GoldTrace: tracking gold in arc lavas

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Strategic metals, such as gold, silver and copper, are in high demand in support of our modern society. Yet we still struggle to understand where chalcophile (akin to sulfur), and siderophile (akin to iron) elements originate within the crust and how they are transported to the Earth's surface. The capacity to liberate precious metals from the mantle and carry them in magmas significantly increases when volatiles (e.g., H_2O, CO_2, S) are present. Mantle that overlies down-going plates at convergent plate boundaries (i.e., subduction zones) is volatile-rich and commonly produces volatile- and metal-rich mafic magmas. While subaerial arc volcanoes release large quantities of volatiles and metals into the atmosphere during magma degassing, much of the metal-load in submarine intra-oceanic arcs is captured in arc lavas and glass owing to high hydrostatic pressures prevailing at the seafloor. Kermadec arc front volcanoes, NE of New Zealand, are ideal for studying processes involving metal enrichments in arc lavas. Here, we present volcanic glass major, trace element, and metal data from volcanoes spanning the length of the Kermadec arc to understand the role the subducting plate (including the Hikurangi Plateau) has on metal-flux beneath arc volcanoes. Preliminary results suggest that S, Cu and Ag contents are higher in lavas erupted above thick subducting Hikurangi Plateau than in lavas erupted above normal oceanic Pacific crust, suggesting that the composition, angle and thickness of the subducting plate affect the metal-fertility of arc magmas. In this project, we aim to identify first-order, large-scale parameters that lead to the formation of metal-fertile melts aiding the formation of seafloor massive sulfide deposits endowed with strategic metals.