

Letter of interest for a research proposal to the Integrated Studies theme of the Ridge 2000 program:

Small-scale spatial variability of flow regime, geochemical gradients, biogeochemical processes and associated microbial communities in relation to benthic community structures at selected hydrothermal vents ('Bull's eye') in the Lau Basin

Wiebke Ziebis - *University of Southern California – Geobiology Program/Department of Biological Studies/Section of Marine Environmental Biology*

Douglas Capone - *University of Southern California - Wrigley Institute of Environmental Studies/Department of Biology/ Section of Marine Environmental Biology*

Myrna Jacobson - *University of Southern California - Wrigley Institute of Environmental Studies/Department of Biology/ Section of Marine Environmental Biology*

Jed A. Fuhrman *University of Southern California - Wrigley Institute of Environmental Studies/Department of Biology/ Section of Marine Environmental Biology*

Marilyn L. Fogel - *Carnegie Institution of Washington Geophysical Laboratory*

We propose interdisciplinary research that involves active student participation in the laboratory and the field, and uses a combination of innovative approaches and novel techniques to investigate the interaction of hydrothermal fluid outflow, geochemical processes, microbial activity and macrofauna assemblages in selected areas of the Lau Basin.

The specific aims of the project are to

- characterize small-scale geochemical gradients at selected sites by high-resolution in-situ measurements of physico-chemical parameters using microsensors (flow, temperature, pH, redox-potential, oxygen, hydrogen sulfide (eventually methane and hydrogen) and high resolution pore-water analyses (organic and inorganic nutrients, metals)
- assess microbial activity along these gradients by in-situ incubation experiments, radiotracer studies and enzyme analyses
- compare patterns of marine microbial diversity and function along geochemical gradients with molecular genetic techniques
- assess trophic interactions by use of comparing stable isotopic compositions (C, N, S) of pore waters, bacteria and animal tissues
- investigate interactions between biogeochemical processes, microbial activity and key macrofauna species by conducting detailed biogeochemical and microbiological studies in close collaboration with macrofauna physiologists

We are certain that these process-oriented investigations will be an important contribution to a detailed understanding of small-scale ecosystem functioning in hydrothermally influenced sediment systems and will lead to new and exciting discoveries at the interface of geology, geochemistry and biology. We propose to perform these high-resolution studies in 3 selected areas in the 'bull's eye' or along a transect within the Lau Basin Integrated Studies Site that will

be selected by the end of 2004. The location of the exact study sites will depend on the choice of the bull's eye for the Lau Basin and on the preliminary data on venting styles, geochemistry and fauna data that will be available by the end of this year. Preferably we would like to focus our investigations in a sedimented area of low temperature diffuse discharge with diverse and abundant fauna in the East Lau Spreading Center (for example: Hine Hina 22°35'S). We understand our investigations as part of a multidisciplinary research and envision close collaboration and coordination with other research teams.

The proposed investigations address one of the fundamental questions formulated in the RIDGE 2000 Implementation Plan for the Lau Basin and aim to investigate two of the site-specific objectives.

- Fundamental Question: 'How does the global and tectonic setting of the Lau Basin contribute to the distinctive biological, chemical and geological characteristics of the Lau basin relative to the other R2K integrated study sites'

- Site Specific Objectives:

3.2.4. Understanding variations in vent fluid and biological community characteristics along a geological gradient.

3.2.6. Understanding the structure and function of biological communities, hydrothermal flow, and chemistry at the "Bull's-eye" site.

We welcome scientific and educational collaboration in all disciplines and would particularly appreciate collaboration with physiologists specialized in vent macrofauna.