

Petrographic analysis of major and trace element partitioning during assimilation of quartz xenoliths into the lava of the 2013-2014 New Southeast Crater eruption, Mt. Etna, Sicily

RILEA N. KYNOCK

Department of Earth Sciences, University of New Brunswick, Fredericton, New Brunswick, E3B 5A3

Mt. Etna is a continental volcano with multiple cinder cones on its flanks and several craters in its summit area (approx. 3000 m high, with an area of 190 km² around). The powerful eruptions that began at the end of 2013 developed into strombolian lava fountains that blanketed the area around the new southeast crater with fresh volcanic rock. Twenty-one samples of volcanic rocks in contact with quartz xenoliths from the siliceous metasedimentary basement were collected from the December 2013–January 2014 eruption at the new southeast crater. The goal of this study is to examine the petrography and mineral/glass chemistry of both the lavas and the xenoliths to decipher the patterns of element partitioning during assimilation of the xenoliths. The xenoliths comprise subrounded and embayed quartz and interstitial glass as well as rare poikilitic clinopyroxene crystals. The host lava comprises phenocrysts of complexly zoned, plagioclase and clinopyroxene, as well as forsteritic olivine, and Fe-rich oxides all of which are in a glass- and microlite-rich groundmass. Between the lava and the quartz-rich xenoliths there is commonly a zone of mixing in which melts from the lava and xenolith are co-mingled. Preliminary analyses show that glass in the quartz xenoliths is more silica-rich than that in the lava but has similar amounts of Al₂O₃ and K₂O as the lava. The lava is enriched in Na₂O, MgO, CaO, TiO₂, and FeO. With these preliminary petrographic and chemical data we can test a model in which Etnean lava infiltrates the xenolith and dissolves quartz, and crystallizes secondary clinopyroxene. The amount of clinopyroxene crystallisation required to give the observed compositional trends is generally consistent with the petrographic observations. However, the extreme enrichment of K₂O in the most silica-rich glasses cannot be explained by such a model. We propose that potassium enrichment in the silica-rich glass occurs because K is preferentially partitioned into polymerised melts over depolymerised melts. The remainder of this study will focus on defining this behaviour using LA-ICPMS analyses of the coexisting high-silica and low-silica glasses.