# Hydrogen ($H^+$) in Olivine Phenocrysts from the 1974 Eruption of Volcán de Fuego

[1]M. Dia, [2]E. Ferriss, [3]H. Bausch, [2]T. Plank

*[1]The College of William & Mary, [2]Lamont-Doherty Earth Observatory of Columbia University, [3]The University of Chicago*

Eruption timescales are an important parameter in understanding why an effusive eruption differs from one that is explosive and is crucial for our understanding of volatile loss during eruptions. We have investigated the distribution of hydrogen (H+) across olivine phenocrysts from the 1974 sub-Plinian eruption of Volcán de Fuego in Guatemala by studying ash fall samples (< 2mm) which are most representative of pre-eruptive conditions due to their rapid cooling rates. The novelty of this investigation is its exploration of entire olivine crystals, as opposed to melt inclusion or embayment studies that have been done on olivine phenocrysts to quantify magmatic ascent rates. We used Electron Back-Scattered Diffraction (EBSD) to determine the crystallographic orientation of the crsystals and then conducted polarized and unpolarized Fourier Transform Infrared Spectroscopy (FTIR) analyses. We fit the data with 1-D models produced with the python package pynams that allowed us to determine the area under infrared absorption peaks associated with the presence of hydrogen. Volatiles diffuse out of crystals at lower pressures, so we expected that the rim, which is in contact with the surrounding magma, would lose more water than the core of the crystal. To ensure that we were measuring at a rim, samples with glass on their exteriors were preferred as glass is an indication of interaction with the melt during ascent. However, in our findings the olivine phenocrysts from Volcán de Fuego had H+ concentrations that did not experience complete loss close to the rims. Our results suggest that there may be other mechanisms behind volatile loss and internal distribution in olivine phenocrysts than currently known and raises the question of how site-specific trends and zonation of varying cations may impact H+ concentrations in olivine phenocrysts.