



MAPPING LAVA FLOWS BY SURVEYING LAVA TUBES EXAMPLE: AILA'AU/KEAUHOU FLOWS, KILAUEA / HAWAII

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Abstract

The 500 to 350 years old Aila'au and Keauhou lava flow field of the Kilauea contains several of the longest lava caves yet explored. These are - among others - : Kazumura Cave, Pahoa Cave System, Keala Cave, Ainahou Cave System, J. Martin/Pukalani Cave System, Keauhou Trail System, Epperson's Cave (approximate ordered according to length). Of these Keala Cave (8.60 km) and the Keauhou Trail System (3.066 km in 5 caves excluding Jens' Puka which measures 0.401 km) were mapped by my students. The tubes offer a prime possibility to differentiate the lava flow fields into individual lava flows. This is an improvement compared to the first such attempt published by Holcomb, 1987, which relied entirely on aerial pictures. Much of the two flow fields are covered by intense vegetation or by grass, hiding flow boundaries from view. The trace of the tubes on the topographic maps in most parts follows a noticeable flow ridge, but not everywhere, making morphological mapping difficult. The mapping shows that clumps of trees are not only associated with the cave's pukas (collapse holes of tube roof) but also occur on top of the cave where the roots can penetrate the roof and tap the moist air below.

The geological map of the middle Aila'au Flow shows that the Keala Tube is an older branch of the flow which has been superceded by the Kazumura flow. Kazumura lava invades both the upper and the lower ends of Keala. In between of the two flows is an older kipuka (area surrounded by younger lava).

In case of the Keauhou Trail area, we were able to differentiate between three flows, one containing the Ainahou Ranch System to the west and one containing the Keauhou Trail System to the east. In between is a younger flow, superceding both Ainahou and Keauhou. It also invades the upper end of Keauhou, covering its upslope section. It is not clear which of the flows, Ainahou or Keauhou, is older. Keauhou may in fact be a discontinued branch of Ainahou. Ainahou certainly was active a longer time than Keauhou, featuring much deeper erosion and advanced development of secondary ceilings. Because the upslope area of the Keauhou flow field has been covered by later lava and by ash of the Mauna Ulu eruption, 1969, there is no chance of finding the upslope continuation of the Keauhou tube. Both Ainahou and Keauhou tubes end at the Poliokeawe Pali, a face of the lystric fault system displacing the southern shoulder of the Kilauea seaward. Ainahou ends in a portal, where the lava once issued to the open air, while the Keauhou tube is closed by collapse at the fault.