Using mineral isotope stratigraphy to understand crustal contamination in the Lesser Antilles arc

J.R.BROWN[1]*, J. PRYTULAK[1], G.F.COOPER[1,2], C.G.MACPHERSON[1], G.M.NOWELL[1], I.NEILL[3]

[1] Department of Earth Sciences, Durham University, Durham DH1 3LE (*correspondence: joshua.r.brown@durham.ac.uk)

[2] School of Earth Sciences, University of Bristol, Queens Road, Bristol BS8 1RJ

[3] School of Geographical and Earth Sciences, University of Glasgow, Glasgow G12 8QQ

Arc lavas from the central and southern Lesser Antilles show diverse radiogenic isotopic compositions and considerable variation at individual volcanic centres [1]. Debate centers on whether this variation represents addition of subducted sediment to the mantle source, or assimilation of arc crust by magma *en route* to the surface.

$^{87}Sr/^{86}Sr$ ratios of zoned plagioclase from cumulate xenoliths, entrained in erupting lavas, record changing melt compositions during crystallization in crustal reservoirs so should track contamination of host magma. It may also be possible to determine $^{87}Sr/^{86}Sr$ records of magmas at different crustal levels since thermobarometric and petrological data suggest cumulate formation over a range of depths (≤15 km, pressures of ≤4 GPa) [2]. Cores of zoned plagioclase or deep formed cumulates enriched in radiogenic strontium would support a significant sedimentary input to mantle sources. However, increasing $^{87}Sr/^{86}Sr$ ratios from core to rim, and/or in progressively shallower cumulates, would indicate the presence of crustal contamination.

We will analyse cumulates from Martinique and St Vincent. Martinique whole-rock (WR) $^{87}Sr/^{86}Sr$ data span the whole arc range so we anticipate evidence for this in the cumulate isotope stratigraphy. Less diversity (and less radiogenic compositions) in WR $^{87}Sr/^{86}Sr$ of St Vincent lavas suggests that its cumulates will either disprove significant contamination or, perhaps, preserve cryptic evidence for assimilation not visible beyond the crystal scale. Plagioclase core $^{87}Sr/^{86}Sr$ compositions from both islands will be used to evaluate the sediment content of mantle sources.

[1] MacDonald, R., Hawkesworth, C.J., Heath, E (2000), *Earth-Science Reviews*, 49, 1-76.
[2] Cooper, G.F., Davidson, J.P., Blundy, J.D (2016), *Contrib. Mineral Petrol.*, 171, 87