ODP TECP MEETING
FALL, 1993
CORNER BROOK, NEWFOUNDLAND
EXECUTIVE SUMMARY

PROSPECTUS RANKINGS

Rank	Proposal	Score (/4)
1.	346 Rev 4 Equatorial Atlantic	3.08
2.	330 Add 3 Mediterranean Ridge	2.45
3.	323 Rev 3 Alboran Sea	2.08
4.	NARM Non-volcanic II (IAP new package)	1.67
5.	NARM Volcanic (NARM Add2)	0.92

Deep Drilling Recommendation: The deep Alboran Hole--Alb 1.

Leg 157 Contingency recommendation: 346 Rev 4. Equatorial Atlantic Transform

Assessment of NARM Drilling. TECP recommends:

1. That the second leg of NARMvolcanic drilling be the proposal NARM Add 2 (Larsen), rather than thesecond leg as outlined in the NARM DPG report.

2. The conjugate approach to the Newfoundland-Iberia transect is stillvalid.

3. Problems still exist with thesiting of the deep Newfoundland basin site, as outlined in the comments onNARM Add (item III.A.4 above), and it needs further study.

4. The second leg of NARM Non-volcanic drilling should be on the Iberian Abyssal Plain. Because of complications arising from the Leg 149 results,more documentation is needed from that area concerning thethree-dimensional nature of basement highs, the possible dip of faults, and the regional distribution of basement.

   TECP recommends a pause, some re-survey, and a newpackage of approved drilling targets possibly involving extending Leg 149 sites898, 900 and 901 further into basement, drilling either the S' reflector(item III.A.2 above), or site 3 of the NARM DPG report. TECP has appointeda sub-committee of R. Von Huene (Chair), S. Agar, U. Ten Brink, T. Reston, and D. Sawyer to assemble a newpackage from existing drilling proposals. This package will be submittedin time for the December PCOM meeting. The aim of this new leg of drilling would be to characterize the regionaltectonic situation more clearly, to understand the geometry of the Iberiansector more fully, in order to enable a formulation of a new more refinedmodel of the process of rifting in this region.

5. The deep IAP sites need furtherstudy before committing drilling time to them. IAP 1 needs an advocate,currently lacking.

Evaluation of PPSS and VPC

PPSS. TECP supports it as a good tool if itworks. It shows potential of enabling the quantification of in situ volumeof gas. Pushing ahead of the core barrel is a good idea, as it doesn'tdisturb the core.

VPC -TECP supports the development of this tool. The recovery of sands is valuable in a number of tectonic environments,such as accretionary prisms, transform fault basins, etc.

Suggested check list for proposal review

1. Are the scientific objectives well thought out?
2. Thematic relevance?
3. Technical feasibility
4. Is this the best place to tackle the scientific problem.
5. Scientific feasibility--can the problem be solved with the drillingplan?
6. Urgency or timeliness of project?
7. Special scheduling considerations--borehole labs, etc.
8. Are the individual site choices justified inthe context of accurate 3-dimensional characterization of theregion?
9. Adequacy of background information?
    a. Site survey data?
    b. Incorporation of all other regional geology (including landgeology).
    c. Geologic/tectonic maps?
    d. Balanced cross sections to the extent possible or appropriate?
10. Appropriate reference list?

Other TECP Recommendations:

1. A wealth of structural information should be present in DSDP and ODPcores. We recommend a comprehensive structural-tectonic survey of all DSDPand ODP cores to glean whatever information exists. This would be perforcea "salvage job", because most cores were collected without regard to the structures that may have beenpresent. Because of the delicate nature of many of the microstructures thatmay be preserved, TECP believes that any disturbance of the cores before this survey has beenmade potentially will destroy a great source of information about platedynamics and/or kinematics. Thus TECP urges the completion of such asurvey before any cores are moved.

2. TECP is concerned about the lack of routine collection of structuralinformation on ODP legs, in view of the apparent widespread presence ofsuch features. We have received reports, for example, that structuralfeatures were encountered on such legs as Sedimented Ridges (Leg 139), the North Pacific (Leg 145), despite thefact that no structural geologist was aboard the JOIDES RESOLUTION. Wealso note that no structural geologist has been included on Leg 152,despite that it is on a rifted margin and was highly ranked by TECP. TECP urges that the routine collection ofstructural information be implemented ASAP, and that each Leg include astructural geologist as part of the scientific party.

On tectonic drilling legs there is commonly a lack of sufficient applicatnts. Land geologists with appropriate thematic or regionalexperience can be better integrated into the ODP system. We suggestbroader advertising in journals such as GSA Today, Geotimes, Science,Nature, etc. Advertisements should include a brief abstract and a list of positions available, etc. They should appearwith as long lead time as possible before the pre-cruise meeting so thatstaffing can be completed by that time. Basically, cruises should beadvertised as soon as scheduled. This expansion of the ODP participant base would help expand awareness of ODPactivities and achievements, as well as improve support throughout theEarth Science Community.

3.Quantifying tectonic processes in oceanic crust. In its evaluation ofdrilling proposals for studies of processes in oceanic lithosphere, TECPnotes that several important geologic tools are notably lacking. TECPurges the development and implementation of tools to achieve the following scientific objectives:

1. Horizontal and vertical reference frames in oceanic crust.
2. Dating of young (0-≈2Ma) oceanic crustal rocks.
3. Geobarometers relavent to reconstructing the vertical movement historyof oceanic crustal and shallow mantle material (0-3 Kb).
4. Geothermometers to constrain the thermal history of relatively low T(≤350°C--greenschist facies) rock volumes such ashydrothermally altered material, brittle fault zones, etc.

TECP believes that advances in these areas would permit thequantification of major tectonic processes and would have significantimpact on the formulation of drilling objectives.

U.S. Panel Membership.

A. General large-scale tectonics (to replace E. M. Moores)
   1. L. H. Royden, MIT
   2. An Yin, UCLA
   3. Suzanne Baldwin, U. Arizona
   4. R. Allmendinger, Cornell
   5. G. A. Davis, U.So. Calif.

B. Mid-ocean ridges (to replace Jeff Karson)
   1. Yildirim Dilek, Vassar College
   2. Steve Hurst, Duke U.
   3. Jian Lin, WHOI
   4. Greg Harper, SUNY Albany

C. Physical properties (to replace Mark Zoback)
   1. Kevin Brown, UC.Santa Cruz
   2. Steve Hickman, USGS Menlo Park

D. Paleomagnetism (to replace Steve Cande)
   1. Lisa Tauxe, Scripps
   2. Jim Channel, U. Florida
   3. Dave Schneider, LDEO
   4. Steve Hurst, Duke U.

Next Meetings:

Spring:	Tentatively March 10-12 Hawaii, Host: Greg Moore	Fall:	Edinburgh? Japan? Italy? Iceland?

DRAFT MINUTES

TECTONICS PANEL MEETING
CORNER BROOK, NEWFOUNDLAND,
SEPTEMBER 19-21, 1993

Present: Panel Members: Susan Agar, Northwestern
Steve Cande, UC San Diego
Carlo Doglioni, Italy
Jeff Karson, Duke
Yves Lagabrielle, France
Greg Moore, U. Hawaii
Eldridge Moores, Chair
Yujiro Ogawa, Japan
Alastair Robertson, UK
Joann Stock, Caltech
Uri Ten Brink, Woods Hole
Roland von Huene, Germany

Liaisons:
Peter Clift, ODP-TAMU
Karen Schmitt, JOIDES-U. Washington
Brian Taylor, PCOM

Apologies:
Michael Steckler, Lamont-Doherty
Philip Symonds, Australia-Canada
Mark Zoback, Stanford

I. Welcome and Introductions

Moores welcomed everyone to the meeting, and it began with a round ofself-introductions.

II. Liaison Reports

PCOM: Brian Taylor reported on two PCOM meetings since the last TECP meeting. The April meeting set the ship's direction for the next four years, and itconfirmed Alastair Robertson as the new TECP Chair. The 1994 schedule wasreviewed. Programs not on the schedule either were not in the ship's operational area or site surveys were not ready. PCOM hascharged TECP to 1. Prioritize programs in prospectus; 2. Continue revisionof Whitepaper--a. summarizing ODP accomplishments to date, b. prioritizemajor themes pre & post 1998, c. outline strategy and technological needs to achieve themes; 3. Incorporatescientific feasibility into recommendations--perhaps as a separate questionon review form, 4. Evaluate the PCSS; 5. Review status of NARM; 6. Makesuggestions for Leg 157.

