Geophysical Research Abstracts,
Vol. 11, EGU2009-10768, 2009
EGU General Assembly 2009

Assessing magmatic processes and architecture using crystalline inclusions: Case studies from North America, Central America and Indonesia.

J.P. Chadwick (1), V.R. Troll (2), B. van Wyk de Vries (3), and C. Siebe (4)

(1) Dept. of Petrology FALW, Vrije Universiteit, Amsterdam, Netherlands, (2) Dept. of Petrology, Uppsala Universitet, Uppsala, Sweden, (3) Laboratoire Magmas et Volcans, Université Blaise Pascal, Clermont-Ferrand, France, (4) Departmento de Volcanologia, Universidad Nacional Autonoma de Mexico, Mexico

Information on magmatic processes and architecture are integral for understanding the eruptive behaviour of volcanoes. Geodectic techniques have been successfully applied to identify complex plumbing architectures at a few intensely studied sites. However, such studies yield only restricted information on magmatic processes and can be difficult to implement at sporadically active strato-volcanoes. Combined geochemical and geothermobarometric analyses provide an alternative means of assessing magmatic architecture and processes. Such analysis of inclusions in lavas can provide distinct information on varied crystallisation environments and processes during ascent: records that may be incompletely preserved, homogenised, and or blurred in the host magma.

Crystalline igneous inclusions have been identified in previous studies as fractionation residues reflecting crustal processes operating in magmatic systems. Individual megacrysts are common in lavas at mature strato-volcanoes and can be high-pressure phenocrysts which crystallise early from the host magma (cognate), fragments of coarsely crystalline zones from partially solidified magmas (co-magmatic/co-genetic) or entirely foreign to the system (xenocryst) from a disaggregated xenolithic source.

We have carried out petrographic and geochemical analyses combined with mineral thermobarometry, to investigate the magma plumbing systems of three intermittently active but dangerous strato-volcanoes cited on basement of variable composition and thickness; Popocatepetle volcano, in Mexico, Telica volcano in Nicaragua, and Merapi volcano in Indonesia. The eruptive products contain a range of inclusion types hosted in magmatic compositions from basaltic to andesitic. Preliminary data indicate that the magmatic systems feeding these volcanoes are large and complex. The traditional model of shallow and elliptical magma chambers feeding volcanism is an oversimplification for these volcanoes and potentially many other strato-volcanoes elsewhere.