Mo and U isotope behavior in the Lesser Antilles subduction system

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Significant stable molybdenum (Mo) and uranium (U) isotope fractionations can be induced by redox processes at Earth's surface. If oceanic sediments or altered ocean crust contain fractionated Mo or U, these surface signals may be either transferred to arc magmas at subduction zones or restirred into the deeper mantle. Here we examine the Mo and U isotope composition of mafic to intermediate lavas from Martinique in the Lesser Antilles arc and sediments from the downgoing plate in order to further explore whether these isotopic systems can be used as slab component tracers and assess whether Mo and U experience isotopic fractionation during subduction. Martinique is an ideal test case because the lavas are well characterized and the relative roles of slab fluids and sediment melts differ across the island.

Lavas show a wide range of δ^{98}Mo values (+0.09 to -0.88‰, relative to NIST 3134) and show a systematic relationship between δ^{98}Mo, age, and geographic location on the island. The younger sampled lavas (i.e. those < 2.1 Ma), which are also concentrated on the northwest side of the island (i.e. further from the trench) tend to have lighter Mo isotopic composition, with values significantly lighter than published results for MORB and other island arcs [1]. These lavas show relationships between δ^{98}Mo and radiogenic tracers consistent with mixing between sediment melts and a MORB source. The older lavas, located closer to the trench, show a differing trend, suggesting either a different sedimentary endmember or the occurrence of Mo isotopic fractionation in either the slab-mantle wedge interface or the magma plumbing system of the upper plate.

δ^{238}U values in the lavas show a large range, but the majority of samples are slightly heavier than chondrite and show no correlation with age, location, or any other chemical or isotopic parameter. Both the range and the skew of values towards heavier compositions stand in contrast to data from other arcs [2], suggesting the potential for isotopic heterogeneity in U that is ultimately transferred from the slab to to arc.

[1] Freymuth et al. (2015) *EPSL*, **432**, 176-186. [2] Andersen et al. (2015) *Nature*, **517**, 356-359.