JOIDES TECTONICS PANEL:
Fall Meeting:
Nicosia, Cyprus, 20-22 October 1994
EXECUTIVE SUMMARY

Attendees

TECP members; A. Robertson (Chair), S. Agar, K. Brown, C. Doglioni, S. Hurst, Y. Lagabrielle, J. Lin, G. Moore, Y. Ogawa, M. Steckler, J. Stock, P. Symonds, U. Ten Brink, R. von Huene, A. Yin.

Liaisons; P. Clift (ODP-TAMU), K. Gillis (LITHP), H-C. Larsen (PCOM)

Guests; P. Dauphin (NSF), C. Jacobs (JOIDES Office), P. Pezard (ODP-BRG Marseilles), B. Taylor (PCOM)

Host; C Xenophontos (Geological Survey Dept., Cyprus).

1. Ranking of proposals:

Note: TECP voted in favour of also ranking 376-Rev Vema Fracture Zone

Rank	Area	Proposal Reference	Vote Score
1	Costa Rica	400-Add3	8.00
2	SE Greenland Margin	460----	7.73
3	Return to Iberia (NARM N-V II)	461----	6.67
4	Vema Fracture Zone	376-Rev3	5.10
5	Caribbean Basalt Province	411-Rev	4.03
6=	Sedimented Ridges II	SR-Rev3	3.90
6=	California Margin	386-Rev2	3.90
8	East Juan de Fuca Hydrothermal	440-Add	2.90
9	Caribbean Ocean History	415-Rev2	2.77
	West N. Atlantic Sediment Drifts		No Interest

2. Panel Recommendations to PCOM.

For each recommendation below TECP recommends to PCOM that PCOM recommend to JOI Inc. that TAMU be required to implement the specific proposal.

1. Recommendations concerning tool/ technology development (Agenda item 9).

1.1 TECP strongly endorses the continued development of the WSTP with particular emphasis on determining in situ pore fluid pressure measurements.

Explanatory note: Given the close links between fluid flow and deformation TECP is generally supportive of fluid sampling devices (WSTP and PCS) but places a high priority on the WSTP or some modified version of this tool as a means to constrain pore fluid pressures.

1. 2 TECP strongly supports the deployment of CORKS, whenever practicable, as a means to obtain valuable quantitative measurements of environmental parameters that control deformation in active tectonic environments.

Explanatory note: TECP has an interest in using CORKS as a platform for stress and strain monitoring and spatial and temporal fluid pressure and temperature variations. Monitoring fluid chemistry is also an important factor for water rock interaction and its influence on failure mechanisms.

1.3 TECP recommends that near future (5 years) tool development should focus on adapting existing sensors for down-hole radar technology and NMR tool.

Explanatory note: TECP has a long-standing interest in techniques that will reveal the structural and lithological framework in a larger volume surrounding the borehole. TECP has been led to believe that radar technology and NMR require relatively little development to be deployed in ODP boreholes (i.e. primarily repackaging existing sensors to fit the specifications of ODP operations).

1.4. TECP recommends that long term tool development should focus on cross-borehole or sea-floor to borehole experiment technology.

Explanatory note: TECP recognises that these techniques have a potential to relate borehole measurements and core analysis to regional three-dimensional structural and lithological frameworks and therefore endorses a long term plan to investigate the feasibility of and develop cross-borehole experiments and non explosive sea-floor sources. TECP understands that cross-hole technology is currently limited to about 300m. It was noted that gravity measurements could also provide relevant data for this purpose but that such instruments require a stable thermal regime, that is generally not the case for ODP sites, and that the failure record for this technique is long.

2. Shipboard Structural Science (Agenda item 11)

2. 1. TECP strongly recommends that structural data be summarised by addition of an exiting column to the published Core Barrel Summary Sheets.

Notes: the aim is that sedimentary structures will be indicated in summary form by use of descriptors (i.e. as an index), as set out accompanying explanatory notes. However, detailed sedimentary structures can not be published in this way and additional records are essential.

2.2 TECP strongly recommends that a Structural Data Table be completed; i) Routinely (i.e. mandatory) during legs that have been highly ranked by TECP (in the top 6); ii) Whenever structural data are noted in cores by shipboard scientists during other legs. TECP wishes to make it the responsibilities of the Co-Chief Scientists and the TAMU Staff Scientist to monitor the presence of structural data and activate (mandatory) completion of the structural table whenever structural features are noted.

Notes: The structural data table has been devised following widespread consultation. Standardisation of data collection and archiving is essential. During TECP supported legs it is intended that structural geologists will complete the table. However, it is very important that structural data, where present, are also collected on other legs. With aid of the explanatory notes (see below) it is anticipated that many or all of the structural data can be collected, if necessary in the absence of specialised structural geologists (i.e. by sedimentologists). However, it is **not** intended that the structural table be routinely filled out on all legs where there are no structural data.

2.3 TECP strongly recommends that the structural data collected at sea be published in full, at least on CD ROM.

Note: TECP also hopes that as much as possible of the important data can also be included in the scientific results volumes, depending on available space and priorities of individual legs.

2.4. TECP recommends the writing of a structural technical note at a meeting of a small selected group of structural geologists in the spring of 1995. Travel funds are requested for U.S. participants to attend (ca 5 people).

Notes: This meeting would be co-ordinated by Peter Clift and Steve Hurst.

3. Computing Database Upgrade (Agenda item 12)

3.1 TECP strongly recommends that a computerised method of structural data collection be advanced and incorporated into the database, as an integral part of upgrading the ODP data base as a whole.

Notes: TECP is very concerned that the computerisation of structural data should in future proceed on the same basis as computerisation of other essential primary data. e.g. sedimentary structures. TECP urges TAMU and the JOI steering committee to seek advice from the scientific community at large in the designing of the database requirements. In particular TAMU is urged to consult Steve Hurst (Duke Univ.) who is chairing a sub-committee on the database and its application to structure. Input from Hurst and the committee is essential to the development of the database.

5. **Future meeting**

TECP suggests Las Vegas with a continental extensional field trip for the Spring Meeting on 20-22nd February 1995. Field trip will be 17-19th February.

6. **Panel membership**
No action is required at present

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Thursday 20 October 1994

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Host; C Xenophontos, Geol. Surv. Dept., Cyprus

1. Approval of last minutes and agenda.

The previous Minutes and this meetings' agenda were approved by the panel without further comment.

2. Discussion of White Paper Themes and Objectives.

In the discussion of the TECP White Paper the panel were asked to become more focused in the field of interest. In practical terms this is most easily achieved through an examination of active tectonic processes. Importance is to make TECP goal relevant to the broader community and to the general public as personified by the funding bodies. Geophysical observatories in an active margin setting is a need. Panel wishes to allow options to remain open for future science and proposals while focusing interests. Panel must try to be less regional-related and more process-related, with fewer better defined goals.

Division of interests into passive, active, ridge and all other settings is a possibility but was not so well received by the whole panel. An alternative classification system is one classing proposals as extensional, contractional, strike slip and vertical tectonics. In both schemes young, active systems would be favoured, with quantification being a key element. Alternative schemes are stress/strain, kinematics of hotspots and plate driving mechanisms, or kinematics of plate motion, plate driving forces and impacts. During a wide ranging discussion some of the key points expressed were as follows: Kevin Brown stressed the importance of rheology in tectonics. he suggested classification under the following categories, rheology, stress, thermal evolution and fluid. Sue Agar favoured a less radical approach, rephrasing the passive, active.... categories as processes rifting, subduction, spreading, collision... Yujiro Ogawa stressed the importance of deep seated mantle circulation as the driving force of tectonics and wanted to see this expressed in a long term plan. Brian Taylor reminded the panel that the focus of interest should be earth deformation. Carlo Doglioni stated his support for a traditional plate tectonic approach to tectonic classifications. Phil Symonds expressed concern that too esoteric or abstract a document would be useless in guiding people in writing drilling proposals. Hans-Christian Larsen noted that ancient as well as modern systems could contribute important information.

Proposed Hierarchical Scheme
1. Earth Systems (including relevance to society)
2. Plate driving motions
3. Kinematic Environments (extensional, contractional, strike slip and vertical tectonics)
4. Deformational Mechanisms (rheology, stress, thermal evolution and fluid)
5. Measurements (sampling, experiments and earth observatories)

In the ensuing discussion individual panel members undertook to produce revised drafts of specific sections a new white paper that would be compiled (and circulated) by the panel chair in time for submission to the next PCOM meeting.

3. Liaison Reports

i) PCOM

The PCOM liaison reported that the SW Indian Ridge (Site 735) had been removed from the prospectus due to the re-fitting of the ship taking place in the UK as opposed to South Africa. He also reported that the DCS system will definitely not be tested on Leg 164, and that this would now become a science leg. He suggested that areas for budget cuts will have to be identified very shortly as the projected budget is flat until at least 1998. He told TECP that their revised White Paper is required for publication in the JOIDES Journal in February 1995.

He further reported that 1996 operations would probably be in NE Pacific-Caribbean-N. Atlantic. After this wider areas will be included, i.e. W. Pacific, Indian and S. Atlantic. PCOM welcomed idea of Japanese drill ship.

ii) NSF

Canada-Australia consortium now guaranteed until 1998. No support for increase in funding before 1998. Must re-examine organisation within existing budget, assuming six partners. Will permit 2/3 Canada-Australia membership. Further addition to this consortium is being pursued. Now to begin mid-term review of program prior to 1998. ODP Council wanted greater details of Japanese proposals before greater endorsement can be given.

iii) TAMU

JANUS Project (Computer database upgrade)

Project is now at the stage of contract signing during October. Signing will occur after JOI approval between TAMU and Traycor in Austin. A new committee has been formed by JOI, chaired by Brian Lewis, to steer and advise the JANUS project. Presently the priorities of the project are being determined through consultation with the staff scientists at TAMU, the steering committee and the SMP. While the leg, site, hole, and other basic core data form the first division basic data for the database the ranking of other shipboard data is not so clear at the present time. Structural data, however, has been included and ranked highly along with other basic core descriptive information.

Engineering

With the current change in management at TAMU the development of the DCS has been delayed. The secondary heave compensation system is still being addressed by Parvis Inc in Salt Lake City and from the computer software aspect by a research group at Texas A&M University dealing with fuzzy logic. A new project will deal with a multi-use re-entry system, aimed at being a major improvement on the hard rock guide base (HRGB). The ability to deal with limited sediment cover is a goal, since this has been a problem with the present HRGB. Flexibility will be a key element, with a modular design allowing use in different scenarios. It is hoped that the new system can be more easily transported and stored on JOIDES Resolution. Dave Huey, now at Stress Engineering in Houston is managing the design of the project.