JOIDES-WASHINGTON Karen Schmitt reported on EXCOM deliberations concerningestablishment of a core-repository at Bremen. ODP-TAMU plan for moving hasbeen sent to panels for comment. The next deadline is proposal deadline isJanuary 1--revised proposal guidelines are available. James Watkins has been appointed new President of JOI. New guide to ODP will be published June 1994. MOU's are signed withGermany, UK, ESF, France, Canada-Australia (7/12), Japan is pending.

TECP Recommendation:

A wealth of structural information should be present in DSDP and ODP cores. We recommend acomprehensive structural-tectonic survey of all DSDP and ODP cores to gleanwhatever information exists. This would be perforce a "salvage job",because most cores were collected without regard to the structures that may have been present. Because of thedelicate nature of many of the microstructures that may be preserved, TECPbelieves that any disturbance of the cores before this survey has beenmade potentially will destroy a great source of information about plate dynamics and/or kinematics. Thus TECPurges the completion of such a survey before any cores are moved.

ODP-TAMU Peter Clift reported that staffing was complete to Leg 156. DCSis delayed, is being refurbished in Texas. Hydraulic compenationredesigned, being tested on land prior to December PCOM meeting. ThePressure Core Sampler at present is only good for APC hole. It is deployed by wireline, using weight of drill stringto drive it into sediments. User has to find way to access gases. Deepdrilling: Somalia looks best, Alboran looks good, although there is worry aboutcurrents and shallow water. Alboran could be done in about 5 weeks. Galicia S reflector considered horrendous. Newfoundland basin is diffficult because of weather conditions, water depths, and extreme length ofhole. The drill string loss has led to a change in procedure to inspectpipe threads routinely. Three corks have been purchased. Hard rockorientation will be used on Legs 152 and 153. Core from Leg 152 will go to LDEO, following legs to Bremen. Inresponse to a question from Moores, Clift stated that nothing was beingdone to implement the routine collection of structural data. AccordinglyTECP made the following recommendation:

TECP Recommendation:

TECP is concerned about the lack of routine collection of structuralinformation on ODP legs, in view of the apparent widespread presence ofsuch features. We have received reports, for example, that structuralfeatures were encountered on such legs as Sedimented Ridges (Leg 139), the North Pacific (Leg145), despite the fact that no structural geologist was aboard the JOIDESRESOLUTION. We also note that no structural geologist has been included onLeg 152, despite that it is on a rifted margin and was highly ranked by TECP. TECP urges that the routinecollection of structural information be implemented ASAP, and that each Leginclude a structural geologist as part of the scientific party.

On tectonic drilling legs there is commonly a lack of sufficient applicatnts. Land geologists with appropriatethematic or regional experience can be better integrated into the ODPsystem. We suggest broader advertising in journals such as GSA Today,Geotimes, Science, Nature, etc. Advertisements should include a brief abstract and a list of positions available,etc. They should appear with as long lead time as possible before thepre-cruise meeting so that staffing can be completed by that time. Basically, cruises should be advertised as soon as scheduled. This expansion of the ODP participant base would helpexpand awareness of ODP activities and achievements, as well as improvesupport throughout the Earth Science Community.

LITHP Jeff Karson described the completion of the LITHP Whitepaperand the desirability of TECP comments on it. Karson also mentioned theneed for tool development to achieve both LITHP and TECP objectives.

TECP Recommendation:

Quantifying tectonic processes in oceanic crust. In its evaluation ofdrilling proposals for studies of processes in oceanic lithosphere, TECP notes thatseveral important geologic tools are notably lacking. TECP urges thedevelopment and implementation of tools to achieve the following scientificobjectives:

1. Horizontal and vertical reference frames in oceanic crust.
2. Dating of young (0-≈2Ma) oceanic crustal rocks.

3. Geobarometers relavent to reconstructing the vertical movement historyof oceanic crustal and shallow mantle material (0-3 Kb).
4. Geothermometers to constrain the thermal history of relatively low T(≤350oC--greenschist facies) rock volumes such as hydrothermally alteredmaterial, brittle fault zones, etc.

TECP believes that advances in these areas would permit thequantification of major tectonic processes and would have significantimpact on the formulation of drilling objectives.

DMP Sue Agar reported on developments. Wireline logging servicesoperations are now directed by D. Goldberg at LDEO together with threechief scientists from LDEO, Leicester, and Marseilles. Leicester will be responsible for the Schlumberger geochemicaltool, while the Marseilles group will focus on the formation microscanner. The WSLO has been asked to draft a prioritization plan for tool developmentto be presented at the Santa Fe meeting in October. They have also been asked by DMP and thematic panelsto keep funds for Liaisons to thematic panels a high priority within theseplans. To assist thematic panels in their assessments of the scientificfeasibility of proposals, the DMP is considering preparing "tool monographs". These documents would includea brief outline of the principles of tool operation, the assumptions usedfor tool interpretation, and an assessment of their applicability toscientific problems. A prime candidate for such a monograph would be the recent presentation to DMP ontechniques for magnetic investigations of boreholes.

A review of recent logging at holes 894, 504B, & 896 showed that thedigital borehole televiewer continues to have problems. The main problem is thought to be caused by an incompatibility of the datatransmission package with long cables. The low success level of this tool,combined with the high costs consumed over the past several years, bringsits continued use into question. The WHOI 3-component VSP tool also failed three times. The neutron porositytool will remain in the logging suite, as the data are considered to bevaluable, even thougy the calibration problems have yet to be addressed. The future of GEOPROPS tool as a potential fluid sampling device was discussed. Tom Pettigrew estimated thatit would take 60-80 hours of ship time to test the MCP/GEOPROPS deployment. "Measurement while drilling" (MWD) was discussed as a possibility for theBarbados leg. This would require dedicated holes, as it is incompatible with coring. No sonic tool isincluded in the Schlumberger MWD logging suite.

The French temperature tool still has problems with fluids penetratingjoints and causing cable corrosion. WLSO has no funds to continue working on this tool. The Camborne tool still has prblems withceramic component failure in the resistivity array, and is limited tomeasurements below 260o C. Even if this tool becomes functional, it wouldnot be able to deal with the anticipated 350o C at TAG. Peter Lysne reported on the development of DOE tools. Atest of the DOE precision temperature-pressure tool was due to be conductedin Summer, 1993. Development of a fluid sampling tool will follow if thesetests are successful. There are possibilities for joint DOE/ODP tool development, although DOE has nofunds for 3rd party certification.

A Scripps wireline re-entry system using a downcable thruster to positionthe reentry package into the borehole was discussed as a possible optionfor wireline reentry from a service vessel. Such a system would bevaluable for cross-borehole acoustic measurements and deployment of the OSN seismic system.

DMP has extended its list of watchdogs for specific tools: KeirBecker--CORK; Johann Draxler--third party tools; Robert Desbrandes--magnetometer tools; JorisGieskes--WSTP; Steve Hickman--LAST; Mark Hutchinson--MWD; Peter Lysne--hightemperature tools; Karen von Damm--fluid sampling tools, WSTP; MikeWilliams--land-based tool test facilities. Any queries concerning logging tools can also be addressed by e-mail(DMP@sandia.gov) which is automatically forwarded to DMP members, PCOM,thematic and service panel liaisons or panel chairs and contract operators.

The next meeting of DMP is to be held in Santa Fe 12-14 October as a joint session with LITHP. Agenda topicsinclude formation characterization in regions removed from the borehole,high temperature instrumentation, the digital borehole televiewer, and MWDfor Barbados.

III. Review of New Proposals

III. A. Rifted Margins and Oceanic Ridges

III.A.1. 079 Rev 2 Mesozoic Somali Basin/Coffin et al.

This a technically challenging site at 4000 m. water depth, involvingpenetration of 2500 m of sediments and 500 m of basalt. The location isindeed critical to an understanding of the Mesozoic evolution of Tethys fom theAtlantic to the northern Australian areas, which have been the target ofprevious DSDP and ODP drilling. Most of the objectives are essentiallypaleoceanographic and thus outside TECP's mandate. The main questions of tectonic interest are the nature andalteration of Jurassic marginal oceanic crust, regional platereconstructions, and in situ stress measurement. None of these topics,however, are of sufficient importance to TECP to justify drilling based on tectonics objectives alone. TECP would,however, have a lively interest if the proposal emerges as a high priorityfor another panel. TECP encourages the proponents to obtain the necessaryadditional site survey data to allow specific site locations.

TECP emphasizes also its desire for three-dimensional characterizationof the proposed drill sites wherever possible. Detailed structural mapsand accurate true-scale cross-sections (balanced to the extent possible)need to be presented to provide better constraints and justifications for the drillsites. The specific objectives and hypothesis-testing questions for eachdrill site should be clearly stated.

Box: 3.

III.A.2.334 Rev 3 Galicia Margin S' Reflector/ Boillot et al.

