

Symposium Summary

ODP-InterRidge-IAVCEI Symposium: Ocean Lithosphere & Scientific Drilling into the 21st Century

North Falmouth, MA, USA, 26th - 28th May 1996
Conveners: Henry J. B. Dick and Catherine Mével

InterRidge has a long standing interest in collaborating with ODP as closely as possible. Drilling has always been seen as a vital tool for ridge research. This workshop grew out of some work done by H.J.B. Dick who originally set up a group called DOCUM which focused on ocean drilling in the USA. R.C. Searle addressed P-COM about a year ago during which the idea of ridge crest drilling was informally discussed. This idea was formalized in this workshop.

Five thematic working groups were set up at the meeting: Fast-spreading Ridges, Slow-spreading Ridges, Active Ridge Processes, Large Igneous Provinces and The Arc Environment. There weren't many people involved in arc environments present at the meeting and it was thought that a further workshop to target those people might be held.

The main conclusions came from the first 4 working groups. LIPs are not closely linked to ridge processes so InterRidge is principally concerned with the results of the first three groups. Each working group identified first-order scientific questions and the objectives needed to answer them.

- One of these was total penetration of the crust from the top of the extrusive basalt layer into the mantle for both fast- and slow-spreading ridges. A variety of reasons were presented for this: Limited resolution of geophysical methods, interest in the way the crust is built up, the way melt is delivered from the mantle into the crust, how well does the layered seismic/ophiolite model correspond with real oceanic crust generated at a mid-ocean ridge.
- The techniques of offset drilling and drilling tectonic windows at both fast- and slow-spreading ridges were emphasized in order to look at lateral variability and extend the knowledge gained from single deep holes.
- It was recognized that the deep holes would require new technology and consideration was given to planning into the next century. A planning program was generated to the year 2003 and onwards.

The plans for drilling match very closely those which were generated at the InterRidge 4-D Architecture of the Oceanic Lithosphere Workshop held in Boston. It is probably through implementing this type of plan and by writing drilling proposals and getting them funded that we will implement much of the 4-D Architecture project plan.

The slow-spreading targets selected were the 15°N area where there are large outcrops of serpentinized peridotite, and the generic site for the InterRidge 4-D Architecture. The 15°N target was identified because it is thought to provide the best opportunity to carry out the mantle study objectives of the 4-D experiment. While this is separated geographically from the main 4-D Architecture experiment it therefore remains thematically similar. It calls for an array of 5 - 6 relatively shallow holes to be drilled in order to investigate the upper mantle and lower crust. The drilling plan for the 4-D experiment generic site involves two transects of

holes perpendicular to the ridge trend. About three holes would be drilled from very young crust to 10 Ma crust at a segment centre where there's a well developed mantle Bouguer anomaly low and presumably thick magmatic crust. Another three holes would be drilled at a segment end where there's a mantle Bouguer anomaly high and presumably thin magmatic crust. This drilling project would start with the existing capability of the *JOIDES Resolution* with shallow holes. As drilling technology advances, a pair of those holes would be chosen, one at the segment centre and the other at the segment end, to deepen for full crustal penetration. This would be coupled with arrays of offset drilling holes around the two deep holes.

The drilling targets for fast-spreading crust were initially off-axis in mid-plate at the H2O site half way between Hawaii and the western US coast. There is a submarine cable at this site. The precise location would be decided by the people who write the drilling proposal. If drilling is successful at this site, the hole would be maintained and a deep crustal section would be drilled during the next decade or so. If this site was not successful, the focus would move to medium-spread crust at the Costa Rica Ridge. A hole would be drilled very quickly, without sampling, down to the depth reached at hole 504B and then deepened down to the Moho. Alongside that, offset drilling would be carried out at Hess Deep as discussed in the 4-D Architecture project plan.

The Active Processes working group gave highest priority to drilling at the ridge axis. They propose drilling and instrumenting 5 holes in conjunction with a ridge axis observatory. The ideal configuration would be 4 holes to ~500 m depth and 1 hole to ~2 km depth. These holes would be logged and CORKed and instrumented in order to determine the physico-chemical state of the crust in the region of an active volcano-hydrothermal system and monitor the fluid and geochemical evolution of the system over decade timescales. Other critical environments for Phase 3 drilling include the flank of the Juan de Fuca Ridge, mid-plate volcanoes and convergent margin hydrothermal systems.

The main recommendation to ODP was that working groups should be set up to take the ideas issuing from this workshop forwards. ODP is in the process of structural reorganization. What has been P-COM over the past few years will divide into an Operations Committee and a Science Committee (SCICOM). SCICOM will continue to send out proposals for peer review, but it will also set up working groups called Project Planning Groups which will report to it. They will be pro-active in developing drilling proposals. It will still be possible for individuals to develop proposals for submittal to SCICOM. However, ODP is encouraging proposals to be submitted via the Project Planning Groups which will be set up in conjunction with thematic programs like InterRidge.

The workshop recommended that 4 Project Planning Groups be set up: Ridges (both fast- and slow-spreading), Large Igneous Provinces, Active Processes and Biology. The Biology Planning Group was inspired by the recent discovery of biological activity deep in the crust and the general thought was that this was an opportunity to be seized. One of the recommendations was, as a matter of urgency, to set up a proper microbiological laboratory on the *JOIDES Resolution*.

InterRidge was tasked with recommending membership of the Ridges (and with MARGINS, the LIPs) Project Planning Groups. InterRidge would not be the sole organization having input, but a large part of the recommendations was expected to come from InterRidge. It was also recognized that, since a Biological Studies Working Group already exists within InterRidge, that group of people might assist ODP in composing a suitable ODP Biology Project Planning Group. SCICOM was due to meet in February 1997 when they would formally set up or invite nominations for these working groups.