

## **Geochemical mass balance during hydrothermal alteration of subseafloor volcanic rocks at Brothers volcano, Kermadec arc**

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In intraoceanic volcanic arcs, the combination of unique subseafloor processes produces a wide range of vent fluid chemistry and mineral deposits that are often considered as modern analogues of certain ore deposits mined on land. While it has been demonstrated that inputs of volatile-rich magmatic fluids play a crucial role in the chemistry of arc-hosted hydrothermal systems, the processes affecting the mobility of metals in the subseafloor remain a matter of debate.

During IODP Expedition 376, a series of five sites was drilled at Brothers volcano, on the Kermadec arc. Here, we present major and trace element geochemistry of altered volcanoclastic materials and lavas from two contrasting hydrothermal systems (1) at the NW Caldera, which is seawater-influenced, and (2) the Upper Cone, which is magmatic fluid-influenced and characterized by advanced argillic alteration. To assess the bulk geochemical exchange during alteration, compositions of variably altered rocks were compared with those of the unaltered protolith.

The most intensely altered rocks exhibit extreme depletion of several major elements (Mg, K, Ca, and Na) and overall enrichment in total sulfur, attesting to high-temperature reaction of rocks with acid-sulfate fluids derived from degassed magmatic volatiles. Total Fe concentrations, which are locally controlled by the distribution of pyrite, show strong variations throughout the drilled intervals at both sites. We further applied Fe isotope systematics to study fundamental processes controlling the mobility of Fe and associated metals and metalloids in magmatically dominated and seawater influenced hydrothermal systems and their potential impact on marine geochemical cycles.