This proposal presents the S' reflector as an alternative to the proposed,deep S reflector site, which could pose severe problems given current ODPdrilling technology. In response to previous comments, the proponents havemade considerable efforts to present a balanced view of the correlation of the S' reflectore with theS reflector. Several problems exist with this correlation. Even thoughthe S reflector and basement merge on seismic profiles, it does not meanthat the S reflector continues onto the peridotite ridge. The proponents suggest that the S' reflector online GP 03 connects to the top of the peridotite ridge. This may not beso. The reflectors shown could be due solely to crystalline basementoverlain by pre-rift sediments. The amplitude attenuation analysis may indicate a close correlation between S andS', but does it really indicate anything more than the presence of a strongreflector at about the same level in one part of the section? Nevertheless, the equivalence of S and S' is not as critical as the question of the process involved. Given theproblems in assessing the nature of the enigmatic terrane (ET), TECPsupports the proposed drilling strategy (ET velocities are close to thosefor syn-rift lithified sediment velocities on other margins).

Although this proposal addresses a high priority objective of the TectonicsPanel, the proponents need to address the scientific feasibility andpotential outcome of the drilling, particularly if ET is not basement. What is one hole through the S' reflector going to tell us? What would be measured and sampled with drilling? What technological developments would be needed to generate significantresults from drilling this comparatively deep hole? Comparable sedimentarysections have already been drilled, although the timing of the Transverse fault andconstraints on vertical motions would provide valuable tectonic data. TECPdoes, however,

recognize this proposal as a mature proposal which addressesmany of the same objectives outlined in the S reflector proposal.

TECP emphasizes also its desire for three-dimensional characterizationof the proposed drill sites wherever possible. Detailed structural mapsand accurate true-scale cross-sections (balanced to the extent possible) need to be presented to provide better constraints and justifications forthe drill sites. The specific objectives and hypothesis-testing questionsfor each drill site should be clearly stated.

Box: 4.

III.A.3. 432 A deep hole off Galicia-S reflector/Reston et al.

In general this proposal is a good writeup of the problem. Previouswork: DSDP hole 398 was drilled in this area in 1979. Holes 637-41 on leg103 established the stratigraphic corrrelation and extended thestratigraphic documentation back to rifting in the Valanginian (early Jurassic), possibly in two phases. Related dives (Galinaute cruise) established tilted fault blocks andcharacterized the ocean-crust boundary (OCB) crust as serpentinizedperidotite. The proposed drill hole is 30 km west of Leg 103, within a grid of seismic reflection lines that have beendepth-migrated and interpreted. The velocity above the S-reflector wasalso studied from MCS, but surprisingly, no wide-angle data are shown(deep-water velocities based on MCS can be misleading). Despite the listing of ten objectives, only those relatingto the S-reflector and perhaps the subsidence curve are really valid and ofprime interest. The sedimentological objectives of the early syn-riftsediments can be addressed on topographic highs where the sediments are exposed and accessible tosubmersibles. The considerable variability in the sediments found on Legs103 and 149 make the interpretation of one more hole somewhat murky. Questions of low-grade metamorphism and diagenesis and of magmatic events are somewhat problematic and uncertain. Theauthors should show AVO, waveform analysis, etc., to constrain velocities,to present the internal structure of S (low V, high V, laminated,thickness, etc). S' reflector questions may be of more interest.

TECP emphasizes also its desire for three-dimensional characterizationof the proposed drill sites wherever possible. Detailed structural mapsand accurate true-scale cross-sections (balanced to the extent possible)need to be presented to provide better constraints and justifications for the drillsites. The specific objectives and hypothesis-testing questions for eachdrill site should be clearly stated.

Box. 4.

III.A.4. NARM Add Non-volcanic Atlantic Margin--Newfoundland/Austin et al.

This proposal attempts to bolster the case for drilling the toppriority deep hole at site NB 4A in the northern Newfoundland basin,conjugate to the Iberian abyssal plain (the subject of completed Leg 149);the two together forming the focus of drilling for the North Atlantic 'non-volcanic' rifted margin project.

Site NB 4A is in the controversal area of deep water between thecontinental shelf edge and recognizable (i.e. obviously magneticallystriped) oceanic crust. The primary aim of the hole is to establishwhether the basement is continental or oceanic, thereby testing which of two opposing ides for the position of theocean-continent transition is false. At the outset, this proposal raises abroader issue of the likelihood that the primary aim for this hole would be met, without considerable testing in moreholes to basement in the area. The concern , which was raised during NARMDPG discussions but got submerged by other enthusiasms in the NARM DPGreport, is that in the evolution of highly stretched continental crust, combinations of inhomogeneous strain(boudinage) and possible widespread intrusion of mafic magma might resultin a patchiness of

recognizable pre-existing continental basement subcropamong quasi-oceanic material. If so, there would be no uniquely definable ocean-continent boundary and the"transition" might extend over several tens of kilometers or indeed thewhole length of the controversial deep-water area. The metagabbroicbasement found in Hole 900 (Leg 149) illustrates this potential problem. In addition, the objectives of the "U"unconformity are better addressed at site NB1 than does this site. Thecharacterization of the basement of NB 4A is problematic, based on eitherreflection character or seismic velocity.

This proposal responds to criticisms in three specific areas regarding siteNB 4A in the controversal area of deep water between the continental shelfedge and recognizable (i.e. obviously magnetically striped) oceanic crust. These areas and TECP's assessment of the responses are as follows:

1. Issues of conjugacy/tectonic fabric. There still is uncertainity ofmany tens of kilometers in the fit of the supposedly conjugate margins, sothat co-linearity of the two parts of this transect is not guaranteed. This is probably not a major problem because structures aroundthe drill sites appear to extend for several 10's of km along strikewithout any obvious major terminations. The somewhat allied problem ofoverprinting during propagating spreading has long been recognized as applying in this area (e.g. as witnessed bythe multiple unconformities on the Grand Banks) and it is probably the bestreason for looking at other sites for understainding processes associatedwith one rifting event. This problem is also probably not a major one.

Although TECP has never formally criticized the lack of a tectonic map inthe NARM DPG, the Panel does view the production of such maps as aninvaluable tool in refining and sharpening tectonic drilling objectives.Thus we wish to commend the proponents for their valiant attempt at a tectonic map.

2. Quality/quantity of existing multichannel seismic control. Thenew site survey data are a big improvement over the older data used in theoriginal proposals and in the NARM DPG. What the new data confirm, however, is a major difficultyin recognizing basement. The arguments on page 15 and in figure 21illustrate the ambiguity of a shallow or deep "pick" of basement. Possiblya site closer to the extreme right-hand arrow of Figure 21 and intersecting the dipping horizon would bebetter. The "acoustic basement" may be not crystalline continentalbasement at all, but either early rift sediment, orNeoproterozoic-Paleozoic Appalachian sediments (Meguma sequence?) involved in a southeast-vergent fold-thrust complex, possibly modified bysubsequent northwest-dipping normal faulting. The refraction velocitycontrol sheds little light on the nature of the basement.

The processing scheme adopted for the seismic data is a fairly basic one. Possibly DMO and pre-stack migration, particularly using the iterativeprestack depth migration procedures, illustrated in proposal 432 (Reston etal), could dramatically improve the definition of basement and the dipping sequences beneath the Uunconformity.

3. Construction of balanced cross section. TECP wishes also to commend theproponents for their attempt at the construction of a balanced crosssection. Like tectonic maps, such a section is a means of refining andsharpening focus on tectonic drilling objectives. Although the construction of balanced sections for wholemargins can be very subjective and may require many assumbtions, it is avery useful aid to proponents when thinking about the extensional historyand processes that have operated, and may point out inconsistencies in the proposedmodels. Figure 26 and the figures leading up to it are very interesting. For example there appears to be a significant change in the style of uppercrustal extension in the Salar basin area--could this be the side of a major transfer/accommodation zone? There is a significant change in the amount of upper crustal extension fromthe area of the Jeanne D'Arc/Salar basins (42%) to the Newfoundland Bain(9%; Figure 25), and there must also be a significant change in the amount of deep (lower crust/uppermantle) "sub-detachment" thinning between these two regions to account forthe change

in water depth and crustal thickness. That is, much of thethinning of the inboard basin system is in the upper crust resulting in significant subsidence during the thermalsag phase following rifting. The balancing allows subsidence models to beproposed that can be tested by drilling.

