

JOIDES Lithosphere Panel

Chairman's Annual Report

1987

The Lithosphere Panel (LITHP) has met twice since the last annual PCOM meeting: in May at Lamont, and in October in Paris. The October meeting was held jointly with CEPAC. Both were three day meetings and, in general, I believe the semi-annual meeting schedule begun this year has worked out quite satisfactorily. The 3-day meetings are long enough to discuss important issues in sufficient detail, and meeting only twice a year appears to be frequent enough to provide the input needed by PCOM.

The panel accomplished three main tasks at these meetings: (1) completion of the long-awaited LITHP White Paper, (2) evaluation of the 3rd WPAC Prospectus, and (3) review of CEPAC proposals and development of LITHP thematic objectives in the CEPAC area. Our recommendations in each of these areas are briefly summarized below. I also include some comments on the panel advisory structure and long-term planning within ODP.

LITHP White Paper

In May, the LITHP White Paper was completed and distributed to PCOM and the regional and thematic panel chairmen. The purpose of this document was to identify important global lithospheric drilling themes, and develop specific recommendations on the drilling strategies and technical development required to achieve these objectives.

The panel identified the two most important long-term lithospheric drilling objectives as: (1) the completion of one or more deep holes into the lower oceanic crust, and (2) the establishment of a suite of crustal drill holes at both fast and slow spreading ridges. We recognized that achieving these long-term drilling objectives will require a major engineering development effort to improve crustal drilling technology, and strongly recommended that a major commitment of manpower and resources be devoted to this effort within ODP over the next 5-7 years. In the short-term, the panel identified a number of important lithospheric problems that can be addressed using existing drilling technology in intraoceanic convergent margins, on old oceanic crust, in young oceanic rifts and on oceanic plateaus and aseismic ridges. We argued that the most sensible lithospheric drilling strategy for the next five years was to continue to address these problems, with a parallel engineering development effort to obtain the drilling technology needed to achieve our longer-term lithospheric objectives.

I have heard some comments that the recommendations to come out of COSOD II, especially the Crust-Mantle Interactions Working Group, are at odds with the priorities established by LITHP, and that our panel has not been representing the views of the broader community. This impression is not correct. LITHP has always rated deep crustal drilling as one of its highest priority thematic objectives and on this count we are in full agreement with the Crust-Mantle Interactions Working Group. They did not rank ridge crest drilling as highly as LITHP, but I believe that is because LITHP represents a much broader constituency, including the hydrothermal community, who were included in a separate COSOD II working group. The problem in the lithosphere community is not on agreeing what we want to do, it is in having the drilling technology and the drilling time to achieve those objectives.

Evaluation of 3rd WPAC Prospectus

At our May meeting, we gave an overall appraisal of the 3rd WPAC Prospectus. The Bonin drilling program, the Japan Sea legs and the Lau Basin drilling all satisfy important thematic interests in the western Pacific and were all rated highly by our panel. In the case of the Lau Basin, we recommended the drilling concentrate on the magmatic evolution of the back-arc basin, especially the interplay between volcanism and tectonics in the early opening of the basin. Bare-rock drilling is not required to achieve these objectives.

The most serious omission in this prospectus, we felt, was the absence of a viable reference hole program which has been one of LITHP's highest thematic priorities in the region. Drilling a series of crustal holes outboard of the arcs in the western Pacific can address a variety of objectives emphasized in the LITHP White Paper. These objectives include: (1) determining the composition of sediment and igneous crust being circulated into the mantle at subduction zones, (2) testing whether there is a correlation between the composition of the subducting plate and the neighboring arc volcanics, (3) investigating the temporal and spatial variations in the composition of igneous crust, (4) determining the alteration history of oceanic crust, and (5) "ground-truthing" geophysical models of oceanic crust produced at a fast spreading ridge. While the term "geochemical reference holes" (and the awful cow-grass-milk analogy) connotes objectives (1) and (2), the priority LITHP places on these holes is based on the entire suite of objectives. We believe a minimum drilling strategy for a reference hole program in the western Pacific is one deep hole outboard of the Bonins and three shallower holes near the Leg 59/60 Mariana transect. This program requires 1 1/2 legs of drilling.