Within the hard rock orientation system the sonic core monitor remains the outstanding problem. The first few meters of core in the core barrel are presently invisible to the monitor. It will be solved by an outside contract. There is also a personnel problem with the system as it stands as it requires one full time staff. In any case the system will not work if the core pieces are less than 6-9" long.

Another new project is that of real time drill monitoring. Following the depth and rate of penetration are the key to further rig instrumentation. This project is also being handled by Stress Engineering. The pressure core sampler (PCS) is presently being redesigned so that the ball valve can be activated externally. This way the seal of the sampler can be tested after the assembly of the PCS. An auger-style cutting shoe is being tested to ease the entry of core material into the core barrel. A new WSTP tool is being designed as a thesis topic of a TAMU graduate student. The new design will initially aim at perfecting the sampling of fluids and the problem of temperature measurements will be tackled later.

Lab News

Development and upgrade of the MST within the physical property lab is being pushed ahead as a major advance in the data collection and handling on the ship. New equipment acquisitions include a new Zeiss microscope for principally for palaeontology purposes. A new gas chromatograph is being tested and will shortly be installed in the chemistry lab. An upgrade for the XRF glass disc fuser is being examined and will be purchased. A trade-in upgrade for the LASENTEC particle size analyser will be made shortly.

Budget

Due to the effective cut in real budget this year TAMU will attempt to limit its effect on the ship's operation by delaying the publication of a number of scientific result volumes during the next financial year. The possibility of putting more information on to CD ROM and pooling CD information from several legs on to a single CD is being examined.

Offset Drilling

Two day meeting at TAMU discussed future offset strategy. Agreed to find better places to drill and to develop technology to drill these place better (i.e., improve regular torque, hole stability and straight holes). Consensus on finding another old piece of crust , with less fracturing (e.g., Vema, off axis at MARK, Romanche). A problem is the limited amount of shallow blocks off axis on fast spreading ridges. Improve site survey, better on bottom geophysics, slope data, outcrop distribution maps, sediment thickness maps. Must improve drill technology with sea-floor template, drill-in casing, drill in BHA and hole stabilisation equipment (under-reamers, hole openers). Recommend MARK for an engineering leg to try out some of this technology.

LITHP wants TECP to endorse the DCS to help support the project. LITHP were also keen to see that the JANUS project focuses on data integration rather than archiving and data management.

iv) LITHP

The LITHP met in Rouyn-Noranda, Canada, Oct. 3-5th. Sherm Bloomer presented the recommendations of a Off-set Drilling Workshop convened by TAMU Sept 13-14th. The goal of this workshop was to bring together the engineers and co-chiefs of the recent off-set drilling legs and panel representatives to discuss engineering strategies for future off-set drilling legs in light of the difficulties encountered at Hess Deep and MARK. Two strategies were recommended: (i) to continue to learn to drill hard places (e.g., solve torque, hole stabilisation, hole deviations problems) and (ii) learn to find easy places (e.g., old crust?). It was considered that both strategies need to evolve in parallel as it is probable that no easy place will be identified to investigate fast-spread lower crust. It was recommended that a engineering leg be dedicated to testing (e.g., sea-floor template, drill-in casing, hole stabilisation equipment). A list of site survey data for site specific outcrop characterisation was also compiled. A workshop report is being prepared by TAMU.

LITHP received some information from TAMU concerning the computer upgrade. The panel was concerned that too much emphasis was being placed on data archiving/publications at the expense of data integration.

Mike Purdy updated the panel on the Ocean Seismic Network. In order to get complete global cover, ONS will require ~20 new permanent observatories stations within the ocean basins. Studies are in progress to evaluate if it is necessary to place instrumentation in a borehole or if burying it in sediment is sufficient.

LITHP urges TECP to strongly endorse continued development of DCS. LITHP chose not to respond to PCOM's request to comment on the budget.

v) IHP

IHP had discussed the computer upgrade and proposed new data handling system. IHP had been made clearly aware of the importance TECP assigned to the collection and archiving of structural data on a routine basis. It seemed likely that structural data could be summarised on the existing Barrel Sheets, but this was not a solution to the problem of publishing detailed structural information. Such detailed structural data could be included on CD-ROM. It would be up to existing co-chiefs to find space in scientific reports volumes to publish hard copies of additional important structural data. IHP had been made aware of the need to collect and archive structural data even on legs that were not primary TECP supported. TECP would consult further with IHP and other interested parties.

vi) DMP

DMP reviewed methods for making in situ stress measurements considering the following methods. They concluded that the borehole televiewer, used in conjunction with the FMS were currently the best approach but considered several other techniques, including, anelastic strain, hydrofracturing, sonic logs (currently being developed by the Gas Research Institute) and a six arm calliper. The cost of a Schlumberger televiewer would be about $15 k per leg plus shipping. DMP noted that common problem for most of these techniques is that they rely on a magnetic orientation device and that stress orientations within mafic lithologies require a gyroscopic orientation device. The cost of developing or using this tool is unknown at present.

DMP requested that the thematic panels closely examine forthcoming legs for opportunities to make in situ stress measurements and propose scientific justification of the deployment of the BHTV and or FMS. They have further requested contingency funds from PCOM so that short notice, add-on techniques could be incorporated as justified by the panels and DMP ($40,000 per leg). Historically about 2 legs per year have justified use of BHTV.

DMP received a report from CLICOM (an advisory committee, chaired by Joris Gieskes) that has been examining the best methods to integrate data. CLICOM proposed that shipboard gamma and magnetic susceptibility measurements

were important for core-log integration. If the sonic core monitor could be improved to function on shorter, minimum core length requirements then it would also be important. CLICOM proposed that 3 workstations should be reserved on the ship for the task of data integration. They recommended that there should be a trained specialist for hardware and software use and running the multi-sensor track, in addition to a data integration specialist. They also noted that shipboard database development needs to recognise the existence of the CLIP program that's been developed for shipboard data integration.

DMP discussed logging results in gas hydrates and possible borehole measurement techniques, including the potential use of shear wave tools. They suggested that a VSP experiment combined with BHTV or an analogue or full wave-form digital tool (for acoustic impedance analysis) would be worthwhile for the gas hydrates leg. Logging while coring was also discussed (involving the use of memory tools (i.e. no wire line) embedded in the core tube). Anadrill state that they can measure resistivity at the bit, focused resistivity, gamma ray, weight on bit, torque and relative motion between the core tube and the core barrel. This technique could therefore be very useful for core-log integration. As there is no immediate industrial application there is currently no development of this technique but DMP have requested a feasibility study for use in ODP. Sue Agar distributed planned logging operations for 1996 on which DMP had flagged items that would require additional funds (e.g. televiewer, VSPs, CORKs and magnetic susceptibility measurements). DMP asked TECP to comment on these items and the possible use of LWD for Costa Rica or the Mediterranean operations (cost about $250,000).

In discussions of the budget, DMP announced that it would be starting a review of tools at the Spring meeting. DMP has asked the BRG to come up with a budget scenario with details of the last 3 years of expenditures, planned next 3 years and scenarios with tool elimination, for example without the geochemical tool or FMS. DMP has recommended an extra technical positions for BRG and that 4% of the budget of BRG will be kept for innovation. In a long term view of tool development DMP has compiled a list that includes development of a high temperature cable, a test facility for tools, Logging While Coring, cross-hole experiment, an improved geochemical tool, down-hole radar tool, NMR tool, gravity measurements, and a non-explosive, sea-floor seismic source. DMP has requested a logging while coring feasibility study. DMP recommends that no more BRG funds to be spent on DMT televiewer but encourages DMT to continue development.

DMP has put together a new set of guidelines for third party tool development. These include a pressure housing test, an electronics test, a vibration test, a wireline test and a systems test. A watchdog is assigned from DMP for every tool being developed and is authorised to make a decision for DMP if a quick decision is needed. There is now a 2 page overview of several tools that will shortly be distributed to panels. This information will also be available on "Mosaic".

vii) SMP

The liaison was unable to attend the meeting in Las Palmas. A copy of Peter Clifts' report on the current status of shipboard structural measurements was passed onto Joris Gieskes and was included as an Appendix in the SMP minutes. The collection and preservation of structural data was ranked by SMP along with other core related data as being of prime importance. TECP attaches importance to close collaboration with SMP in future.

4. Leg Reports

Reports focused on results from legs of relevance to TECP.

Leg 152: SE Greenland Margin

FMS derived dip data from Site 917 shows the upper lavas at the SE Greenland margin are more shallow dipping than the lower lavas and dip in a different direction. This raises the possibility of a significant time gap between series and has implications for rift tectonics. Data correlates with older than expected radiometric ages for the older lavas. Software for deriving planar features results in very large data sets which may not always be easily correlated with measurements in the core.

Leg 156: Barbados Accretionary Wedge

The leg achieved good agreement between LWD measurements and physical property measurements made in pre-existing ODP holes in nearby sites. Vertical seismic profiling taken to compare with existing seismic data. Packer tests performed on décollement for porosity/permeability and fluid pressure testing. CORK was fitted to two holes for in situ monitoring. LWD showed that the difference between normal and reverse seismic polarity was that the reverse polarity was due to a wide zone of overpressured sediment. The normal polarity zone had over pressured zones within the décollement but of shorter length than the resolution of the seismic method.

5. Logging Aspects

P. Pezard presented a summary of the applications to which borehole logs had recently been applied with success in ODP. TECP agreed to provide advice as to which tools were likely to produce the best (and most cost effective) scientific results when proposals were being discussed and graded.

6. Ranking of Proposals

Note: proposals not included below were regarded by the panel chair as having no thematic relevance and were not circulated to TECP: No comment on these is made.

333-Add2 **333-Add2 Cayman Trough**
The addendum adds several figures to 333-Rev2. The latest revision differs substantially from earlier versions. The emphasis is now on the uncertain crust of the outer trough, and on the interaction of the long transform-short ridge geometry rather than the rifted margin. TECP views this as a positive step in the maturation of this proposal. While the Cayman Trough may be an example of asymmetric rifting, its particular interest lies in the effect of its transform setting on its tectonic development. TECP encourages the proponents to further develop broader implications of Cayman trough. We feel that the Cayman trough is a valuable analogue to the scheduled Eastern Equatorial Fracture Zone leg. The Cayman Trough, consisting of a single rift segment, is affected by the cold transform, but is not later modified by passage of an adjacent ridge segment as at the EEFZs.

