Tracking the geochemical evolution of arc melts from lower-crustal MASH zone to mid-crustal melt reservoir, Fiordland, New Zealand

GILLIAN GREENBERG[1] AND JOSHUA SCHWARTZ[2]

[1] Department of Geological Sciences, California State University Northridge, CA 91330, USA gillian.greenberg.468@my.csun.edu

[2] Department of Geological Sciences, California State University Northridge, CA 91330, USA joshua.schwartz@csun.edu

We use major- and trace-element data from magmatic amphiboles in Fiordland, New Zealand to evaluate geochemical relationships between lower- and mid-crustal reservoirs in a Cretaceous Cordilleran arc. We focus on the Misty and Puteketeke Plutons which were emplaced at 30-45 km and 15 km paleodepths from 115-122 Ma along the south-eastern margin of Gondwana. Major- and trace-element amphibole data reveal that construction of the Misty Pluton involved sheeted emplacement of HFSE- and REE-enriched hornblende pyroxene diorites and HFSE- and REE-depleted hornblende diorites. Enriched hornblende pyroxene diorites display a broad range in Zr concentrations (30-140 ppm) and crystallized at 890-960°C. In contrast, depleted hornblende diorites show a lower and much narrower range in Zr concentrations (10-60 ppm) but have overlapping crystallization temperatures (820-950°C). The lack of geochemical overlap between these enriched and depleted rocks suggests that there was little to no evidence for mixing or melt communication even in closely spaced samples.

Amphiboles from the mid-crustal Puteketeke Pluton display broad similarities to the depleted hornblende diorites in the lower crust with Zr concentrations ranging from 10-50 ppm. On a fine scale, the mid-crustal amphiboles are distinct in having lower average Ba (<50 ppm) and Sr (<80 ppm) concentrations, but higher Pb (2-10 ppm) and Sr/Y (3-30). Crystallization temperatures are distinctly lower ranging from 780-840°C. Similarities between depleted lower- and mid-crustal rocks suggest that the former were likely parental melts that underwent fractionation and cooling during vertical transport through the crust.