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Insights into the early transcrustal plumbing system for Mt Taranaki, NZ using cumulate xenoliths.

TRENT OLSON[1], DAVID W PEATE[2] AND INGRID UKSTINS[3]

[1]University Of Iowa
[2]University of Iowa
[3]University of Auckland

Presenting Author: trent-r-olson@uiowa.edu

Mt Taranaki has a rather unusual location in the rear-arc region of the North Island of New Zealand, ~ 140 km behind the Taupo Volcanic Zone and ~ 200 km above the subducting slab. Details of the underlying transcrustal magmatic system can be revealed from thorough studies of mineral compositions of the antecryst cargo and cumulate xenoliths brought to the surface during eruptive events. For this study, we focus on a lithologically diverse suite of cognate cumulate xenoliths found in the Motunui debris avalanche deposit, formed during the earliest collapse event of the Mt Taranaki edifice. Because of the location of Mount Taranaki on New Zealand's North Island, understanding how magma is transported to the surface is important information for assessing the hazard potential for the region.

Twelve xenoliths (8 gabbros, 4 hornblendites) containing plagioclase, clinopyroxene, amphibole, Fe-Ti oxides, and apatite are being used to reconstruct the early history of Mt Taranaki's transcrustal magmatic system. Major and trace element analyses of these mineral phases are in progress, and they will be used to estimate pressures, temperatures, fO2 conditions, equilibrium melt compositions, and H2O content for each of these xenoliths. Estimating fO2 conditions for the eruptive products of Mt Taranaki is difficult due to the rarity of ilmenite, but several of the Motunui cumulate xenoliths contain touching ilmenite-magnetite pairs. Preliminary results of mag-ilm geothermometry have been determined for two of the gabbroic xenoliths. One gave 770-925°C and ΔNNO of 0.8 to 1.0 log units, while the other gave 780-1000°C and more variable ΔNNO of 0.4 to 1.8 log units. Additional mag-ilm geothermometry analyses together with new clinopyroxene and amphibole analyses will be integrated to start to build a comprehensive view of the transcrustal plumbing system beneath the earliest stage of the Taranaki edifice.