

## **Long-Term Monitoring of a Backarc Ridge Segment: The Eastern Lau Spreading Center Observatory**

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*\*Please note – we expect to add additional authors for the final proposal.*

The Lau integrated study site was chosen as a focus site by the Ridge 2000 Program to increase the range of biogeographic diversity, fluid and rock compositions, and crustal and mantle structure relative to other well-studied ridge sites. The Lau focus site, along the Eastern Lau Spreading Center (ELSC) in the Lau backarc basin, displays an exceptional range of spreading rates (40-95 mm/yr, full rate), (ii) magma source and lava chemistry (andesitic lavas to typical tholeiitic basalts), (iii) axial depth and morphology (an inflated axial ridge, ~1800 m depth, to an axial valley, ~2700 m depth), (iv) melt lens characteristics (a seismically detected melt lens ranges from 2.0 km to 3.5 km below seafloor and is absent in other locations), (v) crustal structure, and (vi) proximity to arc magma sources and the subducting slab.

An initial series of RIDGE2000 sponsored reconnaissance cruises is now underway, and has discovered an exceptional abundance of hydrothermal activity, perhaps making the ELSC the most hydrothermally active ridge segment studied. Several active vent fields have been documented, and a “bulls-eye” of the focus site will be determined following the final reconnaissance cruises in April-July, 2005. In addition, a large active-passive OBS proposal has been funded, which will map seismic activity and crustal and mantle structure throughout the region, and work to map deep ocean currents in the region is ongoing. Thus, within several years, the Lau ISS site will be well characterized and new questions will arise demanding more detailed studies of a limited region that will include long-term temporal monitoring.

We propose to install a seafloor observatory utilizing a buoy to provide power and real time data access to a suite of seafloor instruments focused on monitoring and responding to events along the ELSC and in particular, near the Ridge Lau “bulls-eye” site. One type of sensors (seismographs and hydrophones) would detect seismic crises associated with eruptive events in the vicinity, perhaps enabling rapid response from Fiji or Tonga, which are located only a few hundred km away. These seismo-acoustic sensors, in conjunction with land-based instruments on the nearby islands, would also significantly improve seismic monitoring of the entire ELSC. Other instrumentation will monitor temporal changes in vent temperature and chemistry, and changes in the response of the macro and micro-biota. Such long-term monitoring and remote response capability is necessary to understand the temporal evolution of Lau vent fields and their fauna, which have exhibited drastic changes between previous expeditions.