

Melt segregation evidence from a young pluton, Takidani Granodiorite (Japan)

Eva Hartung (1), Luca Caricchi (1), David Floess (1), Simon Wallis (2), Satoru Harayama (3), Massimo Chiaradia (1), and Kalin Kouzmanov (1)

(1) Department of Earth Sciences, University of Geneva, Switzerland, (2) Department of Earth and Planetary Sciences, Nagoya University, Nagoya, Japan, (3) Department of Geology, Shinshu University, Matsumoto, Japan

We are presenting new petrological data from one of the youngest exposed plutons in the world, the Takidani Granodiorite (Japan), which has been suggested as a source for large volume ignimbrites ($> 300\text{km}^3$). Takidani Granodiorite ($1.54 \text{ Ma} \pm 0.23 \text{ Ma}$) is located within the active Norikura Volcanic Chain in the Northern Japan Alps and has been previously linked to large andesitic ($1.76 \text{ Ma} \pm 0.17 \text{ Ma}$) and rhyolitic eruptions ($1.75 \text{ Ma} \pm 0.17 \text{ Ma}$). The pluton is vertically zoned and consists of granites (67 to 68 wt.% SiO_2) in the lower section, granodiorites (65 to 66 wt.% SiO_2) in the middle section, a chemically more evolved fine-grained porphyritic unit (67 to 71 wt.% SiO_2) near the roof and a marginal granodiorite at the roof (67 to 68 wt.% SiO_2). The porphyritic texture of the more evolved unit near the roof indicates rapid crystallisation, which could be the result of the late intrusion of this unit at the roof of the magmatic system. However, no sharp contact is found between the underlying granodiorite and the porphyritic unit. Instead, a gradual change in rock fabric, whole-rock chemistry and mineralogy is observed suggesting that melt was extracted from the granodiorite.

Electron microprobe analyses of plagioclases show three main crystal populations (Type I, II and III) with distinct anorthite and Fe contents. Type I plagioclase (An_{30-40}) occurs dominantly within the marginal granodiorite at the roof. Type II plagioclase (An_{40-45}) are common in the granodiorite and porphyritic unit. Type III plagioclase (An_{45-50}) is predominantly present in the granite. All plagioclase populations share a common sodic rim (An_{22}) across the different units. Takidani Granodiorite rocks are compared to crystallisation experiments from similar magmatic suites. Emplacement conditions of the Takidani Granodiorite are obtained from the latter as well as barometry, thermometry and hygrometry indicating that magmas were ultimately emplaced at around 200 MPa, 850°C to 875°C and contained about 4 to 5 wt.% H_2O . Major and trace elements whole rock analyses together with mineral chemistry suggest that residual melt was extracted between 780°C and 730°C at crystallinities between 40 to 60 vol.%. The fine-grained matrix of the porphyritic unit indicates rapid crystallisation which may be the result of pressure quenching through eruption.

We are currently working on the volcanic products putatively associated with the Takidani pluton, to determine whether the porphyritic unit was actually the source of large eruptions that produced more than 300km^3 of volcanoclastic deposits.