

Letters of Intent: EPR
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Thermal Cracking and Hydrothermal Circulation at the RIDGE 2000 East Pacific Rise Integrated Study Site: A Detailed, 3-Year Study of Seismicity and Exit-Fluid Temperatures at Vents Between 9° 46'-51'N

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We propose to study the complex network of hydrothermal circulation systems underlying the high- and low-temperature vents within the axial summit trough of the East Pacific Rise (EPR) between 9° 46'-51'N [Haymon et al., 1993; Von Damm et al., 1995; Von Damm, 2000]. Our proposal involves three, sequential, 1-year deployments of ~10 ocean-bottom seismic stations in two arrays, one around the vent complex centered near 9° 50'N and the other at the vent complex at 9° 47'N. Multiple high- and low-temperature probes will be used to measure exit-fluid temperatures for all known vents in the study area (~3 probes per hi-T vent, 11 vents to be monitored; ~16 probes per low-T diffuse flow biological community, 4 communities will be instrumented). We also plan to deploy a tide gauge so that correlations between tides, seismicity, and fluid temperatures can be assessed, and to enable deconvolution of tidal periods from the temperature probe data. We propose to obtain synchronous data from these sensor networks for a period of three years. Our field programs will require ~15-19 days on-station each year with either Jason2 or Alvin. We anticipate coordinating our field activities with other funded research at the IS site, including on-going studies as well as future EPR ISS studies. We have planned our field effort in coordination with both the Shank et al. planned biological/chemical experiment and the Fornari et al. detailed SM2000 sonar mapping study. We would be very interested in collaborating with other planned EPR ISS studies, including, for example, geodetic or MCS campaigns.

Our primary objectives are to:

- 1) delineate the position of the water-rock reaction zone(s) beneath the active vent fields and their variation over the 3 year time of the experiment,
- 2) use temporal and spatial correlations of seismic activity and vent fluid temperatures to deduce fluid flow paths in the crust,
- 3) use quantitative seismic and thermal analyses to constrain hydrothermal heat flow,
- 4) establish a physical context for other planned chemical and biological studies including those by Shank et al., Lutz et al., and Van Dover et al.,
- 5) monitor magmatic and tectonic activity in the EPR IS "bull's-eye" during our 3-year observation period.