Figure 26 shows conjugate margin balancing incorporating Flemish Cap at the western end of the extensional systm, whereas one might haveexpected that this should show the Grand Banks basin system, including theJeanne D'Arc Basin to truly represent the conjugate margin drillingtransect. Also Figure 26B (E) shows the 'tilt' blocks beneath the Newfoundland basin to have been tilted aboutwest-dipping faults, an unexpected relationship if upper crustal extensionhad occurred above a detachment which shallows to the west and incorporatestransport of upper crustal blocks to the east. Section C of this figure is more closely related to thedrilling transect and shows both east and west dipping faults beneath theNewfoundland Basin, presumably based upon the dipping reflector sequencesthat the proponents have placed within basement, i.e. beneath their preferred basement pick.

In summary, although this addendum is a much better proposal than theoriginal, the selected sites are still hampered by the same problems. Foroptimum basement characterization, NB4A should be moved southeast of its current location. Even then the site would beseriously compromised by the lack of sufficient definition of basement atthe specific sites and the uncertainity of the significance of a spotdetermination of basement at any site. Perhaps a multi-hole step-wise strategy for basement sampling, such asthat begun on the IAP, will be necessary.

For further information on these or other points, the proponentsshould contact TECP's watchdog on rifted margins, Phil Symonds.

Box: 4

III.A.5. NARM Add 2. NARM Volcanic--East Greenland/Larson et al.

TECP strongly endorses this amendment. It capitalizes on new MCS data thatreveal relatively shallow (300-400m) targets in the shallow water (<500m)of the E. Greenland margin. The new proposed sites can provide criticalinformation on the style and timing of the seaward-dipping reflector (SDR) sequences and adjacent, stronglydeformed continental basement. These holes cross a critical portion of themargin and will help tie the stratigraphy of deeper seaward holes with the "feather edge" of the SDR wedge. The proposed drilling provides and essential link with related structuresexposed on land, without duplicating information available there. A newinitiative to provide additional details of the on-land structures is a welcome addition to this study. Drilling on Leg 152, the second EG 63 leg and these subaerial studiesshould produce a major advance in the understanding of the architecture ofthis volcanic rifted margin and the processes that have created it.

TECP emphasizes also its desire for three-dimensional characterization ofthe proposed drill sites wherever possible. Detailed structural maps andaccurate true-scale cross-sections (balanced to the extent possible) needto be presented to provide better constraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should beclearly stated.

Box. 5.

III.A.6. 425 Rev Offset drilling--15o20' North/Casey, Cannat et al. .

The Mid-Atlantic Ridge near the 15o20' North fracture zone clearlyrepresents a complex mode of sea floor spreading. TECP appreciates thepetrological, geochemical, and hydrothermal objectives of the proposeddrilling, but also believes that the tectonics objectives can be

substantially strengthened. TECP is very interested indetachment tectonics and associated deformed rocks. Problems noted withthe current proposal include:

1. Highest priority drill sites are located away from mapped primarylithologic contacts and are unlikely to penetrate them.

2. The proposed drill sites do not appear to constitute a viableoffset drilling strategy in that units that could conceivable be laterallycorrelated or a single fault block structure are present only for sitesS1/S2 and N1/N2.

3. The nature of the contacts between median valley basalts andmedian wall plutonic rocks is not clear. Are the volcanics allochthonous(i.e., the hangingwall of the proposed detachment), or are they resting with depositional contact over a detachment surface?

4. The specific tectonic hypotheses to be tested are not clearly spelled out.

TECP emphasizes also its desire for three-dimensional characterization ofthe proposed drill sites wherever possible. Detailed structural maps andaccurate true-scale cross-sections (balanced to the extent possible) needto be presented to provide better constraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should beclearly stated.

TECP did not feel that any of the rankings available adequately expressedits opinion of this proposal. The Panel believes that interesting andimportant tectonic problems may be addressed in this area, but that eitherthose problems have not been clearly delineated in the context of drilling or that this may not be the bestlocation to study them.

Box: 3.5.

III.A.7. SR Rev 2 Sedimented Ridges II/Franklin and Zierenberg.

This is the second leg of a proposed two-leg program of drilling in Middle Valley of the northern Juan de Fuca Ridge andon the southern Gorda Ridge at Escanaba Trough. These spreading axesexhibit important sedimentary deposits, mostly continental turbidites,covering 0-age crust.

Leg 139 drilled four sites in four distinct environments along the easternside of Middle Valley. Site 885 included a four-hole transect across thehangingwall of the rift valley-bounding fault. The objectives of the holewere to characterize the nature of the water that recharges the hydrothermal system. Drilling established that seawateris being drawn down into the oceanic crust along the fault plane. TECPnotes with concern that although these objectives and results are clearlyof tectonic interest and that the control of the hydrothermal system is structural, apparently no detailedstructural studies have been carried out, and none apparently are proposed.

Site 856 included two holes (A and B) into a small hill ofsediments--Bent Hill--which bottomed in primitive (picritic) basaltic sills. The hill is close to an outcroppingsulfide mound and a hot spring of clear water. The uplift of the hill isthought to be related to intrusion of sills. Six shallow holes were alsodrilled across the massive sulfide deposit. The deepest hole is 95 m. deep; logging data indicates a deposit ofpure massive sulfides (pyrite and pyrrhotite) with almost no interbeddedsediments. The Sedimented Ridges group considers these results to be veryexciting and proposes to drill four 200-350 m in this area to determine the thickness and geometry of thedeposits, the timing of deposits, the nature of the footwall, and the rateof flow paths. TECP's view of this area is that the main question to beposed is whether the control of localization of the upflow and discharge of sulfide-forming fluids is avolcanic high or a structural feature. To answer this question it isnecessary to determine the nature and structure of the basement below thedeposit.

Site 857 included four holes to a total depth of 936 m, bottoming out in a sill complex. The Leg IIproposal includes reoccupation of this site to replace a failed thermistorstring and recording package and to monitor temperature and fluidcomposition.

Site 858 included four shallow and two deep holes in the Dead Dog ventfield, which established sharp lateral limits to the upflow system. In LegII they propose to complete the shallow hole transect to determine thecomposition and processes leading to mound growth.

Finally, four sites are porposed for the Escanaba trough, an area ofvolcanic edifices and hydrothermal deposits interlayered with thicksedimentary sequences.

As written the objectives of this proposal are mostly to determine thecomposition and the growth history of the massive sulfide deposits and thehydrogeology of the active vents. The volcanological and petrologicalaspects of the proposal are well formulated. The proposal is seriously deficient in its discussion of the structural and tectonic aspects, however. Although it seems highly likely that one of, if not the, principalcontrol of hydrothermal deposition is faulting, the proponents do not dealwith the structural setting, nor do they indicate how information from thecores will help in determining the geometry and nature of the structural setting of these deposits. Theauthors do not envision that discrete extensional processes, includingfaulting and brecciation, and changes in stress state may importantlyinfluence the fluid circulation. The thick sedimentary cover that covers the 0-age crust has an excellent potentialfor recording of structural information. Detailed stratigraphic andmicrostructural analyses potentially will enable the development of adetailed history of extension in relation to volcanism, sedimentation, and hydrothermal system development. Suchstudies would also allow detailed comparison with other slow-spreadingcenters where spreading may have alternated between mostly tectonic andmostly magmatic episodes on a time scale of 0.3-1 m.y.

TECP's conversations with the Sedimented Ridges Group indicates that theyrecognize the important role that structural processes have played. Indeed, they recognize that the scientific party of Leg 137 was inadequateto describe and interpret the results of the drilling. TECP urges that the group revise and resubmit thisproposal including an analysis of the structural setting of the depositsand the possible controlling role of structures in their formation. Thisanalysis should include, but not be limited to a salvage operation of examining existing coresfor structural information. TECP would be very interested in a revisedproposal that adequately incorporates structural information in definingthe proposed drilling targets. (TECP would also like to recall to the proponents' attention the suggested TECPChecklist published in June, 1991, JOIDES JOURNAL). TECP urges that forrevision, the proponents add to their team someone with the requisitestructural and/or tectonic expertise.

TECP emphasizes also its desire for three-dimensional characterization ofthe proposed drill sites wherever possible. Detailed structural maps andaccurate true-scale cross-sections (balanced to the extent possible) needto be presented to provide better constraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should beclearly stated.

Ranking this proposal on the numerical scale is difficult. It shouldand could address high-priority thematic interests, but as written it doesnot. Thus the proposal ranks somewhere between 2 and 4.

III.B.Convergent Margins

III.B.1. 400-Rev Determination of mass balance, fluid flow and deformationmechanisms, Middle American Trench off Costa Rica/Silver et al.

This is a revision of a proposal that was highly ranked by TECP in1991. At that time, TECP agreed that the determination of the mass balancein accretionary prisms is of fundamental tectonic significance and that theCosta Rican convergent margin is probably the best place to carry out this experiment becauseof the lack of a trench wedge and a continuous slope cover that preventsloss of the prism by erosion. Several questions were raised in the initalreview and the proposal was assigned a "4".