TECP encourages the proponents to develop multiple drilling alternatives. If the outer trough proves to be continental, then drilling the conjugate will critical to understanding the formation of the region. However, if the outer trough proves to be oceanic, then drilling the some of the conjugate sites in western outer trough would be a lower priority and alternative sites addressing other questions might be preferable. Furthermore, drilling time for the 10 sites proposed may be more than a leg.

However, this proposal is still immature. Site survey data is inadequate, particularly in the western trough and on the flanks of the trough. SCS and heat flow data would tremendously help in defining sites that would constrain the vertical motion, and the thermal and stress state of the Cayman Trough. Numerical modelling of expected stress field, when appropriate data are available, would be useful to confirm that chosen sites will distinguish between the hypotheses.

Rating: As the proposal stands, it was rated **A2**. However, this proposal could become a top priority, A1, if the issues raised here are addressed. The remainder of the evaluations are: **B1.1**; **C2**, **D1**, **F2**.

355-Rev4: Gas hydrate, Peruvian margin....
TECP's discussion focused on the tectonic aspects of this proposal. The proposed sites would address the important theme of tectonic erosion. Peru is a very good place to attack this high priority topic. TECP finds the present proposal to be mature and to be highly relevant to top thematic objectives.

Although TECP supports this proposal, there are still a few remaining questions. TECP wonders about the feasibility of extracting the tectonic erosion "signal" from other influences. We question whether the vertical history of the forearc has a unique explanation or whether several processes can produce similar histories. What influence does changing slab dip have and how can it be recognised? How can we determine the reference depth on the south side of the Nazca Ridge? How can we distinguish the uplift effects due to ridge subduction versus underplating? TECP would like to see some modelling of the expected uplift/subsidence due to ridge subduction, underplating, basal erosion, frontal erosion, etc.
Rating: A1 (for tectonic aspects), B1.1, B2.1, C3, D1, E8, F2.

376-Rev3 Vema Fracture Zone....
This proposal addresses three drilling objectives: 1) obtaining a core of mantle peridotite at site VE1 to study the structure, geochemistry and petrology of an upper mantle section; 2) sampling transition from gabbro to dyke complex at site VE2 to determine the structural and petrological nature of this boundary; and 3) sampling the carbonate platform capping the transverse ridge at site VE3 to understand the vertical tectonics. This revised version was improved significantly over its predecessors by the addition of the results of multi-channel seismic data and the results of new rock dredges along FZ walls.

TECP reaches the consensus that drilling VE3 is of the highest priority to TECP and that this mature site should be drilled at the earliest opportunity. Drilling at the other two sites (VE1 and VE2), however, addresses

primarily the LITHP objectives with some interests to TECP. To better determine the geological context of these two sites and to better identify specific drilling targets, it is desirable to obtain additional near-bottom data near VE1 and VE2 using high-resolution mapping tools such as AMS-120 and TOBI.

TECP ranked this proposal at the Fall 94 meeting despite that the proposal was not in the FY96 prospectus. The ranking took place because TECP is strongly interested in the objectives of site VE3 and because the prospective engineering leg at the Vema FZ is now unlikely due to the DCS problems.

TECP recommend the following three alternative strategies for drilling at the Vema FZ: STRATEGY 1: Only site VE3 would be drilled during a mini-leg. The possibility of such a mini-leg need to be considered by the ODP. STRATEGY 2: The proponents may consider to focus an entire leg on the objectives of vertical uplift. TECP views vertical uplift as a fundamental problem and that such focused leg may yield great returns in scientific results. More specifically, the proponents may consider drilling sites not only at VE3 but also at limestone caps 100-200-km to the east. By examining multiple sites, it might be possible to obtain information on the history of
differential uplift. STRATEGY 3: The proposal maintains its current LITHP and TECP objectives while additional site studies be conducted near VE1 and VE2.

TECP wish to reiterate two specific questions that were raised in earlier reviews but were not addressed in the revised proposal: (1) How would poor recovery in limestones affect the resolution necessary to construct uplift history? and (2) How drilling at site VE3 would eliminate any of the stated hypotheses on the tectonic origin of the transverse ridge?

Rating: A1, B1.1, C1, D3, F2

386-Rev2, California margin

This is principally a palaeo-oceanographic proposal but has the potential to contribute to the understanding of some important global and regional tectonic problems: Global problem; The deformation of an oceanic platelet as it collides and subducts. There are several competing models for rigid and non-rigid intraplate deformation of the Gorda plate as it attempt to subducts under the Oregon coast. The Gorda plate structure and the rheology of the oceanic lithosphere are fairly simple, compared to continental or arc-back-arc environments, hence, intra-plate deformation and pervasive shearing can be more easily studied. The latest update of the drilling plan proposes drilling only CA-4. High-resolution continuous down-hole magnetic logging (using the GHMT), and whole core cryogenic measurements on board of the sediments are planned in order to track rotation of the platelet through time. The plan is also for an additional hole CA-4a to reach basement and take stress measurements (BHTV, FMS). An alternative plan to CA-4a is to drill CA-3 (sediments only) to track rotations in two points. Documenting rotation on CA-3 may not be useful to TECP objectives, because it lies beyond the hinge line and therefore may not have rotated much.
Regional problem: The evolution of the California plate boundary.

CA-9 Miocene faulting along the central California margin, the timing of extension, the time of capture of the Monterey plate by the Pacific plate. This hole will ground truth an extensive EDGE seismic survey in 1991 that tried to tackle these problems. Is it possible to extend the hole to the basement in order to determine its origin?

CA-15 - Tanner basin, and BA-2 - San Nicholas basin - Possible rotation of borderland basins with time will complement the kinematic evolution of the transverse ranges.

CA2 - The new drill site in a small basin south of Mendocino triple junction that is tilted to the NW and compressed may document the migration of the triple junction and . Dating of compression in sediments may help constrain triple junction migration and associated deformation offshore.

All holes - The developing topography of late Cenozoic California brought different sediments through time. Documenting offshore deposits may help constrain some of the timing of vertical movements.

TECP stresses the need to appoint at least one structural geologist to this leg and carry out structural measurements at sites CA2, CA4, CA9.

Rating: A3, B1.1, B2.1, C1, D1, F4

Friday 21 October 1994

Reviewing of proposals was continued, ordered to benefit comparative discussion

400-Add3, Mass balance, Costa Rica
This mature proposal is very highly rated by TECP. Due to the wide variety of data and very well characterised nature of the toe of the margin we feel that it has a high probability of achieving its primary mass balance and fluid objectives. At this point, we would just like to reiterate the importance of constraining the back stop geometry of the system. The panel feels that determining the nature of the material (accreted sediments vs. ophiolitic basement below the rough reflector) at CR4 is very important. CR4 is positioned above a structural low in the rough reflector. In itself this is a good position in terms of recovering a complete sedimentary section. If, however, if it is not possible to penetrate a kilometre or more of slope sediments above the rough reflector at this site, a secondary fall-back site should be developed above an adjacent structural high with a thinner sedimentary cover. If the two sites were located in geographically close proximity it should be possible wash down through the previously cored portions of section and accomplish the objective in a short time. The proponents have all the necessary 3D data and we feel that this will pose them little problem in terms of the stated objectives of this proposal.
Rating: A1, B1.1, B2.1, C1, D1, E1, F1

435-Add, Mass balance, Nicaragua margin...
While this proposal is not yet mature TECP does rate its primary objectives very highly, particularly in the context of the along strike variations in crustal fluxes when compared to the Costa Rica and Guatemalan margins. The Panel, thus, strongly encourages further development of the general site survey program for the proposed region of study.
Rating: A1, B1.1, B2.1, C2, D1, E5,8, F2

411-Rev Caribbean Cretaceous basalt....
Major tectonic interest is the plate movement-Galapagos connection, which is downplayed in this version of the proposal. Bolide impact investigations are a possible secondary tectonic interest that were not addressed in this proposal.
Rating: A3, B1.1, B2.1, C1, D1, F4

415-Rev2 Caribbean multi-objective drilling
This proposal represents a good revision of several earlier versions. It is well prepared and formulated. The authors also intend to provide soon new site survey information. However, as the authors themselves admit, the proposal is mainly focusing on OHP and LITHP objectives. Not really tectonic targets are introduced in the proposal: for instance, no mention is made about the origin of the Caribbean Sea as a back-arc basin of the W-dipping Barbados subduction. Similar thick crust and lithosphere is observed in the Mediterranean region where the Tyrrhenian and Pannonian back-arc basins overprinted earlier Alpine and Dinaric orogens, having thicker lithosphere and crust for these inheritances. Basement objectives in the second drilling scenario could provide new light on the Large Igneous Province, or in the continental nature of the basin versus a classic development of a back-arc basin. These sites could also be useful in order to calculate diachronous subsidence rates in two E-W transects of the back-arc basin, subsidence that could have been responsible for the drowning of the Nicaragua bank.

In an earlier meeting in Granada, two years ago, TECP did not consider meteoritic impacts as prominent tectonic objectives. However, TECP now includes these phenomena in the tectonics field and this proposal has some interest to the panel, but even in this case, the proposal is devoted more to the stratigraphy associated to the impact rather than to its deformational pattern.
Rating: A3-(5?), B1.2 - B2.1, C1, D1, E4, F3-(4?)

448-Rev, Ontong Java Plateau
The main goal of the proposal is to determine the age and emplacement history of the Ontong Java plateau. The TECP would be strongly interested in this proposal, if more tectonic objectives and means of testing various models are outlined. Although the problem to be solved is implicitly important in global plate reconstruction, the immediate goal is quite irrelevant to the thematic interests of the TECP (deformation of the lithosphere). For example, we are more interested in the processes of collision of oceanic plateaux with arcs and continents (e.g., under what conditions do oceanic plateaux subduct?). In these processes, the physical properties and the mechanics of the plateau (density, thickness of the oceanic crust and lithosphere, and related thermal history) are more important in controlling the style, magnitude, and history of deformation. We are also interested in the age and duration of deformation of the oceanic crust during the collision.

In terms of global tectonics and processes related to the development of plumes and hotspots, the panel considers that the age information of the Ontong Java plateau is essential to further design palaeomagnetic studies (i.e., whether the time window is appropriate for doing such an investigation).

We found that the site survey is too preliminary and structural interpretation of the southern margin of the plateau is premature. We suggest that the proponents determine the geometrical framework of the deformation system in the southern part of the plateau by high-quality seismic reflection profiles. Structurally tilted sections should be identified during this phase. These sites could be the best targets for drilling.

Rating: A3, B1.2, B2.1, C2 (site survey needs to be improved), D2, E5 (the P.I.s should look into structurally tilted sections to minimise the number and depth of drills), E7, F3.

