Insight into mush zone processes: Si isotope offsets between minerals of the Fish Canyon Tuff

K. BRÜCKEL[1], C.C. LUNDSTROM[1]

[1]University of Illionis at Urbana-Champaign, Urbana, IL 61801, USA (bruckel2@illinois.edu;lundstro@illinois.edu)

Silicic plutonic and volcanic (P-V) rocks are similar in many aspects, such as compositional variability. However, significant differences between the two rocks exsits as well. One major difference is K-feldspar composition. K-spar in plutonic rocks is high in Or (75-90) and forms megacryts, whereas those in volcanic rocks are lower in Or (40-75). Experiments demonstrate that most K-spar growth occurs late, after rheological lock up and immobility of the system [1]. Nonetheless, large K-spar can also be found in intermediate ignimbrites [2]. Can these K-spars reveal something about the connection of silicic plutonic and volcanic rocks?

An optimal site to study this P-V connection is the Fish Canyon Tuff (FCT) (CO). The FCT is the largest known eruption (5000 km^3) and has pluton-like characteristics: homogenous phenocryst-rich dacit with a near-solidus mineral assemblage of a granodiorite. While hydrous minerals are pristine, anhydrous minerals show resorption features. This suggests that heat or H_2O was added to a crystal mush prior to its eruption [2]. We test the hypothesis that the FCT represents a remobilized pluton by measuring Si isotope fractionation factors ($\Delta Si_{min\text{-}min}$) between FCT minerals and comparing them to ($\Delta Si_{min\text{-}min}$) for plutonic rocks. $\delta^{30}Si$ linearly increases with SiO_2, for igneous systems [3] indicating some mechanism of fractionation during differentiation. In this study, $\delta^{30}Si$ of FCT minerals are compared to $\delta^{30}Si$ of granodiorites minerals from the Tuolumne Intrusion Suite (TIS). In the TIS case, we find quartz heavier than plagioclase and orthoclase, consistent with theory. Preliminarly results show that sanidines in the FCT are heavier than quartz, which could give insight into the paradoxical difference in K-spars. Results will allow a better understanding of magmatic processes and insight into the P-V connection.

[1] Johnson & Glazner (2010) *Contrib. Mineral. Petrol.* **166**, 777-799. [2] Bachmann *et al.* (2002) *J. Petrol.* **43**, 1469-1503. [3] Savage *et al.*(2011) *Geochim. Cosmochim. Acta* **75**, 6124-6139. [4] Savage *et al.*(2012) *Geochim. Cosmochim. Acta* **92**, 184-202.