This revision addresses the questions raised in the initial review,strengthens the fluid flow aspect of the original proposal and adds acomponent to study the fate of subcrustally subducted sediment. Becausethe Costa Rican volcanic arc is one of the most thoroughly studied in the world, a vast and comprehensivechemical data set exist for the volcanic output with which to comparesediment inputs as determined from the proposaled drill cores.

The 2-D and 3-D seismic data are of high quality and constrain the prismgeometry and structure well. New ALVIN observations and heat flowmeasurements to be made in early 1994 will help document the effects offluids on prism deformation by testing for fluid flow around out-of-sequence thrusts, the frontal thrust, and the mudvolcano. Piston cores will also be collected to further constrain drillingtargets.

This proposal now addresses mechanisms of deformation, fluid flow, and massbalance within accretionary wedges, all high-priority objectives of TECP. TECP still believes that the Costa Rica convergent margin is probably thebest place to carry out this experiment because of the excellent data base, lack of a trench sedimentwedge, continuous slope sediment cover, and well-studied arc volcanoes.

TECP emphasizes also its desire for three-dimensional characterization ofthe proposed drill sites wherever possible. Detailed structural maps andaccurate true-scale cross-sections (balanced to the extent possible) needto be presented to provide better constraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should beclearly stated.

Box: 5.

III.B.2. 435 Crustal Fluxes into the mantle at convergent margins:Nicaragua and Izu-Mariana margins/ Plank et al.

This proposal addresses the flux of crustal material subducted at tworelatively simple convergent margins. Both have a distinct petrochemistryas known from previous drilling in the oceanic crust and extensivesampling of the Central American volcanic arc. Sufficient previous DSDP and proposed ODP drilling provide regionalcontrol. The more "global" view of two entire convergent margins givesthis proposal a breadth surpassing more local studies of an accretionarywedge.

Once it was recognized that globally more sediment has been subducted thanaccreted, the question has always focused on the fate of this material. The proponents think that much can be learned from drilling off Nicaraguaregarding partitioning into accretion, underplating, tectonic erosion, recycling in volcanoes, or returen tothe mantle. It seems quite possible to greatly narrow the volumetricconstraints on this partitioning off Nicaragua.

There are insufficient existing geophysical data, however. One early KT seismic line exists across this margin. It needsconsiderable reprocessing. Desirable would be swathmapping along this lineto get a third dimension. This a minimum required to define theaccretionary prism. Desirable is better magnetic data seaward of the trench. Good velocity structure from wide-angleseismic data would be very helpful.

TECP emphasizes also its desire for three-dimensional characterizationof the proposed drill sites wherever possible. Detailed structural maps and accurate true-scale cross-sections (balanced to the extent possible)need to be presented to provide better constraints and justifications forthe drill sites. The specific objectives and hypothesis-testing questionsfor each drill site should be clearly stated.

Box: 3

III.C. Collisional Settings

III.C.1. 323 Rev 3 Alboran Sea/Comas et al.

The Alboran is a deformed extensional basin surrounded byoutward-driected compressional thrust systems. It remains a basin forwhich no adequate geodynamic model exists, although a number of contradictory partial kinematic models havebeen proposed. Because of the lack of agreement, drilling has theopportunity to have a significant impact. Well data are confined to theSpanish and Moroccan margins and DSDP 121, which lies on astructural high. TECP has rated drilling in the AlboranSea highly. There have been major problems, however, with the proposed legwith regard to drilling time estimates and site safety. This revisionaddresses these problems with a modified drilling plan. Essentially, the deep hole and the nearby hole havebeen combined into one shorter hole and the other two holes have beenshortened and no longer reach basement.

Structurally, the Alboran Sea contains several basins, plateaus, and ridgesthat are manifestations of the extensional and transpressional tectonics ofthe region. The drilling plan, both previously and now, will samplesedimentary sequences from three distinct regions. In order of decreasing understanding of their tectonichistory, they are the Western Alboran, the South Alboran, and the EastAlboran basins, respectively.

In the earlier proposal, a deep hole was to penetrate the thick sequence ofthe Western Alboran basin into the lower-middle Miocene synrift section. The hole was located in a major half-graben towards the (low-angle?) borderfault. A second hole updip was to sample the basement. Leg 121 recovered 16 Ma metamorphic basementfrom another part of this high. Since strata in the fault block includeearly Miocene sediments, it is unclear if Leg 121 encountered true basement ora deformed detachment surface. The crustal domain of the Western Alboranregion was not determined.

Problems with these holes included estimated thicknesses and resultantdrilling times and overpressure in the lower section. Wells along theSpanish margin are all located within the Western Alboran basin. Seismicprofiles have been grossly correlated to these wells to identify 6 uits. The lower units in these wells areoverpressured, however. Also, revised drilling time estimates for the deepwell indicated that it would have taken an entire leg.

The proponents have corrected these deficiencies by moving the new Alb-1site updip. It htus avoids the deeper overpressured units and reachesbasement with a single hole, combining most of the objectives of the twoprevious holes in one. It also penetrates basement on the border fault itself, rather than on the adjacentbasement high. With 150 m basement enetration it should sample both the deformed fault and the underlying basement. A replacementhole, Alb-2, has been sited to enable the basement objectives to beachieved in the event of problems being encountered in the deeper Alb-1.

The drawback of the new plan is that it no longer samples the lowermostrift units. This seems a worthwhile compromise. Lower Miocene extensionis well known throughout the northern margin of the Alboran Sea, bothoffshore and onshore, as well as much of the western Mediterranean. The Western Alboran basin is the best-known of a poorly known region. The

largerproblems of the Alboran Sea are related to the subsequent deformation andwhether the extended terrane has undergone westward (or eastward, for thatmatter) translation and by how much. The early Miocene geometry of the Alboran Sea can only be determined bysorting out the middle Miocene-Recent deformation and associations of thebasement.

The drilling site in the South Alboran basin Alb-3 was sited to data azone of compressional deformation that extends for 50 km along the south flank of the AlboranRidge. Previously this hole extended to basement. However, the basementoutcrops along the Alboran Ridge, and a proposal has been submitted tosample the basement adjacent to Alb-3 using the submersible CYANA The basement at the drill site appears to beidentical to the outcropping basemnet. Thus the proposed hole has beenshortened to concentrate solely on the timing of the deformation along theAlboran Ridge. The proponents consider this site to have the lowest priority in the event of any drillingdelays.

The last site, Alb-4 lies in the poorly understood East Alboran basins. Extension here probably is later than in the western Alboran basin. Somesort of upper Miocene extension/strike-slip motion may be required toenable the westward movement of the Alboran Sea/Gibraltar Arc. In fact the age of the entire SouthBalearic/Algerian ocean (??) basin, onto which the Eastern Alboran Seaopens, is highly uncertain, and may be younger than other parts of the Western Mediterranean. This site will drill through the postrift section into the synrift strata of the Eastern Alboran.

Relative to the earlier proposal, the drill site has been shifted slightlyto the north and shortened so that it will not penetrate basement. As withAlb-3, basement samples will be obtained by submersible. The total depthof the hole is now somewhat adjustable. The minimum penetration will be 650 m, sufficient to drill intothe upper part of the synrift section. If time allows, drilling will continue for an additional 250 minto the synrift section. The main determinant will be whether basementcan be drilled at Alb-1 or if Alb-2 must be drilled to obtain WesternAlboran basement.

Given that the previous, highly ranked, proposal was judged to be close totwo legs in length, the substantial cutting of the drilling time wasaccomplished with minimal loss to the leg. This was accomplished byshifting basement objectives in the South and East Alboran to submersibles and combining the first two holes into one shorter one,leaving out only the deepest part of the Miocene section. The drilling legwill still obtain a complete Middle Miocene and younger seciton in thedeepest basin of the Western Alboran Sea, better estimating the later part of the subsidence and extensionalhistory; sample and date the detachment(?) fault and basement of theWestern Alboran, date the compressional motion along the Alboran Ridge,sample and date the syn and postrift sediments of the Eastern Alboran Sea, constrain the subsidence/extension history ofthe Eastern Alboran Sea. The successful model for Alboran evolution maybe a modification of one of the two presented by the proponents, oralternativelysome other sort of tectonic escape model. Although drilling may not solve all the problems of thetectonic history of the Alboran Sea, it will fill in some glaring gaps thatimpede formulation of a comprehensive and coherent model for evolution ofthis kind of extensional basin within a collisional region. Furthermore, the objectives of the leg can onlybe accomplished by drilling.

Box: 5.