440-Add Hydrothermal circulation at E Juan de Fuca

This proposal aims to examine three different types of hydrothermal circulation in a relatively simple setting on the eastern flank of the Juan de Fuca Ridge. TECP reiterates its comments from the previous review that this proposal could be relevant to the thematic interests of TECP with certain revisions. TECP had previously suggested that the proponents examine the evidence for deformation of the ridge flank and its relation to fluid flow paths. In particular, what are the structural complexities that may cause abrupt changes in the flow regimes between the sediment free and sediment covered sections? What is the structural framework of the permeable penetrators? How does the structure influence the distribution of fracture permeability in the basement? A major concern for TECP is the long term plan for deepening certain holes without consideration of the possible structures and their orientations at depth and hopes that the survey data to be collected in 1995 will help to provide an improved the structural framework. TECP strongly endorses the technology developments that are linked to this proposal.
Rating: A3, F4

SR-Rev3 Sedimented Ridges 11

TECP noted with delight that this revised proposal has made major improvements in addressing TECP interests, in particular the study of relative timing and feedback of faulting and fluid flow. TECP likes the revised drilling strategy that includes obtaining a detailed record through a fault zone in the uppermost basement near sites BH-5-6 and carrying out detailed stratigraphic and microstructural analyses at these and other sites. This drilling component is essential in determining the probable structural controls on fluid flow and hydrothermal deposits. Although this proposal still primarily address LITHP and SGPP thematic interests, we wish to emphasise the importance of retaining the above TECP aspects in the final drilling plan. TECP once again urges the proponents to identify and add to their team a structural geologist as soon as possible.

Some concerns were expressed regarding whether the interpretation of the "856 fault zone" as a tectonic fault in Fig. 7 is unambiguous. We recommend the proponents to look more into this issue by examining carefully other E-W seismic profiles across the "856 fault" feature since a positive identification of its tectonic origin will have direct implications on the proposed drilling at sites BH5-6 as discussed above.
Rating: A3, B1.1, B2.1, C1, D1, E8, F4

451-Rev Tonga forearc

The 451-Revised proposal arises from LITHP recommendation that proposals 446 and 451 be resubmitted as one. Both previous proposals included a total of 11 possible sites. The new 451-Rev proposal includes a series of 9 proposed sites located along the Tonga Ridge (TR 1, 3, 4, 5) and Tofua Arc (TR 6, 8, 9) between 23°S and 13°S. Two sites (TR2 and TR 7) are located at 4000 m depth along the eastern edge of the ridge, toward the Tonga Trench. Only two of those proposed sites correspond to sites listed in the previous proposals.
As noted by the authors, the 9 sites represent more than one single Leg of drilling. No swath mapping data are available around the proposed sites.

As it stands, proposal 451-Rev is of high interest for both TECP and LITHP as it concerns inter-related problems of dynamics of subduction, arc volcanism and tectonic history.
This proposal addresses crucial questions of tectonic evolution in a region of very high interest, characterised by a relatively simple geodynamic situation; the fastest subduction and absolute plate velocity ever recorded; a long, linear forearc domain; a steady-state subduction ; a local complexity due to a subducting ridge; etc.....
The tectonic objectives are not always clearly presented and argued.
One of the major interesting problem is only evoked in a short section at the end of the text. Indeed, a major priority is certainly to test the hypothesis that spreading along the southward propagating Lau Basin axis is more or less controlled by the Louisville Ridge progressive collision along the forearc. If this point is put forward then most of the detailed objectives presented earlier in the text will derive naturally from this major question. In other word, it seems that most of the proposal could be based on that main idea : Is there a link between intra-arc rifting /back-arc spreading and subduction of a major oceanic asperity.

However, some basic detailed objectives are well formulated. They are :
- to know the exact timing of uplift-subsidence in the external forearc and rifting-spreading in the internal forearc,

- to be able to discriminate between steady state subduction erosion and catastrophic event,
- to be able to discriminate between subduction-related and back-arc spreading related tectonics,
-to have constraints from palaeomagnetic data on forearc rotations,

At present the proposals is not mature and shows a number of deficiencies.
We do not know how previous data, especially MCS and SCS lines, allow to provide partial answers to some questions that arise from the proposal.
- What is shown on seismic lines, and how such data allow to confirm tectonic erosion, ridge collision, etc...?
- What are the 3 forearc regions, and what are their own characteristics?
- What is the geological setting of each transect?
This implies more geological descriptions of the study area and more detailed presentation of the drilling sites. This also implies not to use only results of Leg 135 as the main database for the region.

A major deficiency is the lack of any reference (and/or illustration) to a kinematic model showing the relative motions between the Louisville Ridge and the forearc. What can we learn on relative motions from approaches which do not relate to drilling? The detailed kinematic frame obtained from investigations such as bathymetry mapping, seismic lines analysis, plate reconstructions, GPS measurements constraints on true motions, etc....must be proposed.

Finally the question is : what was the position of the Louisville Ridge at various epochs with respect to the position of the proposed drilling Sites?

An other problem concern the possible link between forearc tectonics and spreading in the NE corner of the Lau-Tonga system. The exact geometry of the spreading system is not known, and therefore, it will be difficult to test the influence of subduction on the processes of forearc and back-arc extension.

Finally, as the proposal corresponds to more than one Leg of drilling, the authors should focus on a restricted number of objectives by favouring one of the two following aspects.
1. To develop a multi-disciplinary approach concerning the early development of the forearc (and back-arc edge) by selecting sites located within two of the three described forearc regions.
2. They can focus on the influence of the Louisville Ridge subduction, and more generally the different processes of tectonic erosion in proposing a longitudinal transect along the eastern side of the Tonga Ridge.

456 Tjornes FZSB
A new proposal to know Neogene history in the N Atlantic Ocean, north of Iceland, glaciation details, tectonic and thermal influence. As a whole it is interesting, but still immature. Tectonically, a deep (≥ 4km) basin, controlled by normal faulting along the fracture zone (in fact a transform fault, northern margin of Iceland), an important topic. However, this is not a place for tectonics only, rather the whole proposal might better concentrate on Ocean History, Palaeoclimate and environment.

Ranking: A5, F4

457 Kerguelen LIP
This is an interesting proposal aiming to understand the evolution of the Kerguelen Plateau and Broken Ridge, and eventually to compare their evolution to the Ontong Java Plateau. The authors want to test the meaning of the "Kerguelen Plume" in generating the plateau. They claim that only less than 1 leg has been devoted to the basement on the Kerguelen Plateau.

The main objectives are:
1) Determining the time span of the Broken Ridge-Kerguelen Plateau formation and the mechanism of plateau growth;
2) Understanding the role of the Kerguelen mantle plume in generating the large igneous province;
3) Defining the relative roles of plume, asthenosphere and continental lithosphere in creating the plateau.

Like all the mainstream literature, the proponents associate this major magmatism production to a thermal anomaly. They don't consider that the large amount of lavas could also be generated by a mantle anomalously rich in fluids (e.g. Bonatti, 1990, Not So Hot "Hot Spots" in the Oceanic Mantle. *Science*, 250, 107-111). Fluids decrease the melting point in the mantle, and therefore a "wet asthenosphere" may generate large igneous provinces, even at a relatively lower temperature.

The proponents themselves in the cover letter say that the proposal is not mature and that they plan to send a new more completed version including proposed drill site forms, seismic reflection profiles and drilling time

estimates by January 1, 1995. TECP is willing to see those new data. One or two regional cross-sections of the Kerguelen Plateau and some regional maps would also be welcome.

The proposal addresses objectives that are more pertinent to the LITHP White Paper. However the Kerguelen Plateau is one of the most important "so-called" hot spots used in the hot spot reference frame, and the better understanding of it may provide fundamental improvements in the plate kinematics reconstructions, and the true polar wander computations, among the top aims for TECP. Moreover mass balance of magma production, uplift and subsidence history associated with such a ridge could be topics in the mandate of this panel.
Rating: A3. B1.2, B2.1, C2., D, E1.2.3.4.5.6, F3.

458 Southern Ocean Transect
The proposal is for a transect of eight holes from subtropical to sea ice-covered ocean to provide a record for the Cenozoic evolution of the Antarctic Cryosphere. Although this is primarily a palaeo-oceanographic proposal, its tectonic objectives are to describe the nature, origin, and history of prominent topographic structures and related sea floor spreading in the south Atlantic. The features are: the Agulhas F.Z. ridge, the Meteor and Shona Rises, and the Bouvet Triple Junction. The most recent tectonic work in the area was done in conjunction with Leg 114, whose objectives were to investigate the development of water ways around Antarctica and to study the evolution of the Malvinas Plate, and the aseismic ridges of the Islas Orcadas, and the Meteor Rise. Therefore, there is quite a bit of overlap in the tectonic objectives between this proposal and these of Leg 114.

The tectonic rationale for hole TSO-5 located off the Meteor Rise is unclear. If holes 703 and 704 drilled on top of the rise could not unequivocally determine its origin, why should this site provide the answer?

Site TSO-6 located off Shona Ridge which is hypothesised to be the along Bouvet hot spot track, does not appear to be useful to determine this hypothesis as basement is 1000 mbsf. The same reason applies for TSO-7.

The Agulhas Ridge site (TSO-2) bears directly on the origin and vertical movements of transverse ridges along the fracture zone, which are of great interest to TECP. It is analogous to the transverse ridge along the Vema F.Z. The proposal plans to drill to basement on the ridge. It was suggested that the Agulhas Ridge was formed by either tectonic transpression due to compression or volcanic construction due to extension, and these suggestions can be tested by drilling to basement. TECP would also like the proposal to elaborate on the possibility of dating vertical movements of the ridge from its sediment cover on the basis of the existing cores.

Provided TSO-4 reaches basement, it will help calibrate the magnetic anomalies on the Malvinas plate.

Because of the paucity of proposals addressing translational environments, and because of the remoteness of the study area, TECP encourages the proponents to seek tectonic input to the site selection.
Rating: A4, B1.2, C2, D1, F4

460 Southeast Greenland volcanic rifted margin (NARM-Volcanic)
This proposal, formerly numbered as NARM-Add2, builds on the recent results of Leg 152, and new geophysical and geological studies, including about 5000 km of high resolution MCS data collected in '92 and 1993 since the scheduling of Leg 152. It presents a case for further, more focused drilling at six sites on the Southeast Greenland Tertiary volcanic rifted margin along the two NARM-DPG defined East Greenland transects - three sites on the previously drilled EG63 transect, and three sites on the EG transect to the northeast. The proposal attacks important TECP objectives such as continental break-up and the nature of rifting, as well as the formation and evolution of large igneous provinces, and attempts to examine the influence of mantle plumes of these phenomena. The NARM-DPG selected the northeast Atlantic LIP as the globally optimum place for volcanic rifted margin studies, and this remains the case today. TECP is pleased to see that the proposed drilling is planned as part of an integrated margin study including funded land-based geological studies on the exposed part of the LIP, deep-seismic profiling across the margin, and, perhaps in the future, a deep hole on the coast to examine the thinning and alteration of continental crust during volcanic margin formation.

