

Multiprobe Life Detection in Hawaiian Sub-ocean Deep Igneous Cores

Michael C. Storrer-Lombardi¹

Martin R. Fisk²

Susanne Douglas¹

Gene D. McDonald¹

Radu Popa¹

Alexandre I. Tsapin¹

Rohit Bhartia¹

¹ Center for Life Detection, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, Ca 91109-8099, USA

² Oregon State University, College of Oceanic and Atmospheric Sciences, 104 Ocean Administration Building, Corvallis, OR 97331-5503

If life can exist in relatively unweathered igneous rock environments, the list of potentially habitable sites on Mars and the moons of Saturn and Jupiter expands significantly. The Hawaiian Scientific Drilling Program obtained cores to a depth of 3109 meters near Hilo, Hawaii. We report here on our multiple probe investigation of a single lithologic unit of hyaloclastite recovered from the 1335-1415 meter level. X-ray computer tomography revealed a labyrinth of vesicles. Deep ultraviolet native fluorescence images and Raman spectra obtained on fresh fractured samples without the addition of stains or fluorophores revealed signatures consistent with the activity of microbial life at vesicle rim clay-glass interfaces. These regions stained positive for DNA and chemical analysis using an electron microprobe revealed elevated levels of phosphorous. Environmental scanning electron micrographs demonstrated the presence of spherical forms 2-4 micrometers in diameter in areas exhibiting energy dispersive spectra indicative of elevated levels of carbon, phosphorous, and sulfur. We are currently performing organic analyses for potential biomarkers such as amino acids.
