149 co-chiefs greater flexibility during the leg, particularly if surprises occurred during drilling of sites IAP-2 and 4.

With regard to NARM volcanic leg II, TECP agreed with PCOM's attitude that it would be better to finish the SE Greenland transect at 63° N, rather than commence a new transect of sites at a different location. TECP is keen to see Site EG 63-1 deepened to intersect continental basement, and if possible for site EG 63-2 to be deepened so that it intersects the top of the same seaward-dipping reflector sequence (SDR) sequence to be examined at Site EG 63-4. This approach would improve understanding of lateral variations in the SDR sequence.

Drilling the first two NARM-DPG sites, EG 63-1 and 2, as planned in the NARM report, will be difficult to do in one leg. To complete these sites and perhaps extend their depths, as well as to drill sites EG 63-3 and 4 will take at least two legs of drilling.

The voting on NARM-DPG legs, given below indicates that these sites are dropped somewhat in TECP priority. This may result from the fact that NARM DPG Legs 149 and 152 have yet to be drilled, and results are awaited before more high-priority legs are allocated. Alternatively, the membership of the Panel evolves and new members are not as fully briefed on NARM-DPG objectives/priorities and do not have the same affinity with this multileg program as veteran Panelists. This could point to a problem in getting the NARM-DPG transects drilled over the next few years and may imply a broader problem associated with any multi-leg drilling plan.

In view of the prospect that the three priority sites on the Iberian Abyssal Plain will not be completed in 1993, TECP recommends that the second leg of NARM non-volcanic drilling in 1994 or later continue with the Iberian priorities, to include Galicia, if possible (as in NARM DPG). (Passed 7 for, 3 against, 1 abstention).

In the second leg of NARM volcanic drilling, TECP wishes to see the 63° N transect of sites completed before beginning other transects. (Passed 10 for, 1 abstention).

## RANKINGS

Procedure: Ten prospective drilling LEGS were ranked, selected from the Prospectus and the other highly ranked proposals. Proponents were identified and admonished not to vote for their proposals. A paper ballot was held in which each Panel member ranked the legs in order, with first priority receiving 10 points, second priority 9, etc. Points were totaled and divided by the number voting on that project. The rankings and average scores are as follows:

RANK	LEG	SCORE
1.	323 Rev 2 Alboran Sea	8.41
2.	330 Rev Mediterranean Ridge Phase 1	7.45
3.	369 Rev 2 MARK area	6.64
4.	376 Rev 3 Ivory Coast-Ghana transform margin	6.5
5.	NARM Non volcanic leg 2: Finish Iberian shallow hole transect and drill Gal 1.	6.42
6.	NARM Volcanic leg 2: Finish east Greenland 63°N transect	6.33
7.	376 Rev 2 Vema Transform	4.58
8.	334 Rev 2 Galicia margin S reflector	3.42
9.	NARM Non volcanic leg 3: Newfoundland basin	3.33
10	414 Rev N. Barbados accretionary prism	2.91

#### MEMBERSHIP

Members Tanya Atwater and J. Casey Moore have served since March 1990, and thus are eligible for replacement. Suggested new members are:

To Replace Tanya Atwater    Richard Gordon  
    Richard Pindell  
    Paul Mann

To replace J. Casey Moore:    Greg Moore  
    Steve Lewis  
    Mark Cloos

#### NEXT MEETING

#### TWO POSSIBILITIES:

Durham N. C. First week of March, or

DAVIS, CA, March 22-24.

MEETING ADJOURNED 7: 15 P.M. SEPTEMBER 26, 1992