CEPAC Proposal Review and LITHP thematic objectives

During our past two meetings we have reviewed twenty-six CEPAC proposals and ranked them based on their thematic interest, maturity and suitability as part of a Pacific drilling program. Our panel's six highest thematic objectives, and the highest rated related CEPAC proposals are:

LITHP CEPAC Drilling Themes

<u>Ranking</u>	<u>Theme</u>
1.	Structure of the lower oceanic crust Return to 504B (286E) (1-1 1/2 legs)
2.	Magmatic and hydrothermal processes at sediment-free ridge crests East Pacific Rise (76E Revised) (3 legs)
3.	Magmatic and hydrothermal processes at sedimented ridge crests Juan de Fuca Ridge (232E) (1-2 legs) Esanaba Trough (224E, 284E) Guayamas Basin (275E)
4.	Early magmatic evolution of hot spot volcanos Loihi (282E) (1 leg) Marquesas (291E)
5.	Crustal structure and magmatic evolution of oceanic plateaus Ontong-Java Plateau (222E revised) (1 leg)
6.	Composition and magnetization of old crust Jurassic Quiet Zone (285E) (1 leg)

Two important points regarding these recommendations should be emphasized. The top four LITHP drilling themes in CEPAC require bare-rock drilling (EPR, Loihi), young crustal drilling (EPR, Juan de Fuca, Loihi) or high-temperature drilling (504B, EPR, Juan de Fuca, Loihi), none of which are technically feasible at the present time. If the highest priority lithospheric drilling objectives in CEPAC are going to be addressed in this next round of drilling, a major improvement in crustal drilling technology must be achieved over the next 3-5 years. This will require appropriate long-term planning by PCOM and a major commitment of manpower and resources by ODP/TAMU.

In addition to the development of new drilling technology, achieving the highest priority LITHP drilling objectives in the CEPAC area will also require the commitment of substantial amounts of drilling time. A realistic estimate of the drilling time required to address all six LITHP CEPAC drilling objectives is 8-10 1/2 drilling legs; just the top four drilling themes, which we consider a minimal lithospheric drilling program in CEPAC, will require 6-8 1/2 legs of drilling. We believe devoting this amount of drilling time to LITHP objectives in CEPAC is justified because these are, and have been, our panel's highest global thematic priorities. Only 3 legs (106, 109 and 111) will be devoted to these objectives in the first 5 years of ODP.

Related recommendations:

In order to help achieve LITHP drilling objectives in CEPAC we have made the following related recommendations:

1) A minimum of four hard rock guidebases are required for LITHP drilling in CEPAC. Additional guidebases will be required if any near-axis seamount drilling is carried out.

2) An engineering test leg should be scheduled for sometime in the next 12-18 months to allow ODP engineers to field test their new hard rock drilling and coring systems prior to EPR or Loihi drilling.

3) It is desirable to attempt one leg of young crustal drilling as early as possible in the CEPAC program to allow ODP engineers to evaluate their new systems and have time to make necessary modifications.

4) A working group be established to develop a detailed drilling plan for EPR and Juan de Fuca Ridge/Esanaba Trough including strategies for hydrothermal fluid sampling, borehole logging and downhole geophysical experiments (including VSPs, crosshole seismic tomography etc.), as well as options for long-term instrumentation of the drillholes.

