

WG Proposal “Systematic long-range ridge exploration”

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Although hydrothermal circulation through the lithosphere at spreading axes is believed to be widespread *and* to significantly modify crustal compositions, the quantitative exploration for hydrothermal systems has typically occurred as an "add-on" to cruise programs visiting the ridge for other reasons (geology, geophysics), and often over relatively short (≤ 200 km) length-scales. As a result, 30 years after the first discovery of venting, it is estimated that less than 10% of the global ridge crest has been mapped in detail or investigated systematically for hydrothermal venting and entire ocean basins remain effectively “untouched” by hydrothermal investigations. Yet such knowledge is paramount if we are to begin quantifying the thermal and chemical consequences of hydrothermal activity, its role in vent biogeography and its relationship to crustal structure. Critically, we need a new technological approach.

With the advent of routinely available AUV technology in a number of the world’s leading marine scientific institutions, we believe it is timely to propose placing hydrothermal exploration and the associated mapping of the ridge axis, on a new quantitative, regional- to global-scale footing. This can only occur, however, through international collaboration that will allow us to agree on the best combinations of vehicles, sensors and strategies needed for each ocean basin (a function of both spreading rate and the ocean chemical characteristics that modify plume behaviour) and international coordination of vehicles, sensors and ships to implement such a project. We believe that such a WG would fit extremely well to the InterRidge ethos, coordinating MOR research that no single IR nation could achieve.

Specifically, we propose an IR WG that will focus on developing a program plan to explore, systematically, along significant lengths of the MOR – not least for hydrothermal activity. Its scope would include:

- Identifying vehicles with the necessary reliability, depth and endurance capability for long-range exploration of the mid-ocean ridge.

- Defining standard sensor packages for this work and planning to acquire these sensor-suites for all vehicles.
- Standardising calibration of sensors and data-processing paths between vehicles to produce consistent data quality (*cf* past and future Physical and Chemical Oceanography programs – JGOFS, WOCE, Argo, GEOTRACES)
- Developing a cruise plan to best utilise underwater vehicles and support ships, including novel approaches to deployment, navigation and “refueling/reprogramming-at-sea”.
- Identifying the most urgent targets for such exploration work

As a focus, we suggest that exploration should concentrate, initially, on one particular ridge-segment. On any map of known hydrothermal vents, plume targets and unexplored ridge crests (e.g. Baker & German, 2004) several large stretches of ridge crest appear where no hydrothermal or detailed bathymetric data exist. Some of these are extremely remote (e.g. Pacific-Antarctic Ridge; Gakkel Ridge) and would lend themselves extremely well to long-range AUV investigation in the future. Others (Southern Mid-Atlantic Ridge, several back-arc ridges) play an important role in questions of chemosynthetic biogeography and the influence of tectonics on hydrothermalism. Certainly a major aim for the group’s initial mandate will be to develop a prioritized list of targets, realising that different nations as well as different scientific communities may have different priorities. Whatever initial target is chosen, however, it is clear that the methodologies we will develop, using long-range AUVs to carry out systematic mapping and hydrothermal exploration, will also be relevant for future exploration of the world's last uninvestigated ridge crests and back-arc systems, providing techniques to investigate entire “untouched” ocean ridge sections.

Our plan for WG activities would be as follows:

- i)* Initial meeting of working group members (see below) to identify major questions and problems and combine these into a plan for an international workshop, to be submitted for approval to the InterRidge Steering Committee.
- ii)* Holding of the workshop. A key output of that meeting would be a “road-map” project plan to achieve our exploration aims
- iii)* Presentation of that Project Plan to IR as a whole (including IR StComm, of course).
- iv)* Execution of the exploration program as a multi-national effort.