Apart from its general interest in the formation of volcanic rifted margins and the evolution of LIPs, which are also thematic objectives of LITHP, TECP has specific interest in two aspects of this proposal. The first relates to the discovery on Leg 152 of highly tectonised continental crust and ?rift-related sediments beneath the feather-edge of the seaward-dipping reflector sequence (SDRS), and the opportunity it opens up to examine the pre-volcanic nature and development of the margin. The second concerns the controversy of whether plumes initiate margin formation and break-up, or whether they are more of a modifying influence on extension and plate separation. Such questions are becoming increasingly important in the light of

the growing evidence that volcanic rifted margins are even more widespread than previously recognised. The pre-volcanic history of the Southeast Greenland margin will potentially be examined by two sites on the EG63 (Leg 12) transect (sites EG63-5 and EG63-6), along with a better understanding of the nature and age of the early, oceanic SDRS succession by deepening Site 915. The more northern transect (EG66) is closer to the hot-spot track (the Faeroe-Iceland-Greenland Ridge) and will examine whether there is a clear component of Icelandic plume-type magmas in the early part of the SDRS closer to the plume (site EG66-1A); the nature of pre-volcanic basement (site EG66-1), an important TECP objective; and a whether there is any change through time related to the influence of the Icelandic plume by drilling through a considerably younger part of the SDRS near its outer edge (site EG66-2). The EG66 sites will be important for understanding whether or not plumes initiate or modify break-up processes on volcanic margins. Also, because of the 520 m of post-SDRS sediments that will be intersected at EG66-2, this site may shed light on the cause of the significant late-stage uplift of the inner SDRS in this area - also a TECP objective.

The proposal is well formulated and succinctly presented, and, based on the results of Leg 152, has a high probability of achieving its scientific objectives with currently available technology. Little in the way of regional geological setting is contained within the proposal or its appendices; however, the reader is referred the NARM-DPG report for a more extensive review of the North Atlantic region. The questions raised in TECP's last review of the proposal have been answered in the new proposal in special section on thematic panel questions.

Although the proposal contains several high priority TECP objectives that appear to be ready for drilling without any further action being necessary on the part of the proponents, TECP does have a number of concerns and questions that it would like the proponents to consider during any future refinement and focusing of the proposal:

1. Can TECP's main objective - understanding the pre-volcanic development of the mar gin - be better realised by some adjustment of Sites EG63-5 and 6? Seismic imaging of 'continental' basement at these sites is relatively vague, particularly the so-called break-up unconformity at EG63-6, although TECP recognises that it may be as good as can be expected in such an environment. TECP understands that a recently acquired deep-seismic line along the transect is currently undergoing processing, and this may pave a better indication of the optimum place to drill on the feather edge of the SDRS to best examine the pre-volcanic history of the margin. In particular, it is important to maximise the chance of being able to date the oldest lavas, and to determine the age and tectonic setting (pre or syn-rift) of any underlying sediments, as this will tell us much about the rift/volcanic history of the margin. TECP stresses that it does not want other volcanic margin objectives to compromise its high priority pre-volcanic objectives, as without this the proposal will lose much of its interest to TECP.
2. TECP also notes the importance of site EG66-1 because of its pre-volcanic objectives, and stresses the need to drill 'continental' basement at this location at either EG66-1 or EG66-1A.
3. During discussion of the proposal some doubt was expressed as to whether the incompatible element enriched lavas from DSDP sites 407-409 reflect a clear plume component as suggested in the proposal.. If this were the case then it sheds doubt on the chances of detecting plume influence at proposed site EG66-2.
4. During deepening of site 915 the upper sequence (US)/middle sequence (MS) boundary should be intersected if possible.
5. TECP notes both SSP's and the proponents comments about the need, or otherwise, for the hard-rock guide base, and urges resolution of the issue as it affects consideration of the inner sites that are TECP's highest priority.

Ranking : A1, B1.1, B2.1, C1, D1, E4, F1

461, Rift-to-drift processes within the ocean-continent transition west of Iberia (NARM non-volcanic)

This proposal, formerly numbered NARM-Add3, presents a case for further drilling on the west Iberia continental margin to examine some fundamental questions related to the formation of non-volcanic rifted margins. It uses the results of leg 149, combined with re-processed seismic data, new interpretations of magnetic data, and revised tectonic and magmatic models for the rifting and initial seafloor spreading at this margin, to propose five sites drilled to basement on basement highs mainly within the ocean-continent transition (OCT). The objectives of these holes are to further characterise the OCT, to test the simple-shear lithospheric extension hypothesis, to determine the extent of syn-rift magmatism, and to determine the nature of the first-formed oceanic crust. The proposal also advocates drilling a pilot hole off Galicia Bank as the first step towards drilling a possible detachment fault (the S' reflector) on some future leg. The west Iberia margin has been recognised for some time as an excellent example of a non-volcanic rifted margin. Many of the features that are taken to be characteristic of such margins are well imaged on seismic data in this region.

The proposal is generally well formulated and succinctly presented. TECP commends the proponents for their efforts in taking into account our comments on an earlier version of this proposal, particularly with regard to re-modelling the magnetic data, re-processing of seismic data, and the development of new tectonic models to explain both the Leg 149 and geophysical data sets. Two of the five sites proposed (Site 900-East and Site 901) will re-examine basement highs drilled during Leg 149, and two other sites (IAP-7 and IAP-3C) will examine un-drilled basement highs on the Leg 149 transect. Another site, GAL-1, is proposed as an exploratory hole to drill the "enigmatic terrain" overlying the S' reflector imaged on the northwest slope of Galicia Bank. This drilling is proposed as a precursor to later drilling of a potential detachment fault (S') at this location.

Some critical information from Leg 149 is not yet available to the proponents, such as the age and isotopic data for the Site 900 gabbro. Initial attempts at Ar/Ar dating of samples from this site apparently failed, although we understand that new attempts are underway. Despite the best efforts of the proponents to incorporate Leg 149 results and re-work existing data to predict a consistent tectonic model, TECP still has some concerns about aspects of the proposal, and these are outlined in more detail below. Although some of the seismic interpretations over sites remain ambiguous, TECP wonders how much further the proponents can go in reducing these with the data sets they have available. Leg 149 results and the associated seismic data, have already gone a considerable way to showing the general applicability of detachment-type models to non-volcanic margins, and have highlighted their ability to explain the complex variety of rock types and relationships found within OCT's. However, the question raised in our last review remains - what will further drilling in this area tell us beyond the main outcomes of Leg 149? The most important new objective in this proposal is the possibility of drilling through a detachment fault at Site 900-East. This has long been a high priority objective of TECP.

The general objective of this proposal - to understand the nature of the OCT at a non-volcanic margin - remains a high priority for TECP, and the west Iberia margin is currently this location may not substantially advance our knowledge beyond that from Leg 149, how will we know this until the drilling strategy is completed. There is probably little more that the proponents can do with the available data sets to further enhance the proposal, and on this basis no further action is necessary at this stage. However, during the course of TECP's review several comments, concerns and questions surfaced that it would like the proponents to consider during any further refinement of the proposal:

1. Although the seismic data set in the area is generally of good quality and well processed, and many important features are very well imaged, it is very much restricted to the actual drilling transect, with only minimal crossing lines. This makes it difficult to get a good 3-D understanding of the basement highs to be drilled, and contributes to the interpretation ambiguity at some sites. Further collection of well positioned seismic data could help in this regard. We note that site IAP-7 is some distance from a crossing line, although SSP did not seem to be concerned by this.
2. There is considerable ambiguity with the basement block interpretation of site IAP-7. There is no clear top to the eastward-tilted block, and it appears highly likely that the part of the ?basement block proposed for drilling is in fact a volcanic feature with flow-like features extending to the east. Possible syn-rift section adjacent to the western flank of the block has an unusual relationship to the interpreted west-dipping fault. These feature needs further examination.
3. Site 900-East A and B are proposed to drill through synrift section and then a detachment fault. Site 900-East A appears to have advantages over 900-East B, as the interpreted fault is better imaged at this location; however will this tell us any more than Site 900. Although poorly imaged, Site 900-East B provides the possibility of drilling through basement above and below the detachment, and may therefore provide better evidence for movement along the surface. Leg 149 Site 900 also appears to have drilled through the westernmost part of the detachment and the gabbro obtained at the base of the hole has been described as heavily fractured and sheared. Is there any further evidence for shearing along this basement surface
or has it been removed by erosion etc. - this is not discussed in the proposal?
4. TECP is keen to see both continental (Site 901 deepening) and first-formed oceanic crust (Site IAP-3C) drilled to confirm the extent of the OCT. First-formed oceanic crust has not been drilled off western Iberia and its interpretation is based solely on geophysical data. The seismic character of the IAP-3C basement block, and the adjacent block to the east, as illustrated in the proposal is not altogether typical of "normal" oceanic crust. Is this because this seismic profile does not appear to have been migrated, or is it because basement is somewhat unusual?
5. The comment was made that opening of the Bay of Biscay could have resulted in considerable lateral movement along the Iberian margin. If true, this may complicate the non-volcanic rifted margin story in the area.
6. A better seismic survey coverage map showing the full extent of data in the region would be useful. Site IAP-3C is not shown on the restricted track chart in Fig. A1.

