

Letters of Intent: Endeavour
Target Date: February 15, 2003

Collaborative Research: Linking the physicochemical environment and physiological capabilities of macrofaunal communities on sulfide structures at the Main Endeavor RIDGE 2000 ISS

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We propose to investigate the relationship between physicochemical parameters and organismal physiology and behavior at the Main Endeavor vent field. The main question to be addressed will be how animals survive and respond to the extreme thermal and chemical conditions at hydrothermal vents. In order to address this question, an interdisciplinary approach will be taken to identify the thermal and chemical conditions encountered by biological communities on sulfide edifices, and to determine the physiological, biochemical, and behavioral responses of organisms to environmental conditions. Key environmental parameters including sulfide, temperature, and oxygen will be measured within macrofaunal assemblages (Assemblages I, II, III, IV, V, and VI; described by Sarrazin and Juniper) on sulfide structures. The instrumentation to be used will consist of Hydrothermal Fluid and Particle Sampler (HFPS), Remote Access Sampler (RAS, measurements of temporal variation), an in situ chemical scanner (measurements of spatial variation), and a temperature sensor array (spatial and temporal variation). Representative fauna from these assemblages will be collected and maintained on board ship in pressurized chambers. Experiments will be conducted to determine physiological, behavioral, and biochemical responses to elevated temperature and sulfide. Physiological measurements will include metabolic fluxes and rates of autotrophic carbon and nitrogen assimilation. Behavioral measurements will consist of time lapse video determination of activity and temperature preference within a thermal gradient. Biochemical studies will focus on responses involving intracellular osmolytes that provide protection against sulfide and temperature stress. The proposed studies will contribute to the understanding of the physicochemical niches of vent organisms, and also provide insight into whether abiotic factors structure vent communities.