Geophysical Research Abstracts
Vol. 13, EGU2011-13980, 2011
EGU General Assembly 2011

Volcanic ash from Halema'uma'u Kilauea in 2008: sensitive indicators of near surface process

Bruce F Houghton (1), Lauren A Swavely (1), Don A Swanson (2), and Rebecca J Carey (1)

(1) Geology and Geophysics, University of Hawaii, Honolulu, HI, USA, (2) Hawaiian Volcano Observatory, USGS, Hawaiian Volcanoes National Park, HI, USA

During eruptions of Halema'uma'u, Kilauea in 2008, long intervals of pulsating, continuous degassing and ash emission were recorded from a free surface generally more than 100m below the crater. The subsurface processes accompanying these eruptions are reflected in the "componentry" of the ash, including variability in juvenile/wall rock proportions, and vesicularity, morphology, and lithology of the juvenile ash particles. The wall rock component was not fragmented by the explosions but instead was derived from collapses and minor rock falls of the walls of the vent cavity. The abundance of wall rock particles is thus an indicator of the relatively stability of the vent walls during the eruption. It reflects two processes: 1) the long term trends in terms of increasing stability of the vent walls and (2) short term perturbations associated with random small wall failures.

The juvenile ash contains both vesicular and vesicle-poor populations. Vesicular morphologies include scoria, golden pumice, fluidal vesicular shards and (rarely) reticulite. Vesicle–poor clasts include Pele's hair, Pele's tears, spheres, achneliths and angular dense shards.Extreme textural diversity reflects the combination of a very open style of degassing and very low mass fluxes yet moderately high gas fluxin 2008. The low eruption rates of typically tens to hundreds of kilograms per day (Swanson et al., 2009) meant that magma reaching the free surface had had variable residence time in and below the vent. Vesicle-poor particles reflect that portion of the magma that had had sufficient residence time in the conduit and vent to outgas efficiently. Conversely coarsely vesicular scoria and microvesicular pumice was derived from magma that had entered the conduit very recently and was actively vesiculating at fragmentation. Both juvenile populations were fragmented by a flux of mechanically decoupled magmatic volatiles averaging 850 t/d of SO2 (Elias et al., 2009). The clast assemblage was strongly fractionated by the great depth to the free surface, such that typically only ash-sized particles exited from the vent and were advected by the wind.