Rating: A1, B1.1, B2.1, C1, D1, E4, F1

Letters of Intent

LOI 33 Gulf of Aden rift
The main goal of the proposal is to study the evolution of a young conjugate rift system, where the conjugate pieces can be matched with confidence and the sedimentary cover is not excessively thick. The scientific questions to be addressed here are very relevant to TECP's interests and the site has the potential to be excellently suited to this type of investigation. Specific advantages to this region include: sedimentary cover appears to be manageable in thickness (1-3 km); geothermal gradient should have varied along strike due to the influence of the Afar hotspot and should allow determination of the structural variations due to thermal variations along the strike of the rift system; the thick evaporite section that is so problematic to drilling in the Red Sea is absent in the Gulf of Aden. The position of the continent-ocean boundary is not necessarily well-known (it may not coincide with the oldest marine magnetic anomalies) but can be better constrained with site survey work. We encourage the proponents to follow through by continuing to seek site survey funding, in preparation for submission of a full proposal. Such a proposal should include as much information as possible on the quality and coverage of existing seismic data (including Geco-Prakla) for the region.
Rating: A1 (high thematic relevance)

LOI 34 Intraplate seamount circulation
Review of ODP Letter of Intent #34, Hydrothermal and cold water circulation within the intraplate seamounts: effects on rock alteration (Pacific seamounts).
Rating: A5 (no thematic relevance)

LOI 36 Nankai crustal shortening
TECP supports the idea of studying multiple crustal shortening in the eastern Nankai Trough and encourages the proponents to develop a complete proposal. The processes associated with crustal deformation and fluid flow within the Izu-Bonin/SW Japan arc collision zone are within the thematic interest of TECP.
Rating A2

LOI 37 Subseaflor biosphere
This is a very challenging idea, to test bacteria distribution in the upper crust, particularly close to magmatic emissions. It may really bring new information on the origin of life. ODP should definitely encourage such a high relevance topic.

However, TECP has to note the absence of tectonic objectives in such a research which could be more pertinent to the OHP or SGPP white paper targets. The topic could be easily associated with other legs, particularly those close to oceanic ridges. The area they propose to drill is close to the northern end of the Juan de Fuca Ridge, an area that is very near to the sites of the proposal 440-add, by Davis et al.. There could be common objectives, being the hydrothermal circulation on the eastern flank of the Juan de Fuca Ridge of the proposal 440 a target for the distribution of the biosphere as indicated in the LOI 37.
As a general remark, this letter of intent is too long; ODP should put a limit of a 3-4 pages as the maximum length for this first approach to the review system.
Rating: A5.

LOI 39 Palu-Kyushu
This LOI is written up to explore a relatively local problem and it is not explained how drilling in this area would shed light on fundamental problems of convergent margin processes. The real importance of the Palu-Kyushu ridge is not explained. There are other higher priority targets in this general region (N Mariana trough) and the writers are encouraged to contact the proponents of this other proposal to see if they can contribute.
Rating F 4

7. Status and Ranking of Proposals in the Prospectus.

In the light of comments by a number of TECP members, before voting on the Prospectus a vote was cast (7 for, 6 against) in favour of adding the proposal for drilling at Vema Fracture Zone to the Prospectus.

Rank	Area	Proposal Reference	Vote Score
1	Costa Rica	400-Add3	8.00
2	SE Greenland Margin	460----	7.73
3	Return to Iberia (NARM N-V II)	461----	6.67
4	Vema Fracture Zone	376-Rev3	5.10
5	Caribbean Basalt Province	411-Rev	4.03
6=	Sedimented Ridges II	SR-Rev3	3.90
6=	California Margin	386-Rev2	3.90
8	East Juan de Fuca Hydrothermal	440-Add	2.90
9	Caribbean Ocean History	415-Rev2	2.77
	West N. Atlantic Sediment Drifts		No Interest
	Bahamas Transect		No Interest

8. Watchdog Reports

i) Ocean-Continent Integration

Upcoming legs in the Mediterranean should advance this aspect. Other highly ranked proposals of interest allowing continent-ocean integration are Costa Rica and Taiwan.
There also remains a need to attract more continental tectonic earth scientists to ODP.

ii) Divergent Margins, P Symonds

There was little more to add following the earlier discussion of rifted margins proposals. The Gulf of Aden and Woodlark Basins appear to be areas well suited to study of young and active rifted margins.

iii) Translational settings

Scheduled legs

Leg 159 -Equatorial Atlantic - The first drilling in translational setting is scheduled this year.
165 - Engineering leg on the transverse ridge of the Vema F.Z. to test DCS coring is being delayed again. TECP notes its strong desire to see the carbonate platform on top of the ridge drilled and dated.

Pending proposals

386 - California margin, on 1996 prospectus. A palaeo-oceanographic leg with secondary benefits to the study of the transpressive (and previously transtensile) plate boundary between Mendocino and Baja California.
458 - Southern Ocean Transect. New. A palaeo-oceanographic leg which includes site TSO-2 on the Ridge with plans to drill to basement. This site bears directly on the origin of transverse ridges.
333- Cayman trough. Proposal to study conjugate rifted margins in a small ocean basin. The trough is bounded by long transform faults that represent ocean-continent boundaries. Two transects of shallow holes will cross the northern ocean-continent margin and compare between a margin that was already affected by the passage of the spreading centre (west transect) but has no current active transform fault, with one that was not affected by the spreading and has a transform fault.
376 - Vema F.Z. - The objectives are to core a thick lower crust and upper mantle section along the ridge, to document the vertical movements of the ridge by drilling into the carbonate reef and limestone platform, to understand the mechanism the uplifted and exposed the lithospheric section.

iv) Convergent Margins

TECP wishes to focus on the further quantification of active margin processes, including possible drilling off South America (Costa Rica, Nicaragua), S W Pacific (Marianas) and Japan. To be well received proposals will need to focus on documentation of fundamental processes rather than exploratory drilling.

v) Collisional Settings

There are currently two proposals in the JOIDES system that deal with collisional settings: one to study the northern Australia-eastern Indonesian collision and one to study the Taiwan collision zone. The

Australia/Indonesia proposal (# xx) was last reviewed at the Spring 1993 meeting and has not yet been revised. The Taiwan proposal was last reviewed at the Spring 1994 meeting and received a high ranking by TECP. These two proposals represent the best areas to study arc-continent collisions, so further proaction on the part of TECP is not necessary.

vi) Oceanic Lithosphere Processes

1. InterRidge Workshop (23-24 September 1994)

InterRidge sponsored a workshop on "4-D architecture of the oceanic lithosphere" 23-24 September 1994 in Wakefield, MA. The workshop was convened by Parson (UK), Lin (US), and Mevel (France) and was attended by 45 scientists from the US, UK, France, Japan and Australia. The principal objective of the workshop was to define the role of InterRidge in promoting, co-ordinating, and facilitating international studies of ridge segment-scale processes in the next 3-5 years. The workshop focused on major scientific themes that were identified at the 1993 InterRidge Symposium/Workshop in Durham, UK (Searle, Lin, Sinton, convenors): 1) What are the 3-D magmatic plumbing and hydrothermal systems of a spreading segment? 2) How is extension accommodated in 3-D by brittle/ductile/magmatic mechanisms and how is mantle upwelling coupled to lithosphere accretion and deformation? and 3) What are the fundamental causes of segmentation, and what controls temporal variability in spreading segments?

The workshop developed a consensus on two levels of InterRidge involvement's in segment-scale studies. The LEVEL 1 experiments are those which could not or would not take place without InterRidge co-ordination or collaborative effort. Examples include long-term multi-instrument deployments, focused deep drilling programs, and experiments requiring new tools and development. The LEVEL 2 experiments are those which would be facilitated, accelerated, or made more efficient by InterRidge (but would probably take place eventually either nationally or internationally). Examples of these experiments include multi-ship experiments and extensive mapping/sampling programs.

The workshop recommended a set of both Levels 1 and 2 experiments at slow- and fast-spreading study sites and emphasised the essential role of ocean drilling in direct sampling lower crustal and mantle rocks to test ridge-crest crustal accretion and tectonic models. It was the consensus of the workshop to form an InterRidge working group (Dick and Mevel, leaders) on ODP planning which will lead preparing appropriate letters of intent (LOIs) for drilling strategy in slow- and fast-spreading ridges. The InterRidge letters of intent are anticipated to be submitted in early 1995. Report of the 1993 Durham meeting is available from the InterRidge Office and a full report of the 1994 workshop will be available in December 1994.

2. RISES Workshop (26-27 September 1994)

The RIDGE Design Workshop for Experimental Approaches to RIdge SEgment Structure and Dynamics (RISES) was held 26-27 September 1994 in Wakefield, MA and was attended by more than 50 scientists from 20 U.S. institutions and two InterRidge observers. Lin (WHOI), Karson (Duke Univ) and Sinton (Univ Hawaii) convened the workshop which has a principal objective of defining RIDGE segment-scale studies over the next 3-5 years. The workshop developed a clear consensus around three major problems for RIDGE segment-scale studies in the next 3-5 years: 1) The origin of gravity bull's eyes and the relative importance of magmatism and tectonism in ridge segmentation at slow spreading ridges including how these are distributed within segments; 2) The nature of the melt delivery and crustal magma plumbing system at fast spreading ridges including whether it is fundamentally 2-D or more 3D along-axis; and 3) The interaction of active magmatic, tectonic and hydrothermal processes and their short- and long-term temporal variability at the segment scale.

The workshop recommended a two-pronged investigative strategy for addressing the above problems that involves 1) initiation of a new set of co-ordinated INTRA-segment experiments/surveys to investigate the linkages between magmatic and tectonic processes and CAV variables at one or more common segments; and 2) continuation of INTER-segment studies to define systematic variations in segment characteristics and to understand their dependence on crustal accretion variables (e.g. spreading rate, magma supply, segment length/offset, and mantle source compositions, etc.) The workshop also emphasised the need for a shore-based component of theoretical and laboratory studies for data integration and further model development and comparative studies with ophiolites where appropriate.

The ocean drilling program (ODP) was identified as an integral component of the intra-segment experiments. The workshop recommended a new set of co-ordinated experiments and near- and off-axis drilling programs to address objectives at slow-spreading ridges. For the "bull's eye experiments", five potential candidate sites on the Mid-Atlantic Ridge (MAR) were identified and compared (i.e., 33°S, MARK, TAG, 29°N and 35°N). There was a strong consensus for the 35°N area because it contains two adjacent segments with large contrasts in both axial morphology and mantle Bouguer anomaly. It was emphasised, however, that the 35°N site was chosen to be best suited to address the problem of relative importance of "recent" magmatism and tectonism in ridge segmentation; significant off-axis data are lacking to show that this area is well suited to study long-term

temporal variability. Other sites may be better suited to study temporal variability or to address different objectives (e.g. hydrothermal flux at the segment scale).

Three areas on the fast-spreading ridges were identified as sites for focused studies of the magma plumbing system: Hess Deep, the East Pacific Rise (EPR) between 9°-11°30'N, and the EPR between 17°-17°30'S (MELT area). A second-leg drilling at Hess Deep and complementary structural and geophysical studies were recommended to more fully determine the distribution and variability of lower crustal and mantle rocks formed at a fast spreading ridge. The workshop also endorsed deepening hole 735B at the Southwest Indian Ridge to achieve the lower crust/upper mantle objectives. A full workshop report will be available from the RIDGE Office in December 1994.

