Sulfide geochemistry of cumulates from the Lesser Antilles arc

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The sulfur isotope composition of volcanic rocks in arcs can be difficult to constrain because significant fractionation can occur during degassing. Mafic and ultramafic cumulates represent the least degassed part of the magmatic arc system, thereby offering an opportunity to investigate undegassed sulfur in arcs. Recent work on high pressure metamorphic rocks has suggested that subducted materials can retain their original isotopic composition to sub-arc depths. In particular, extreme negative $\delta^{34}S$ values can be retained in subducted sediments. The purpose of this project is to investigate to what extent these deep subduction zone processes are reflected in the sulfur isotope signature of arc magmas.

In the Lesser Antilles arc, there is a gradual decrease in terrigenous sediment being subducted from south to north. An estimated ~15% subducted sediment in the south and ~2% in the north is reflected in the chemical and isotopic composition of the Lesser Antilles arc magmas. Sulfides in these magma-derived cumulates record the earliest stages of magma evolution and are a more faithful monitor of the sulfur isotopic composition of the magma source region in the mantle than erupting lavas. We hypothesize that the decrease in terrigenous sediment being subducted from the south to north will be reflected in the S isotopes in cumulate samples.

Samples of mafic and ultramafic cumulates have been collected from fourteen islands across the Lesser Antilles arc. Primary rock types are olivine gabbro, amphibole gabbro, plagioclase gabbro, and olivine gabbronorite. Sulfide minerals include pyrite, chalcopyrite, and pyrrhotite, and typically occur as spherical blebs. Sulfides are found primarily as inclusions in clinopyroxene, amphibole, olivine, and plagioclase. Sulfides occur less frequently as inclusions in magnetite and within the matrix. Analyses of sulfur isotopes in cumulate sulfides are currently underway. The decrease in the amount sediment being subducted from south to north in the Lesser Antilles arc should result in $\delta^{34}S$ values that increase from south to north (more sediment subducted = more negative $\delta^{34}S$ values).