Hydrogen Diffusion in Olivine Phenocrysts from Episode 1 of the 1959 *Kilauea Iki* Eruption

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The time it takes for magma to reach the top of a volcano can be linked to why some volcanoes erupt explosively while others erupt effusively. One possible way of measuring magma's ascent time is with hydrogen diffusion profiles. Hydrogen (H^+, colloquially known as water) concentration profiles from olivine phenocrysts from Episode 1 of the 1959 Kilauea Iki eruption were used in this study to help constrain magma ascent rates of that eruption. While ascent times have previously been quantified using melt inclusion and melt embayment data, this study aims to help constrain those times by getting data directly from the crystal itself. Water concentrations were measured in core-rim profiles across five crystals by Fourier Transform Infrared (FTIR) Spectroscopy. The FTIR data was processed by 1-D modeling in the python package pynams (Ferriss 2015). Volatiles diffuse out of magma at lower pressures so it is expected that water concentrations should be lower at the rims of the crystal than at its core because diffusion occurs at the rims of the crystals first. Water diffusion profiles from this study do not follow expectations and instead show that water concentrations are either relatively constant across the crystal or show a higher concentration of water at the rim than at the core. Three of the five profiles taken have water concentrations that are 32%, 35%, and 40% higher at the rim than at the core. Rims of the crystals were identified by the visible glass along the edge. The higher water concentrations at the rims could be present because the crystal partially equilibrated in magma that had a higher concentration of water than where it first formed. Because relatively high concentrations of water are at the rims it is possible that the magma did not spend enough time traveling up the volcano to lose a significant amount of water prior to quenching.