3. Current proposals on drilling at slow-spreading ridges
376-Rev3 (Bonatti et al): Drilling at the Vema F.Z. of the Mid-Atlantic Ridge; reviewed by this panel

402/425-Rev (Casey et al.): Offset drilling at the 15°N of the Mid-Atlantic Ridge; last reviewed in fall 1993

413 (Cann et al): Drilling the Reykjanes Ridge in the north Atlantic; last discussed in 1992

438 (Mutter and Karson): Drilling reflecting interfaces in Cretaceous oceanic crust at the North Atlantic; last reviewed in spring 1994

Recommendation: A joint ODP-RIDGE (InterRidge) workshop be held in 1995 to prioritise objectives and strategy of drilling at ridges and fracture zone settings. Candidate convenors include Dick and Mevel (chairs of the InterRidge working groups on ODP) and workshop participants include proponents of existing ridge drilling proposals.

4. Other proposals on oceanic lithosphere processes
SR-Rev3 (Franklin and Zierenberg): Second-leg of drilling at the sedimented northern Juan de Fuca ridge; reviewed by this panel; on FY96 prospectus

440/Add (Davis et al.): Drilling the Eastern flank of the Juan de Fuca Ridge to study hydrothermal circulation's; reviewed by this panel; on FY96 prospectus

420 (Purdy et al): Letter of intent by Fisher et al. in Spring 94 to move drilling away from the East Pacific Rise

vii) Back-arc and Fore-arc Settings
This aspect was discussed at length in the Spring TECP minutes and there is little more to add since then.

viii) Geophysical Observatories
There are two major ways to proceed; 1) Ocean Seismic Network (OSN), but although some holes are drilled for this programme, they might not be used ever (P. Dauphin announced that a workshop would be held in December 1994); they will need help, possibly in conjunction with a submersible. 2) CORK observations, three legs were ever devoted for this programme, and some data are coming from Cascadia margin. In Barbados, new data are acquired after two CORK deployments to the toe of the accretionary prism. Pressure, temperature and water sampling are being obtained. Data would be gained in 1995.

ix) Stress and Strain
We have the opportunity to make use of currently available technology to kick start strain measurements programs that can form an integrated part of observatory systems in active tectonic environments. The ridge program is already involved with the development of strain measurement systems some of which offer the possibility of considerable accuracy but at great cost (i.e. beyond the scope of ODP resources). The following are examples of two types of relatively expensive sensors that offer immediate possibilities to ODP and TECP objectives.

Vertical motion - Relatively inexpensive ($ 5 -10K) and highly accurate pressure sensors can be used to measure changes in depths below the sea surface to 10^{-8} accuracy of full scale (i.e. changes of a few mm at full ocean depths). These devices also feel the influence of periodic tidal forces and episodic effects of "oceanographic weather". Periodic tidal effects can be relatively easily filtered out. Oceanographic weather (of intrinsic interest itself) is more erratic and requires the instruments to be out for sufficiently long period that a baseline can be established and the effects of instrument drift can be analysed (i.e. periods of several months to a few years of data). Tremendous advantages can be a gained if more than one instrument in geographically similar but technically/structurally different environments can be use to correlate the weather effects (which will be fairly similar over scale lengths of a few km) and remove them form the records. An example would be the

subtraction of the oceanographic weather signal using a comparison of the signals between sensors on the incoming stable plate with sensors on the toe of an accretionary wedge.

Sonic extensiometers (cost of individual sensors on the order of ~10K) are accurate to a 1-2 cm over distances of 1km between sensors and can be put out in arrays of 16 or more units. Again temperature and salinity can cause fluctuations in sonic velocity that require attention. These velocity effects can be subtracted out of the signal if portions of the arrays have known stable dimensions (i.e. reference baselines) so that any fluctuations can be attributed to changes in the velocity structure of the intervening water body. Corrections can then be applied to the portions of the array that cross active structures.

Together with tilt meters these types of sensor could from part of the same modular strain measurement instrument. Note, the practical use of all of these strain measurement system requires a very good coupling to be achieved between the instrument and the seabed. In active sedimented environments the mobile nature of the high porosity near surface sediments causes problems, with local differential subsidence and fluidisation during earthquake events being potentially significant. Cased ODP holes (with or without emplaced CORKs/seismometers) supporting and stabilising simple surface platforms to which third party instruments could be securely attached/detached (by submersible or on deployment) would provide a practical answer to this problem. Depending on the local environment and scientific objectives such platforms could be supported by relatively simple (low cost!) short open cased holes a few tens of meters in depth or be part of more substantial observatories that include CORK systems.

x) Palaeomagnetic Aspects

California Margins Drilling 386-Rev2
Addresses: 1.) high-quality, long-period data for secular variation and magnetic excursion studies. 2.) tectonic rotation of Gorda Plate or local tilting at sites. 3.) Magnetic reversal stratigraphy.
Proposal does a good job of including these palaeomagnetic aspects.

Santa Monica Basin 422-Rev.
Most of the same arguments can be used for these sites for palaeomagnetic component of data acquisition. Tectonic aspects (block rotations and local tilting) are somewhat less clear cut at these sites.

Ontong-Java Plateau 448-Rev.
Palaeolatitude data to help constrain plate motions in the western Pacific. Not a major part of this proposal but a significant add-on.

Tonga Fore-Arc
Proposal Suggests using palaeomagnetics for determining rotation and translation of fore-arc during spreading in Lau Basin. Palaeomagnetics would be of marginal use here because of small degree of asymmetric opening and minor latitudinal changes.

Other proposals that may be able to expand on palaeomagnetic aspects include the Kerguelan Plateau, Tjornes Fracture Zone, and Southern Ocean Transect.

xi) Microstructural Studies

Several of the proposals that are relevant to TECP themes reviewed at the Fall meeting recognised the potential for microstructural studies. This recognition is best developed in convergent margin studies. These proposals include the potential for relating microfabrics to permeability studies and calibrating Vp and Vs wave studies (e.g., Costa Rica, Peru). They also provide an opportunity to compare deformation fabrics related to frontal accretion and underplating and a means to examine the evolution of sediment fabrics and their relation fluid flow histories (Costa Rica). The correlation of FMS data with thrust fault fabrics will also be valuable. Costa Rica could also provide an opportunity to compare fault rock fabrics from different generations of faulting. In the Vema proposal there is scope for expansion of microstructural studies, particularly to address the rheological transition across the dike-gabbro boundary and the relation of hydrothermal circulation to deformation and strain localisation. The Sedimented Ridges II proposal now recognises the potential for microstructural studies that can be linked into hydrothermal targets. This has not yet been addressed however in the eastern Juan de Fuca drilling. A drill target on the Ontong-Java plateau that includes a diatreme and recovery of mantle xenoliths may provide an opportunity to examine unmodified mantle fabrics. Some sites in this proposal include deep holes into basement that could provide useful sections for comparisons of palaeostress indicators with in-situ stress measurements. Drilling in the Tonga forearc recognises the need to investigate kinematic indicators in the core that can be coupled with FMS and in situ stress measurements. Microstructural studies will also be useful for establishing the relative deformation and intrusive histories. The SE Greenland drilling provides a good opportunity to examine the brittle deformation and kinematic indicators within the dike complex that can be used to used to investigate apparent rotations of the local stress field. In the Cayman Trough the potential for

linking metamorphism and diagenesis to deformation histories within fault zones has been recognised. This proposal could also include comparisons of palaeostresses with in-situ stress measurements.

xii) Plate Dynamics

Very few proposals currently in the system are devoted or even marginally interested to plate dynamics. Plate dynamics is a wide field that, generally speaking, involves plate tectonics and plate kinematics. One important undervalued point is that the lithosphere is detached with respect to the asthenosphere, at the main viscosity contrast occurring in between; plate tectonics is controlled by different degrees of de-coupling at the base of the lithosphere due to lateral variations of this viscosity contrast. Greater attention should be given to décollement planes, from the lithosphere base to the surface, studying wherever is possible, all the different physical parameters that we may describe at the various structural levels.

Poor attention is also devoted to the lateral variations in thickness and composition of the crust and the lithosphere which are focusing stress fields and determining plate margins. Lateral heterogeneity's are also controlling stress deviations with respect to the direction of plate motions, and we will difficulty arrive to a more accurate plates motion reconstruction until we don't have a clearer understanding of these deviations, margin by margin.

9. Recommendations to PCOM concerning tool /technology development

A. Recommendations concerning tool/ technology development. TECP recommends to PCOM that PCOM recommend to JOI Inc. that TAMU be implement the following:

1. TECP strongly endorses the continued development of the WSTP with particular emphasis on determining in situ pore fluid pressure measurements.

Explanatory note:
Given the close links between fluid flow and deformation TECP is generally supportive of fluid sampling devices (WSTP and PCS) but places a high priority on the WSTP or some modified version of this tool as a means to constrain pore fluid pressures.

2. TECP strongly supports the deployment of CORKS as a means to obtain valuable quantitative measurements of environmental parameters that control deformation in active tectonic environments.

Explanatory note:
TECP has an interest in using CORKS as a platform for stress and strain monitoring and spatial and temporal fluid pressure and temperature variations. Monitoring fluid chemistry is also an important factor for water rock interaction and its influence on failure mechanisms.

3. TECP recommends that near future (5 years) tool development should focus on adapting existing sensors for down-hole radar technology and NMR tool.

Explanatory note:
TECP has a long-standing interest in techniques that will reveal the structural and lithological framework in a larger volume surrounding the borehole. TECP has been led to believe that radar technology and NMR require relatively little development to be deployed in ODP boreholes (i.e. primarily repackaging existing sensors to fit the specifications of ODP operations).

4. TECP recommends that long term tool development should focus on cross-borehole or sea-floor to borehole experiment technology.

Explanatory note:
TECP recognises that these techniques have a potential to relate borehole measurements and core analysis to regional three-dimensional structural and lithological frameworks and therefore endorses a long term plan to investigate the feasibility of and develop cross-borehole experiments and non explosive sea-floor sources. TECP understands that cross-hole technology is currently limited to about 300m. It was noted that gravity measurements could also provide relevant data for this purpose but that such instruments require a stable thermal regime, that is generally not the case for ODP sites, and that the failure record for this technique is long.

