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Presentation Time: 5:00 PM

EXPLORING LAVA TUBES WITH LIDAR IN IDAHO AND HAWAI'I

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We have started to document lava tubes in 3D using LiDAR during our field campaigns in Idaho and Hawai'i. Tube dimensions and the variety of textures that reveal various flow processes have traditionally been mapped in 2D planar and cross-sectional views. A key advantage of LiDAR is that it captures details of the lava tube morphology from kilometer to centimeter scales in a single data set. Contextual views display tube morphology relative to surface topography, while close-up views of the interior show the distribution of flows and rubble on the floor, the morphology and orientation of side tubes, and intricate textures on the walls and ceiling, including lava stalactites. Between 2014 and 2016, we used a Riegl Vz-400 terrestrial laser scanner to document two lava tubes in Idaho and Hawai'i. This LiDAR is a near-infrared, vertical line scanner with a nominal range of 450 m. A Nikon DSLR camera and Trimble R8 differential global positioning system (DGPS) mounted on top of the LiDAR add true color overlay and georeferencing. In Idaho, we completed 22 scans along 250 m of the Indian Tunnel lava tube at Craters of the Moon National Monument and Preserve. In Hawai'i, we completed 65 scans along 400 m of a lava tube on the northern flank of Mauna Loa. Our field methods optimize the capabilities of our instrument. We collected 2-3 scans around the rim of each skylight to capture a portion of the tube interior and the surface with precise positioning from the DGPS. We then registered uncontrolled scans of the tube interior to these controlled scans during post-processing by matching features and reflecting targets placed within the lava tube. Inside the tube, we positioned the LiDAR in spots to best capture the general morphology and flow textures. However, data gaps occur above and below the scan positions. These are minimized by overlapping data from adjacent scans. LiDAR has not been used extensively to study lava tubes, so we plan to document additional lava tubes at each site to show the spatial relationships of multiple lava tubes in 3D and refine our techniques for this style of lava tube mapping. LiDAR data also complements other datasets like ground penetrating radar and magnetics, as well as traditional 2D mapping, providing a new type of data set to inform our understanding of lava tube processes.

Session No. 56

[T228. Field Geology to Inform Volcanic Processes: A Tribute to the Distinguished Career of Don Swanson](#)

Sunday, 25 September 2016: 1:30 PM-5:30 PM

Room 503 (Colorado Convention Center)

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