

Molybdenum isotope evidence for melting of subducted sediments beneath the Lesser Antilles arc

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Molybdenum isotope ratios in arc magmas have recently been shown to trace fluid and melt components derived from the subducted slab. [1]. Here we present Mo isotope data for Lesser Antilles arc lavas and sediments subducting at the Lesser Antilles trench. Radiogenic isotope characteristics in the Lesser Antilles lavas indicate the addition of enriched, continental material to the magmas. It is hotly debated whether this continental material is a sediment derived from the subducted Atlantic plate or if the magmas assimilated material from the overlying plate while ascending to the surface [e.g. 2,3].

Sediments subducting at the Lesser Antilles trench contain sequences of black shales that have unusually high $\delta^{98/95}\text{Mo}$ (the per mil deviation in $^{98}\text{Mo}/^{95}\text{Mo}$ relative to the NIST 3134 standard) of ~ 0.6 . The black shales are highly enriched in Mo and despite being a volumetrically minor component in the sediment column they dominate the Mo isotope composition of the bulk sediment subducting at the Lesser Antilles which has $\delta^{98/95}\text{Mo} = 0.55$, about 0.8 ‰ higher than the sediment subducting at the Mariana trench in the Pacific.

Lavas from the depleted, northern Lesser Antilles islands have $\delta^{98/95}\text{Mo} = -0.1 - 0.05$ and are within the range of previously published data from the Mariana arc [1] whereas lavas from the more enriched, southern Lesser Antilles islands have substantially higher higher $\delta^{98/95}\text{Mo} = 0.15-0.35$. We attribute the high $\delta^{98/95}\text{Mo}$ in the southern Lesser Antilles islands to black shale-derived Mo and show that these lavas require the addition of sediment-dominated slab melts to their mantle sources.

[1] Freymuth et al. (2015) *EPSL* **432** 176-186. [2] Carpentier et al. (2008) *EPSL* **272** 199-211. [3] Bezard et al. (2014) *EPSL* **395** 51-60.