10. National Programmes Relevant to ODP

Ocean seismic network. Ridge office will move to URI from WHOI, chaired by Jeff Fox. Big geophysical survey on EPR for next year, plus Juan de Fuca Observatories. MESH is based at Oregon State under Nick

Pisias. It is a new climate/ocean change on the 100ky-120Ma scale. MARGIN office is at Rice chaired by Dale Sawyer. Focuses on active systems, multi-disciplinary case studies, studying whole systems at multiple scales. Current themes are, How do fault move ? How do plates break to form margins ? What is the vertical variation in strength in the continental and ocean crust ? What is the nature of petrogenesis at subduction zones ? What are the processes of margin sedimentation and stratigraphy ? What fluid fluxes are involved in passive or active margins ? There is a plan to host an InterMARGIN meeting at EUG in Strasbourg and a MARGIN meeting at the Fall AGU. Contact Dale Sawyer at margin@rice.edu.

The French community are setting up a MARGE program, similar to MARGIN. Boillot at Villefranche is organising this.

In Australia there is a co-operative research centre studying the basins and margins around Australia. There is quite a strong economic aspect and international participation is encouraged. It is based at CRO.

In Germany the KTB has terminated at 9101m. It will be still be used for down-hole experiments.

A 'MARGIN' type program has been funded in Denmark and includes deep seismic studies, extensive land geological studies and a proposal for land drilling in conjunction with past and planned ODP drilling of the submerged part of the SE Greenland volcanic rifted margin. The five years program is conducted by the Danish Lithosphere Centre (DLC) and presently involves five US institutions and includes significant NSF/DLC joint funding of individual projects.

11. Recommendations to PCOM: Status of Shipboard Processing of Structural Science

Background by P. Clift (TAMU)

What Structural Geologists Want

The structural community wants the structural data collected on the ship to be accorded the same priority as other shipboard data, to be standardised and incorporated into the new database upgrade. They wish to retain some flexibility to avoid some of the short comings of routines like HARVI and to take into account unusual features in the core. They definitely need the ability to make detailed drawings of the core, which can be labelled and they want at least some of these sketches to be published within the IR volume or at least on the CD ROM. In due course the community would like to see an automated scanning process that would allow rapid scanning of core and labelling on a computer screen, with the data stored on the database. They also want computerised data tables of structural information which form an integral part of the ODP database.

What We Have

At present the review of structural data has consolidated the collection of different tables, sketches and diagrams used in the past into a standardised VCD form, solely for structural work, together with a generic structural data spreadsheet made using MS Excel. A series of structural identifiers has been named using the variety of structures seen in previous cores (both hard and soft rock) and a scale of relative intensity of deformation has been drawn up. These features form the foundations to the structural data description as it now stands. The use of these forms and the nature of the structural collection is discussed by the explanatory notes drafted recently. The procedure calls for the structural geologist to draw a detailed picture of the core using the VCD form. Ball point pen is used to maximise the likelihood that the picture can be scanned and placed on the CD ROM, as there is insufficient staff at TAMU/ODP to effectively redraft all the detailed diagrams that are produced by even a fairly modest leg, even if they could be sure not to lose essential detail marked by the scientists. Individual features are recorded on the data spreadsheet, typically on paper, which must then be transferred by the science party on to the computer if it is to be incorporated into the database. Again there is insufficient staff available at TAMU/ODP to do this task after the cruise. The current system calls for the scientists to fill out the marked columns but leaves open the possibility of adding further columns if the science dictates such. This system has been reviewed by most of the TECP at least once and some of the TECP several times, as well as by the TAMU/ODP staff scientists. It was sailed on Leg 156 where it was modified in the light of experience.

What we need now

For the structural data to progress further it is important that PCOM recognise the principle data sets that the community needs and classifies them as "prime data", i.e. data that it is the duty of science party to collect on a cruise and that they are obligated to record in a fashion that can lead to publication and integration with the database. In order for the structural data to progress towards a place in the database the collection of detailed core drawings and the storage of structural measurements in electronic form on the spreadsheet provided is a

basic need. Further data may be collected at the discretion of the science party but certain basic essentials need to be spelt out and required. TECP would like an ODP technical note to be written by a subset of the structural database committee chaired by Steve Hurst. 6-8 participants would use the existing system in the repository on real core material subsequently sit down and write a guide to structural data collection, defining structural features, intensities of deformation, how to measure the core, etc. Funding support from JOI is requested to hold this meeting in the spring of 1995 at the Gulf Coast Repository.

Further Developments

The needs of the structural community and the data that is collected does not easily slot into any of the existing computer programs operated onboard JOIDES Resolution. The existing barrel sheet programs are complex programs and are not easily altered to display the data required by the structural VCD. While HARVI does have an accompanying outline sketch of the core, the normal detail on this is far below that needed for the structural work. There is no separate column for structural identifiers, although this could be added without too much difficulty. There would however, be no room remaining for close-up sketches. In the case of VCD and its planned replacement "Etch-a-sketch" the problem is more serious as the product of these programs is the original ODP/DSDP barrel sheet, a low resolution graphic log with no representation of the core itself. However, this already includes a column for tectonic as well as sedimentary structures. Major alteration of either of these sedimentary programs is impractical without completely revising the way sedimentary rocks are described and recorded, i.e. a revision of the barrel sheet as the way to describe sedimentary rocks. It appears that the structural VCD will have to remain as an essentially hand-drawn diagram produced on the ship until easy way to scan core or provide good on screen draughting can be made available.

TECP would like to see a combination of actions taken to improve the collection of structural data. The panel feels that use of a structural column on the hard and soft rock barrel sheets could draw attention to structurally interesting intervals, allowing people to examine the structural VCDs on the CD ROM where they wish. The panel wish to see an improvement of the way in which the structural VCD is drawn up. In the short term the realistic aims are to improve the shipboard production of hand-drawn VCDs to the best possible state to allow them to approach publication quality with minimal post-cruise work. A standard Excel spreadsheet needs to be introduced, presumably the version tested over the last seven months. The use of these forms and VCDs needs to be declared mandatory so that a consistent data set of structural information can start to be collected and the publication of all structural data and selected VCDs can be achieved in the short term in the IR volume or CD ROM. Science parties need to
be restrained from just altering the structural data forms and VCDs for personal aesthetic purposes as has been the case in the past, and the structural forms treated in the same way as sedimentary and hard rock VCDs and data programs. At least as important is that ODP must staff structural geologists to almost any cruise of structural significance if this data is to be collected at all. The panel wishes serious consideration to be given to the task of designing a core scanning system, possibly in conjunction with the colour scanning track system of Alan Mix. By scanning the core and then allowing on screen annotation of the image, such as labelling and highlighting structural features, the work load of the structural geologist can be changed to allow greater focus on science and less on data entry. The technology required for such a system is already standard and used in other labs and is familiar to some members of TECP, e.g., Steve Hurst, who are willing to help develop the scheme. Such a system would help raise the standard of shipboard structural data collection hugely. The data produced could then be incorporated into the database presently under construction.

<u>Recommendations to PCOM</u>

Previously PCOM directed TECP to produce an implementation plan. Following further discussion and consultation, we recommend the following be implemented as soon as possible. This is intended as a high visibility, low cost procedure. Specifically, TECP recommends to PCOM that PCOM recommend to JOI Inc. that ODP-TAMU be directed as follows:

1. TECP requires strongly recommends that structural data be summarised by addition of an exiting column to the published Core Barrel Summary Sheets.

Notes: the aim is that sedimentary structures will be indicated in summary form by use of descriptors (i.e. as an index), as set out in the accompanying explanatory notes. However, detailed sedimentary structures can not be published in this way and additional records are essential.

2. TECP highly recommends that a Structural Data Table be completed; i) Routinely (i.e. mandatory) during legs that have been highly ranked by TECP (in the top 6); ii) Whenever structural data are noted in cores by shipboard scientists during other legs. TECP wishes to make it the responsibilities of the Co-Chief Scientists and the TAMU Staff Scientist monitor the presence of structural data and then to activate (mandatory) completion of the structural table.

Notes: The structural data table has been devised following widespread consultation. Standardisation of data collection and archiving is essential. During TECP supported legs it is intended that structural geologists will complete the table. However, it is very important that structural data are also collected on other legs where structural data can be collected. With aid of the explanatory notes (see below) it is anticipated that many or all the structural data can be collected, if necessary in the absence of specialised structural geologists (i.e. by the sedimentologists). It is **not** intended that the structural table be routinely filled in on all legs where there are no structural data.

3 TECP strongly recommends that the structural data collected at sea be published in full, at least on CD ROM.

Note: TECP also hopes that as much as possible of the important data can also be included in the scientific results volumes, depending on available space and priorities of individual legs.

4. TECP recommends the writing of a structural technical note at a meeting of a small selected group of structural geologists in the spring of 1995. Travel funds are requested for U.S. participants to attend (ca 5 people).

Notes: This meeting would be co-ordinated by Peter Clift and Steve Hurst.

12 Status of Shipboard Computing Recommendations to PCOM: :

Database Upgrade Recommendation to PCOM etc (as above)

TECP strongly recommends that a computerised method of structural data collection be advanced and incorporated into the database, as an integral part of upgrading the ODP data base as a whole.

Notes: TECP is very concerned that the computerisation of structural data should in future proceed on the same basis as computerisation of other essential primary data. e.g. sedimentary structures. TECP urges TAMU and the JOI steering committee to seek advice from the scientific community at large in the designing of the database requirements. In particular TAMU is urged to consult Steve Hurst (Duke Univ.) who is chairing a sub-committee on the database and its application to structure. Input from Hurst and the committee is essential to the development of the database.

13. Platforms

TECP sees continuing need for a JOIDES Resolution type ship after 1998 and 2003, but also the need for a deep riser equipped vessel, similar to the JOIDES Resolution stretch proposal or the new Japanese drill ship. Funding of multiple platforms would be achieved through greater international participation outside the US.

14. Budget Prioritisation

TECP felt that one avenue to explore is that some budget cuts could be accommodated by cutting the scientific result volume and publishing in the outside literature. The quality of the SR was perceived by many (rightly or wrongly) to be questionable. Younger scientists in particular appeared to suffer when much of their work was published only on ODP volumes. Members of the panel felt that since the publication ODP staff were scientifically inactive, in contrast to DSDP, that this also reduced the quality of the SR volume. Defence of the SR was raised in saying that the deadlines were important in getting post-cruise research done and making sure a spread of research gets done. TECP did not want to see cuts in DCS development. Panel does not wish to see logging development reduced and particularly did want to see the standard tool set reduced.

15 Suggestions for co-chiefs of highly ranked TECP proposals

Costa Rica: E Silver;
SE Greenland H.-C. Larsen,
Iberia T. Reston, Boillot,
Vema E Bonatti, K Kastens, Y Lagabrielle

16. Next Meeting

TECP suggests Las Vegas with a continental extensional field trip for the Spring Meeting on 20-22nd February 1995. Field trip will be 17-19th February.