Geophysical Research Abstracts
Vol. 16, EGU2014-3894, 2014
EGU General Assembly 2014

Magma chamber processes under Quizapu Volcano, Chile: Models derived from chemical and textural analyses of the 1846-47 andesite-dacite flows

Michael D Higgins (1), Stéphanie Voos (2), and Jacqueline Vander Auwera (2)

(1) Université du Quebec a Chicoutimi, Sciences de la Terre, Chicoutimi, Canada (mhiggins@uqac.ca), (2) Université de Liege, Liege, Belgium

In 1846-47 five cubic km of andesite and dacite lavas (?) were rapidly erupted from Quizapu Volcano. The lavas are quite uniform in the field, with andesite enclaves up to 10 cm in diameter making up 2-17% of the rock. Enclaves were separated physically from the samples before analysis. The resulting analyses have a wide range in major and trace element composition (e.g. 59-68% SiO_2) most of which accords with a model based on simple mixing of dacite and andesite end-members. The andesite enclaves have a slightly lower SiO_2 content (57 wt. %) than the bulk-rock andesite (59), indicating a proportion of 0-80% andesite along the mixing line, which is much more than the amount of enclaves. Hence, andesite must have been injected into the dacite at least twice with perfect mixing during the first event and only mingling during the second event. Also, the second event of injection may have caused eruption which itself may have precluded perfect mixing between the two magmas. Quantitative analysis of the textures shows an even more complex story. The dominant phase is plagioclase, with 4-15% macrocrysts up to 1 mm long. Plagioclase crystals in 13 samples were classified into five groups on the basis of colour in cold-cathode cathodoluminescence images and zonation in visible light. The textures of each population were quantified in terms of total volumetric abundance and crystal size distribution (CSD), where there were sufficient crystals. All populations of plagioclase macrocrysts have CSDs characteristic of coarsening, although each different population was slightly different. A model of cycles of coarsening and kinetic growth is favoured, similar to that proposed for Montserrat volcano. The abundances of the plagioclase populations were compared to the overall SiO_2 content of the lavas: One population correlated with SiO_2 content, suggesting that it is associated with the dacite end-member, whereas another population can be correlated with the andesite end-member. However, the other populations are more complex, with some peaking in a single flow or SiO_2 content. It is suggested that initially homogeneous andesite and dacite magmas were produced and stored at depth. The two magmas rose and mixed in different storage volumes beneath the volcano, where plagioclase crystallised and coarsened. These different storage volumes were tapped successively during the eruption. Perhaps the overall model resembles that proposed for the Inyo rhyolite domes, California, where five different storage volumes were accessed.