Panel advisory structure and long-term planning in ODP

The LITHP has long been a vocal advocate of a more thematically driven drilling program that concentrates on few important global drilling objectives. We believe the circumnavigation philosophy that has driven ODP planning up until now has led to a regionalization of drilling priorities that has been a major impediment to achieving many of the long-term, global drilling objectives recommended at COSOD I and COSOD II. We are thus encouraged that PCOM is finally taking some positive steps toward dealing with this problem, and we hope that some fundamental changes in the panel advisory structure and long-term planning within ODP can be implemented within the coming year. Our panel has discussed how we would like to see the planning process carried out on several occasions. What follows is a summary of some of the ideas that surfaced in those discussions, plus my own personal opinions.

Several factors have contributed to the present situation. One problem, until very recently, has been the largely advisory role of thematic panels and their minimal involvement in the proposal review process or the preparation of drilling prospectuses. We would favor a more hierarchical panel structure in which proposal review and prioritization is done primarily by the thematic panels, with the regional panels evaluating specific drilling strategies and site locations. In this sense we support the recent changes in panel mandates approved by PCOM. However, this should be viewed as only an interim solution. I would argue that in a truly thematically oriented drilling program regional panels should be eliminated altogether. They should be replaced by panels or working groups organized around specific thematic drilling objectives - eg. Neogene paleoceanography or mantle geochemical mapping. These panels would report to the appropriate thematic panel and would be responsible for tackling specific questions such as where to drill, what drilling strategies need to be employed and what drilling technology is required. They might hold workshops to solicit input from the broader

community. They would be responsible for putting together a long-term (~5 yr) drilling plan that addresses their thematic objective. This plan could be based on unsolicited proposals submitted by the drilling community for individual legs, workshop recommendations or the panel's own deliberations. This plan would then be evaluated by the parent thematic panel, and these panels would work with PCOM to incorporate it into an overall global drilling program.

This change in the panel advisory structure would, I believe, help redirect ODP toward a more thematic approach to drilling problems. However, this change alone will not be enough unless there is a parallel change in the way long-term planning is carried out at the PCOM level. Long-term planning in the first five years of ODP has been based on a circumnavigation philosophy with an arbitrarily assigned, equal number of legs in each major ocean basin with no consideration to global thematic objectives, where they are best attacked, or how long it will take to achieve them. The result has been a program with a decidedly regional focus, with the regional and thematic panels fighting over the limited number of legs arbitrarily assigned to a particular area. As long as the long-term planning by PCOM is carried out in this fashion, no amount of fiddling with the panel structure, mandates, liaisons etc. is going to change the regional focus of the program. **Long-term global drilling objectives require long-term global planning, and that cannot be effectively done with the present leg-by-leg, regional planning process.**

We on LITHP would favor a fundamental change in the way long-term planning is carried out in the second five years of ODP (ie. after the conclusion of the planned WPAC and CEPAC drilling programs). As a first step, the plans for a second circumnavigation should be dropped altogether. Each of the thematic panels should be assigned the task of assembling a five year drilling program comprised of say 12 legs that would address the major global thematic objectives outlined in the COSOD I and II documents. In each case they would identify prioritized thematic drilling objectives, where in a regional sense the drilling should be carried out, and the amount of drilling time required. Each "thematic prospectus" would be reviewed by PCOM and used to construct a tentative five year drilling strategy outlining approximately where the ship will go and how much time it will spend in each area. For example, it may be decided to devote most of the first two years to paleoceanographic and tectonic thematic objectives in the Atlantic and Pacific with an engineering leg to test new crustal drilling technology. However, the entire third year might be devoted to drilling a deep crustal hole on old crust in the North Atlantic or western Pacific. That kind of drilling scenario would be impossible with the present planning structure, but might be feasible with this new approach. Once an overall five year drilling strategy has been established by PCOM, the thematic panels and their associated working groups would be charged with developing detailed drilling plans as described above.

Clearly, this kind of approach will not eliminate the problems that will inevitably arise when a variety of groups with competing interests are using a scarce and valuable resource like the drillship. However, I believe it could succeed in giving us the more thematically driven program that the drilling community wants.

Bob Detrick, LITHP Chairman
October, 1987