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Petrological constraints on magma storage and transfer beneath Volcán Cerro Machín (Colombia): A volcano showing signs of unrest

D. Muir (1), L. Caricchi (1), R. Mendez (2), and J.M. Londoño (2)

(1) University of Bristol, Earth Sciences, United Kingdom (l.caricchi@bristol.ac.uk), (2) Servicio Geológico Colombiano, Manizales, Colombia

Cerro Machín Volcano, located in the Central Cordillera (Colombia) is a dacitic volcano positioned along a large-scale fracture system. Past activity is characterised by explosions of varying intensities and by the effusion of lava domes, with 6 main eruptive cycles occurring over the last 10 kyrs. Currently, the volcano presents two central domes with a total diameter of about 3 km, where two fumarolic fields are located. The rest of the edifice is composed of a 600 m thick ring of pyroclastic flows. Recent seismic swarms, located at depths between 18 and 2 km, have prompted further investigation of this volcanic system.

Erupted products are dacitic with similar bulk chemistries to Pinatubo (65.1 wt% SiO_2, 2.1 wt% MgO, 2.1 wt% K2O, 4.3 wt% CaO and 4.4 wt% Na2O) apart from FeOT, which at 3.3 wt%, is lower by around 1 wt%. The mineralogical assemblage is composed of plagioclase, quartz, hornblende (two populations: high- and low-Mg) and biotite phenocrysts along with ilmenite, magnetite, and accessory apatite and zircon. All phases, both in products of explosive eruption and dome samples, appear to be at equilibrium with an absence of sieve textures in plagioclase and no dehydration reaction rims in the hydrous phases.

Because of the similarities in bulk composition, phase equilibria experiments for Pinatubo (Scaillet et al., 2001) can be used to provide information on the storage conditions of Machín magmas prior to eruption. The presence of biotite suggests temperatures lower than 750°C with melt water contents of at least 5.7 wt % corresponding to water saturation pressures between 225 and 240 MPa. Analyses to determine the amount of sulphur present in the magma are currently being performed to assess its possible influence on the stability of biotite (Scaillet et al., 2001).

The lack of evidence of mineral resorption in the eruptive products may imply relatively low magmatic temperatures or fast rates of magma transfer beneath Cerro Machín volcano. We are currently analysing mineral textures and compositional profiles at different stratigraphic levels in the eruptive deposits to constrain the timescales of magma ascent and its relationship with eruptive style. These data are of vital importance to establish the potential delay between seismicity associated with magma migration and an eventual eruption.

REFERENCES

Scaillet, B. & Evans, B. The 15 June 1991 eruption of Mount Pinatubo. I. Phase equilibria and pre-eruption P-T-fO_2-fH_2O conditions of the dacite magma. Journal of Petrology 40, 381–411 (1999).