

Biotite trace element fingerprints (V-Co-Nb) identify magma batches and correlate volcano sequences at Las Cañadas Volcano, Tenerife

SLIWINSKI, JT^{1*}; ELLIS, BS¹; DÁVILA-HARRIS, P²; WOLFF, JA³; OLIN, PH⁴; BACHMANN, O¹

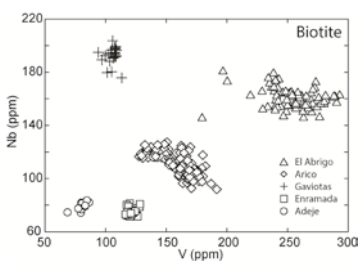
¹ Institute of Geochemistry and Petrology, ETH Zürich, (*correspondence: jakub.sliwinski@erdw.ethz.ch)

² Applied Geoscience Department, Instituto Potosino de Investigación Científica y Tecnológica, Mexico

³ School of the Environment, Washington State University

⁴ CODES Center of Excellence and School of Physical Sciences, University of Tasmania

Accurate identification of single volcanic events in the field is crucial for constraining eruption volumes and calculating recurrence intervals between eruptive episodes. Due to intra-unit textural variability as well as the complexities of pyroclastic transport and deposition, such identification can be challenging. We present a novel method for fingerprinting ignimbrites via trace element chemistry (V, Co, Nb) in biotite by laser-ablation inductively-coupled-plasma mass spectrometry (LA-ICP-MS). Using samples from the alkaline ocean island of Tenerife, we are able to demonstrate: (1) clustering of previously-characterized units into distinct,



homogeneous groups in biotite-V/Co/Nb space; (2) preservation of homogeneous biotite-V/Co/Nb even

in the presence of extreme variation and zonation in other trace elements (Ba, Sr, Rb); (3) the magnitude of difference in biotite-V/Co/Nb space exceeds the magnitude of variability in major elements (e.g. Al_2O_3), meaning that the latter can be estimated from stoichiometry for LA-ICP-MS internal calibration, thus making microprobe analysis optional and underscoring the efficiency of LA-ICP-MS fingerprinting as a reconnaissance tool; (4) biotite compositions are homogeneous throughout a deposit and not changed by stratigraphic height or juvenile clast texture (crystal-rich vs crystal-poor). We propose that biotite trace element archives allow us to (1) fingerprint eruptions at least as large as the ones on Tenerife (VEI \sim 4) and correlate turbidite records/geographically-separated deposits and (2) biotite serves as a faithful marker of the magmatic melt environment throughout much of the evolved magmatic history.