

Letters of Intent: Endeavour
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Collaborative Research: Hydrothermal Plume Particle Properties: A Coordinated Acoustic Imaging and In Situ Particle Analysis Experiment

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Our objective is to determine the behavior, flux and composition of particulate matter suspended in a buoyant hydrothermal plume. Our purpose is to advance understanding of such plumes as major agents of dispersal of material (inorganic and organic) transferred from the lithosphere into the ocean by seafloor hydrothermal convection systems. The large size and intensity of the plume discharging from the Grotto edifice in the Main Endeavour Field make it a prime candidate for this study. Our proposed approach is to coordinate remote acoustic imaging with in situ measurements and sampling of the plume. The acoustic measurements comprise intensity of backscatter from suspended particulate matter and Doppler information with an acoustically calibrated sonar system mounted on an ROV. These data will be processed to reconstruct the buoyant plume volume in 3D, and to measure backscatter cross-section (proportional to total particle load and distribution), and mean particle flow velocities. The in situ measurements will be made with a laser particle analyzer alternatively mounted on an ROV and a mooring to measure particle size distribution, sampling for particle composition, and other relevant parameters. Combination of these data will provide the basis to estimate particle concentration, distribution, and processes within the buoyant plume.