III.C.2. 330 Add 3 Mediterranean Ridge I (shallow)/Camerlenghi et al.

This is a mature proposal that is well-designed to address processes ofhigh interest to TECP, related to deformation at a convergent setting withalong-strike structural variations (representing the final closure of anocean basin and the transition from incipient to actual continental collision). The proposed work is also highly relevant to understanding the fluid flow regime and how it maybe controlled by faults and dewatering within the accretionary wedge. Inaddition, the Mediterranean ridge is lighologically unique, compared toaccretionary prisms

already studied by ODP, because of the presence of evaporites (below the depths targetedfor drilling). The distribution of fluid types and deformation patternshere will, therefore, be extremely relevant to the interpretation ofTethyan and other salt-bearing areas. The drilling plan is well-designed to achieve the desired tectonicobjectives, and it is well integrated with other detailed studies(including IMERSE and MEDRIFF). Drilling in the context of these regionalstudies should yield a very high-resolution picture of the fluid flow and deformational processes occurring across thedeformation front of the Mediterranean ridge, as well as how these varyalong strike.

The revised proposal includes drilling through two different activefault zones at very shallow depths. This is well within TECP objectives and ought to yield some veryinteresting information. Final site selection is awaiting the results ofMCS data that were still being collected at the time of the Panel meeting. TECP stresses the importance of having the entire site survey package in the database as soon as possible.

TECP notes two items of concern in the details of the proposal: 1. Wehave not seen time estimates for drilling that clearly include preparationof holes for installation of CORK and other detailed activities mentioned in the text of the revised proposal;2. The Eratosthenes seamount is a very important drilling objective notonly for its post-Messinian section (of primary interest in this proposal),but also for possible pre-Messinian sedimentary units and because the composition of its basement, and henceits original tectonic setting, is unknown. We stress that flexibilityshould be maintained to drill hole ESM-1 to greater depth (say, 500 m) ifnecessary in order to address either of these two additional objectives.

TECP emphasizes also its desire for three-dimensional characterization ofthe proposed drill sites wherever possible. Detailed structural maps andaccurate true-scale cross-sections (balanced to the extent possible) needto be presented to provide better constraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should beclearly stated.

Box: 5.

III.C.3. 433 Medierranean--a new theory of orogeny/Hsü et al.

This is an interesting proposal which potentially would contribute tounderstanding of the Mediterranean as a natural laboratory. The authorspropose to drill the Eratosthenes seamount in order to clairy 1. thegeneral lack of an Alpine magmatic arc; 2. whether Alpine ophiolites are related to a back-arc setting; 3. evolutionof the Paleotethys in the eastern Mediterranean; and 4. collisionalinteraction of Africa and Europe.

The lack of an Alpine magmatic arc may be due to slow Alpine subduction rates (0.5-1 cm/yr, rather than the 3-6 cm/yr needed tomaintain ;continuous asthenospheric melting; Blankenburg & Davies, 1993 ,Terra Nostra, 1, p.; Davies & Stevenson, 1992, JGR, 2037). The proposal outlines some ingredients of testing a radical new theory ofmountain building involving the concentration of orogenic deformation inthe "back-arc" as opposed to the "forearc" region of convergent margins. This idea flies in the face of conventional wisdom, but Hsü has often been right in the face of conventional wisdom to the contrary. Classic back-arc basins,however, appear to form only with west-dipping subduction zones, and such apolarity is lacking for the Alps (Doglioni, 1993, Journal GeologicalSociety, London, 150, 991).

The proposal does not distinguish the Adriatic from the African plate,although they were separate at least during opening of the Ionian Seaduring the Mesozoic. Thus the African-European relative motions are notdirectly related to Alpine subduction. Activity in the Balkans and the Mediterranean Ridge was really differentfrom movements in the Alps, proper.

TECP notes that the proposal as it stands must be considered preliminary,as it, for example, contains no detailed site information. No seismic data,nor any references are provided. Detailed site information must accompanyany future revised submission. On a positive note, TECP notes, however, that the proposed drilling ofthe Mediterranean Ridge and Eratosthenes Seamount (330, Add 3) byCamerlenghi et al, (see above) would provide an effective test of Hsü's ideas. We reiterate our encouragement of these two groups to worktogether.

TECP emphasizes also its desire for three-dimensional characterization ofthe proposed drill sites wherever possible. Detailed structural maps andaccurate true-scale cross-sections (balanced to the extent possible) needto be presented to provide better constraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should beclearly stated.

Box: 4.

III.D.Transform Faults

III.D.1. 333 Rev 2, Cayman Trough/Mercier de Lépinay, et al.

This proposal has undergone major revision since last reviewed by TECP. Many of TECP's previous suggestions have been incorporated into the revisedproposal, includling dropping of several sites at the far eastern end ofthe basin that can be investigated by dredging and the addition of sites at the western end to explore theconjugate nature of the basin. Several of the thematic objectives as broadly outlined in the proposal are of greatinterest to TECP. In particular, we are impressed with the potential ofdeveloping a program to investigate asymmetric conjugate rifted margins ina thinly sedimented environment; this may turn out to be an exceptional area for studying subcrustal detachmentfaults. For example, the discovery of an "S" type reflector that wererelatively accessible by drilling would be very exciting. A great deal ofwork, however, must be organized and carried out by the proponents before the full potential of this region fordrilling can be adequately assessed. Multi-channel seismic data areurgently needed over the conjugate margin zones. Other data that wouldenable the panel to judge the merits of drilling, such as last year's aeromagnetic data, must be presented to TECPfor evaluation. In general, the proponents need to take the various themesthat are merely outlined in the current proposal and develop much morefully the rationale for drilling. Given the strong potential of the area for addressing important TECPthemes, we strongly encourage the proponents to continue their efforts.

TECP emphasizes also its desire for three-dimensional characterization ofthe proposed drill sites wherever possible. Detailed structural maps andaccurate true-scale cross-sections (balanced to the extent possible) needto be presented to provide better constraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should beclearly stated.

Box: 4.

III.D.2.346 Rev 4 Equatorial Atlantic Transform/Mascle et al.

TECP was very pleased with this substantially revised version of theproposal, that incorporates most of the more recently acquired information,including MCS and submersible results. TECP feels that the drillingstrategy is appropriate and should be capable of shedding important light on key tectonic problems at translationalmargins. The panel noted that the TAMU drilling times suggest that some additional time could remain after drilling and we urge thatplanning proceed for a complete program of logging. In summary, TECPbelieves that this is a mature high-priority thematic proposal that couldno be scheduled for drilling without delay.

Box: 5.

III.D.3. 386Add California Margin/Lyle et al.

This is an addendum to 386Rev 2 in combination with 422 Rev. Previously 25 sites were proposed in 386 Rev2, but in order to condensethem into one leg, 14 sites were selected with 56.6 days estimated drillingtime.

There are two main purposes of the proposed drilling: 1. Late Neogene ocean history and biologic productivity along theCalifornia margin in the late Neogene, in response to the Californiacurrent (part of the NE Pacific oceanic circulation) and attendant upwelling; and 2. Investigations of questions of the variations in CCDand deposition of gas hydrates. These two questions are of primaryinterest to OHP and SGPP.

The principal goal of tectonic interest relates to proposed hole CA-4, which would provide oriented core of sediments deposited above thedeforming and shearing oceanic crust of the Gorda Plate and attempt to usemagnetic declination variations within the sedimentary colume to testdifferent models of the kinematics of the deformation. Because this region is one of the bst-documented areasof pervasive shear shtrain within an oceanic plate, it would be very usefulto penetrate basement in this hole to recover information on stressmagnitudes and/or orientation, from BHTV logs ± hydrofrac tests or FMS logs. A knowledge of the conditions under whichthis deformation is occurring would place useful constraints on models ofstress distribution and magnitudes within plates, a major outstandingproblem of global geodynamics. As a whole, however, the proposal is of secondary tectonic interest.

TECP emphasizes also its desire for three-dimensional characterizationof the proposed drill sites wherever possible. Detailed structural mapsand accurate true-scale cross-sections (balanced to the extent possible) need to be presented to provide betterconstraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should beclearly stated.

Box: 3.

III.E.Caribbean Sea

III.E.1.415 Add Caribbean Ocean History/H Sigurdsson et al.

