

Title: Lava Flow Alteration at Craters of the Moon, Idaho, as an Analog for Microbial Habitat on Mars

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Abstract

Craters of the Moon National Monument and Preserve (COTM), Idaho is host to lava flows with comparable composition and texture to those observed on Mars. As part of the Biologic Analog Science Associated with Lava Terrains (BASALT) project, we investigated the relationship between alteration style and gradient scales in three young (2000 y.b.p.) lava flows at COTM. Alteration of volcanic substrate is known to improve microbial habitability. As such, our investigation seeks to identify and characterize microbial habitat analogs potentially representative of Noachian and Amazonian Mars. Alteration in these flows is dominantly the result of two processes; (1) syn-emplacement degassing and (2) sub-aerial interaction with eolian material and meteoric water. Syn-emplacement alteration products are dominated by hematite and goethite along with various clays and zeolites. These products are concentrated where heat persists during and following emplacement (e.g. proximal to eruptive and non-eruptive vents and in areas exhibiting significant textural transitions, possibly related to degassing concentrated along disrupted surfaces). The syn-eruptive alteration zones display mineralogical

variation across cm-scales, and occur as patchy zones spanning multiple meters. Post-emplacement, ambient meteoric alteration is characterized by carbonates, zeolites and clays concentrated along fractures and within vesicles. Owing to their deposition along fractures, these alteration zones may be less than a millimeter thick, but span multiple meters. Our multidisciplinary team of geologists, microbiologists and organic geochemists seek to identify associations of alteration styles and microbial habitability.