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Complex interactions between Hawaiian fire fountaining and lava drain-back: Kilauea Iki 1959

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The 1959 eruption of Kilauea Iki, Hawaii involved the highest terrestrial fire fountaining recorded in the 20^{th} century. A total of 17 fire fountaining episodes over 37 days built a steep sided cone and deposited a tephra blanket extending over 15 km down wind from the cone. The unusual geometry of the 1959 vent, located on the side of a steep-walled pre-existing collapse crater, lead to ponding and formation of a lava lake on the upwind side of the vent.

Complex interaction occurred between the lake and fountain during many eruptive episodes with lava flooding back into the vent during and particularly at the close of fountaining episodes. We investigate here the nature of the drain-back and mixing processes involving lava and newly arrived actively vesiculating melt, via a study of the ejecta. The ejecta includes two types of clasts ragged, highly micro-vesicular ‘golden pumice” and reticulite, and black fluidal scoria that contains a wide range of bubble sizes. In thin section the black scoria consists of intimately mingled domains with alternating vesicular (mm-cm scale) and microvesicular textures.

Each major event commences with the eruption of a population dominated by scoria and evolves to a pumice-dominant assemblage as the shallow conduit is emptied of drain-back lava.