This proposal is a combination of proposals 415-Rev and 411. Thisupdated proposal is an outgrowth of TECP's and LITHP's request that theproponents of Caribbean drilling combine their proposals into a coherent multi-leg drilling program. It proposes a two-legprogram of drilling, logging, and transit to investigate 1. lateCretaceous-Cenozoic ocean history, 2. the K/T boundary impact site and itsdeposits, and 3. the anomalously thick and shallow basaltic crust that is present over much of the Caribbean plate. The items of interest to TECP involve the nature of impacts and theirstructures as a tectonic problem and the origin of the Caribbean plate. The impact question would be addressed by investigating the distribution of K/T impact ejecta in the Caribbeanregion, as well as evaluation of the Chicxulub structure as the source ofHaiti impact glasses. The Caribbean plate origin questions involve itspossible derivation from the Pacific or Atlantic Oceans, and the nature of the volcanic event. The sitelocations in this proposal are those previously proposed in 415-Rev.

TECP emphasizes also its desire for three-dimensional characterizationof the proposed drill sites wherever possible. Detailed structural maps and accurate true-scale cross-sections(balanced to the extent possible) need to be presented to provide betterconstraints and justifications for the drill sites. The specificobjectives and hypothesis-testing questions for each drill site should be clearly stated.

In spite of TECP's interest in the general questions, the proposal aswritten addresses primarily OHP and LITHP concerns. Thus the proposal isof secondary interest to TECP if it is of great interest to anotherpanel.

Box: 3.

III.F.Sediments, etc.

III.F.2.408 Add Miocene--Nicaragua Rise/Droxler

TECP sees nothing in this addendum to change our original opinion that thisproposal does not deal with high priority TECP objectives. In theirresponse to TECP, the proponents have not attempted to answer some of thespecific questions we raised, such as the significance of bank growth, rather than faulting, in forming thesegmented bank architecture of the area.

Box: 2.

III.F.2.423 Add Gas hydrates/Paull

TECP notes that the proposal plans to investigate gas hydrates in a stable,tectonically inactive area of the Blake Ridge and Carolina Rise, thuslimiting our interest in the drilling. TECP is interested in gas hydrates'possible role as a tectonically significant fluid, and we also feel that changes in sediment structure related togas hydrate formation does constitute a process of tectonic significance. TECP is interested in the plans to drill deformed sediments around themargin of a diapir, TECP urges that a structural geologist be included in the scientific party, should theproposal be drilled.

Box: 3.

III.F.3. 391 Rev 2 Mediterranean Sapropels/Zahn et al.

The prime focus of this proposal remains paleoceanographic. The value forTECP would be to achieve a regional stratigraphic data base to serve as a"dipstick" in this tectonically active region and to establish a basis forregional correlation. The proposal as written contains nothing of direct tectonic interest.

Box: 1.

III.F.4. 354 Add 2 Benguela Current/Wefer et al.

This proposal concerns the Cenozoic development of the current andupewelling systems off the coast of West Africa. This addendum presentsnew high resolution seismic data that has just been collected to aid indetailed site determination. The paleoceanographic objectives of this project are, in general, not of tectonicinterest. However, there are two points where this drilling program may beof interest to TECP.

The West African margin experienced a major erosional event in the mid-Cenozoic. A possible flexural response to this erosion mayhave accentuated erosion on the shelf (McGinnis et al, in press). If so,it may complicate eustatic interpretations of the magnitude of themid-Oligocene sea level fall. The proponents argue that the erosion was assoiciated with the startup of the Benguelacurrent, but sufficient debris from this proposed event has not beenidentified. Drilling could bear on this hypothesis.

In addition, beginning in the mid-Cenozoic, extensive growth faulting over salt deposits occurred along the West African margin. This faulting has led to wholesale seaward rafting of

much of the slopedeposits, salt dome formation, and possible compressional structures on thecontinental rise. These events occurred simultaneously with an increase in sediment flux through the CongoRiver system, which drains much of the western flank of the East AfricanRift. Quantification of the flux could help analyses of the uplift of EastAfrica. Possibly there also are poorly documended tectonic tilting and increases of heat flow along themargin. Drilling could help in determining the history of salt diapirgrowth, terriginous flux from Africa, and correlation of shelf sequenceswith the deep sea record, the latter which at present is prevented by the presence of the growth faulting.

Any possible contribution of this drilling to tectonic objectives isdependent upon drilling to Horizon A, assuming that this corresponds to theEocene-Oligocene reflector associated with the beginning of the changes in margin evolution. This addendum does notspecify the drilling objectives and depths of penetration of the holes. Many of the proposed holes may lie over the rafted regions and thus mayhave been transported westwards by scores of kilometers during the Tertiary. TECP urges that the proponentsadd someone with tectonic/structural interests and expertise to theirteam.

TECP emphasizes also its desire for three-dimensional characterizationof the proposed drill sites wherever possible. Detailed structural maps and accurate true-scalecross-sections (balanced to the extent possible) need to be presented toprovide better constraints and justifications for the drill sites. Thespecific objectives and hypothesis-testing questions for each drill site should be clearly stated.

Box: 1.

IV. Watchdog reports

The following reports that were provided explicitly to the PanelChair. Other reports are subsumed in the discussion and writeup of theTectonics Whitepaper.

IV.A. Stress and Plate Dynamics--Mark Zoback

Not much has been going on since our last meeting since the BHTV has notbeen operational. This has changed, however, due to some fairly intensepressure from a variety of people (including me) and there will be 2 typesof televiewers and 1 technician on board Leg 152 to try to obtain data in the relatively deep holes to bedrilled off the E. Greenland Margin. I have been in contact withHans-Christian Larsen and have offerred to process the BHTV data to search for breakouts and hopefully obtain a useful stress orientation related tothe ridge-push force.

There is still no publication related to the stress measurements in severalholes in the Izu-Bonin forearc (Leg 126) reported by P. Pezard. The datain the stress map that appears in the Proceedings Volume (and the DMPbrochure) is a combination of apparent breakout data (which needs to be checked) and interpretation of localgeologic structures (actually strain not stress!). All this needs to bechecked before its meaning is clear.

Similarly, BHTV from the bottom of hole 504B collected on Legs 137, 140 and148 is quite interesting as it appears to show a stress rotation withrespect to the data obtained previously at shallower depth. These dataalso have not yet been fully analyzed, however, and their significance is not clear. As there has beenconsiderable speculation that a major shear zone (detachment?) is beingapproached near the bottom of the hole, a possible stress rotation isquite intriguing.

In possible upcoming legs, there is hope for successful measurementson the E. Greenland Margin and the Alboran and E. Equatorial Atlantic deepholes (and even SW Indian ridge) have the potential for producing veryinteresting data.

IV.B. Rifted Margins--Phil Symonds

There are ten proposals that fall readily within this theme that werelisted as active as of 1 January, 1993. One other proposal--396 (receivedby JOIDES office on 11 Feb, 1991)--was examined by the NARM DPG, but wasnot incorporated into its drilling transects and should still be listed as active. Thereare four new or amended proposals submitted for review at this meeting (seeitems III.A.2-5 above). Thus there are currently 15 active proposalsconcerned with rifted margins and rifting of continental lithosphere. By January, 1994, two presently activeproposals (265-Add and 363) will become inactive unless revised proposalsare received.

Currently active proposals are as follows:

086 Rev 2 Red Sea (Bonatti). Addresses high-priority TECP objectivesin a region of great interest, but very immature at present.
265/265 Add. Woodlark Basin (Scott)-highly ranked by TECP
333 Rev 2 Cayman Trough (Mercier de Lépinay, Ten Brink, et al). TECP interested, but proposal needs work. See comments in Item III.D.1above.
334 Rev 3 Galicia margin S' reflector (Boillot). See comments in itemIII.A.2 above.
363 Grand Banka/Iberia plume volcanism (Tucholke)--Not included inNARM-DPG because of secondary interest as it stands.
392 Labrador Sea volcanism (Larsen). Considered by NARM-DPG. Addresses high priority objectives with deficiencies. Immature atmoment.
394 Pre-and syn-volcanic extensional basins (Kiorboe). Considered byNARM-DPG. Addreses high priority objectives with deficiences andimmature.
395 Compression on volcanic margin (Boldreel). Considered by NARM-DPG. Is primarily of local/regional interest.
396 Hotspot model for volcanic margins (Anderson). Immature and ofsecondary interest to TECP.
432 Galicia S Reflector (Reston). See comments in item III.A.3. above.
NARM-DPG Highly ranked by TECP. Drilling on Legs 149 and 152. Seecomments in Section V below.
NARM-Add Revision of proposal for drilling in Newfoundland Basin(Austin). See comments in Item III.A.4 above and section V below.
NARM-Add2 Revised proposal for drilling on east Greenland margin(Larsen). See comments in Item III.A.5 above and section V. below.

A new proposal examining the continent/ocean transition south ofAustralia is anticipated in time for review at the next TECP meeting. This area potentially could be a good one to tacklespecific global objectives related to the devlopment of rifted margins andocean/continent transition zones because of its generally sediment-poorcharacter. (Questions of conjugacy with Antarctica could be tackled by interfacing with investigatorsworking with the U.S. N.S.F. Office of Polar Programs with its new researchship, the R/V Palmer.)

IV C. Mid-ocean ridges.

The principal active programs pending include:

1. Leg 153-MARK Nov, 1993-Jan., 1994. Two sites are planned to achieve deeppenetration of a gabbro massif and a serpentinized peridotite in a slowspreading ridge located 10 and 35 km, respectively, south of the KaneFracture Zone. Major tectonic questions include the mechanisms responsible for deep crustal and upper mantle exposuresalong rift-valley walls and the evolution of rift valleys.

2. Leg 154-TAG. Sept.-Nov. 1994. Drilling an active hydrothermalsystem on a slow-spreading ridge (MAR 26o N) to study problems of fluidflow, geochemical fluxes, and associated alteration and mineralization.

3. 300-Rev. Return to site 735. The temporal and spatial variability ofthe lower oceanic crust at a very slow spreading ocean ridge--Se. IndianOcean. Proposal is to deepen main hole to 2 km and add complementary holesof < 500 m at 800 m interval (100,000 yrs) along a lighospheric flow line to explor temporal and spatialvariability. Takes advantage of outcrop of lower crust on wave-cutterrace. Has potential for reaching petrologic moho.

4. SR rev 2. Sedimented Ridges. See comments in item III.A.7 above.

5. 425 rev. Offset drilling within the MAR rift valley at 15o20' N. See item III.A.6. above.

TECP notes that most proposed mid-oceanic ridge drilling sites are close tofracture zones, which according to existing models for oceanic crustalstructure introduces a bias into the results. There is a need to move tomore typical mid-oceanic ridges, such as Hole 504B.

IV.D. Collisional margins.

Current proposals dealing with collisional tectonics are:
1. 323 Rev 3 Alboran Sea
2. 330Add 3 Mediterranean Ridge I
3. 369 N. Australian Foredeeps
4. 383 Aegean Sea
5. 400 Middle America Trench--collisional in the sense of seamountaccretion
6. 433 Eastern Mediterranean-Eratosthenes seamount
7. Sardinia Channel

The first two are mature proposals that are in the prospectus, readyto be drilled, and highly ranked by TECP. The others are all interestingtopics, addressing global questions of convergent and collisional margins. Proposal 400 also is ready to be drilled. 435 and 369have real potential. TECP is concerned about the still underplayed linkbetween on land geology and the drilling proposals. In addition, moreattention needs to be paid to global aspects of accretionary wedges, and possible differences between west- andeast-dipping subduction zones possibly related to westward drift of thelithosphere relative to a hotspot reference frame (Doglioni, 1993, J. Geol.Soc. London, 150, 991). The Nicaragua-Marianas comparison could be a good test of this concept. Drillingalong the north Australia margin could contribute to our understanding ofthe globally economically significant foreland basins.

V. Assessment of NARM Drilling

TECP's recommendations for future NARM drilling are based upon thefollowing factors:

1. TECP's long-standing interest in NARM Drilling, as summarized initem IV B, above.
2. TECP' evaluation of new drilling proposals:
    a. NARM Add--item III.A.4 above;
    b. NARM Add 2--item III.A.5 above;
    c. 334 Rev 3 S' reflector--Item III.A.2 above;
    d. 432 S reflector--Item III.A.3. above.
3. The "thought experiment" on NARM drilling (item ST III from minutesof joint SGPP/TECP meeting.
4. The report on Leg 149 drilling (item ST IIB from joint SGPP/TECPmeeting minutes)

Taking all these factors into consideration, TECP recommends:

1. That the second leg of NARM volcanic drilling be the proposal NARMAdd 2 (Larsen), rather than the second leg as outlined in the NARM DPGreport.

2. The conjugate approach to the Newfoundland-Iberia transect is stillvalid.

3. Problems still exist with the siting of the deep Newfoundland basin site, as outlined in the comments on NARM Add (item III.A.4 above), and it needs further study.

4. The second leg of NARM Non-volcanic drilling should be on the Iberian Abyssal Plain. Because of complications arising from the Leg 149 results,more documentation is needed from that area concerning thethree-dimensional nature of basement highs, the possible dip of faults, and the regional distribution of basement.

TECP recommends a pause, some re-survey, and a new package of approveddrilling targets possibly involving extending Leg 149 sites 898, 900 and901 further into basement, drilling either the S' reflector (item III.A.2above), or site 3 of the NARM DPG report. TECP has appointed a sub-committee of R. Von Huene (Chair), S. Agar,U. Ten Brink, T. Reston, and D. Sawyer to assemble a new package fromexisting drilling proposals. This package will be submitted in time for the December PCOM meeting. The aim of thisnew leg of drilling would be to characterize the regional tectonicsituation more clearly, to understand the geometry of the Iberian sectormore fully, in order to enable a formulation of a new more refined model of the process of rifting in this region.

5. The deep IAP sites need further study before committing drillingtime to them. IAP 1 needs an advocate, currently lacking.

VI. PROSPECTUS RANKINGS

TECP followed its usual procedure, i.e. proponents were identified and enjoined not to vote fortheir own proposal. A total of 5 proposed legs were ranked. Each personranked the legs in the preferred order, giving 4 points to the top choice,3 to the second, and so on, with 0 to the last choice. The scores were totaled by panel nonmembers, anddivided by the number of people voting. Rankings are as follows:

Rank	Proposal	Score (/4)
1.	346 Rev 4 Equatorial Atlantic	3.08
2.	330 Add 3 Mediterranean Ridge	2.45
3.	323 Rev 3 Alboran Sea	2.08
4.	NARM Non-volcanic II (IAP new package)	1.67
5.	NARM Volcanic (NARM Add2)	0.92

VII. Deep Drilling Recommendation

TECP recommends as its target for deep drilling:

The deep Alboran Hole--Alb 1.

In making this recommendation, we note that the hole as proposed inthe revised proposal in the prospectus is highly desirable, but notentirely essential for the success of the proposed drilling. Thus TECPrecommends that it be drilled as deep as practicable.

VIII. Leg 157 Contingency recommendation:

TECP recommends:

346 Rev 4. Equatorial Atlantic Transform

This proposal, highly ranked by TECP, is not far from the VemaFracture Zone, and cold be substituted for the engineering leg with aminimum of disruption of the ship schedule.

IX. Evaluation of PPSS and VPC

PPSS. TECP supports the development of this simplified version of thefailed pressure core sampler. It will be a good tool if it works. Itshows potential of enabling the quantification of in situ volume of gas. Pushing ahead of thecore barrel is a good idea, as it doesn't disturb the core.

VPC -TECP supports the development of this tool. The recovery ofsands is valuable in a number of tectonic environments, such asaccretionary prisms, transform fault basins, etc.

X. Changes in Review Structure

TECP believes that the current review structure works well. We do,however, recommend changes in the proposal review form/procedure. Wesuggest scrapping the 5 boxes, as they have never fit our needs very well, and substituting acheck list addressing the following factors:

1. Are the scientific objectives well thought out?

2. Thematic relevance?

3. Technical feasibility

4. Is this the best place to tackle the scientific problem.

5. Scientific feasibility--can the problem be solved with the drillingplan?

6. Urgency or timeliness of project?

7. Special scheduling considerations--borehole labs, etc.

8. Are the individual site choices justified in the context ofaccurate 3-dimensional characterization of the region?

9. Adequacy of background information?
   a. Site survey data?
   b. Incorporation of all other regional geology (including landgeology).
   c. Geologic/tectonic maps?
   d. Balanced cross sections to the extent possible or appropriate?

10. Appropriate reference list?

XI U.S. Panel Membership.

A. General large-scale tectonics (to replace E. M. Moores)

1. L. H. Royden, MIT

2. An Yin, UCLA
3. Suzanne Baldwin, U. Arizona
4. R. Allmendinger, Cornell
5. G. A. Davis, U.So. Calif.

B. Mid-ocean ridges (to replace Jeff Karson)

1. Yildirim Dilek, Vassar College
2. Steve Hurst, Duke U.
3. Jian Lin, WHOI
4. Greg Harper, SUNY Albany

C. Physical properties (to replace Mark Zoback)

1. Kevin Brown, UC.Santa Cruz
2. Steve Hickman, USGS Menlo Park

D. Paleomagnetism (to replace Steve Cande)

1. Lisa Tauxe, Scripps
2. Jim Channel, U. Florida
3. Dave Schneider, LDEO
4. Steve Hurst, Duke U.

XII. Next Meetings:

Spring: Tentatively March 10-12
Hawaii,
Host: Greg Moore

Fall: Edinburgh?
Japan?
Italy?
Iceland?