Multiple sediment contributions in the southern Lesser Antilles arc

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Lavas from the southern Lesser Antilles have long been recognized to have a large sediment isotopic and chemical signature, in part incorporated within the arc crust, based on AFC relationships and elevated $\delta^{18}O$ [1]. New Hf and double spike Pb isotope data show that the most isotopically depleted lavas in St Vincent and Grenada have Hf-Nd isotopic signatures similar to Atlantic E-MORB but elevated $^{87}Sr/^{86}Sr$, $^{207}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$. These are also the most magnesian in their respective sample groupings, have mantle-like $\delta 18O_{cpx}$ and thus probably have not undergone major interaction with the arc crust. Crustal contamination reduces $\Delta^{208}Pb$, Hf and Nd isotope ratios. In Grenada, this isotopic signature is present in C-series lavas having Nd/Hf and Nd/Zr 2-3x MORB ratios and Ce/Pb>25. Coupled with MORB-like Zr contents, the low Nd/Zr would usually be taken to imply preferential LREE addition to the magma sources, while the high Ce/Pb ratios ought to imply no sediment contribution to the magma source. In contrast, isotopically similar samples in St Vincent have normal mantle Nd/Zr and low Ce/Pb (~9). The elevated $^{207}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$ cannot realistically be derived from anywhere other than subducted sediment. In Grenada C-series sources, the absence of accompanying low Ce/Pb would suggest that the sediment had been depleted in Pb prior to contributing to these magma sources, perhaps through shallow volatile release. Strongly elevated Nd/Zr and E-MORB-like Hf-Nd isotope ratios imply that LREE are transported into the source by a fluid largely derived from the subducting basaltic crust. A residual HFSE-bearing phase is rendered unlikely by normal mantle Nb/Zr and Ti/Zr.

Primitive M-series lavas from Grenada have been divided into low- and high-La/Yb groups with respectively lower and higher source sediment contributions. Both have high Nd/Zr and Nd/Hf ratios, ~1.5x and ~2x primitive mantle for the low- and high-La/Yb groups respectively, and the latter are offset to higher $^{176}Hf/^{177}Hf$ for a given $^{143}Nd/^{144}Nd$. In contrast, St Vincent lavas have higher $^{143}Nd/^{144}Nd$, lower $^{176}Hf/^{177}Hf$ and normal mantle Nd/Zr. This suggests that sediment addition to the source is accomplished via a high LREE/Zr component, either fluid or a melt in equilibrium with residual sediment zircon.

[1] Thirlwall *et al.* (1996) *GCA* **60,** 4785-4810.

The timings of sea level change during the last glacial cycle, from U/Th dating of submerged corals: Results from IODP expedition 310 "Tahiti sea level"

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U-Th dating of Pre-Last Glacial Maximum (LGM) corals, drilled during IODP Expedition 310 "Tahiti sea level", has provided new data about the timing and magnitude of sea level prior to the last deglaciation. Drilling during Expedition 310 recovered 632 m of core (at 57.5% conventional recovery) from 37 drill holes. Of these 37 holes 28 penetrated material beneath the postglacial reef sequence. In contrast to previous onshore drilling [1], the pre-LGM material recovered during 310 has provided fossil corals that have not suffered significant alteration. Much of the Pre-LGM material recovered is aragonitic (40% of pre-LGM corals screened by XRD have <1% calcite), and gives $\delta^{234}U_i$ close to modern seawater (85% of pre-LGM corals, <150 ka, have $\delta^{234}U_i$ between 138 and 150).

The slow subsidence of Tahiti, and the depths of the holes drilled during Expedition 310 has led to the recovery of Pre-LGM material that is representative of sea level lowstands. Thus, results from Tahiti provide a useful complement to existing records of sea level from corals which are typically biased towards highstands.

Pristine pre-LGM samples provide constraints on three periods – MIS3; MIS6; and the start of the penultimate deglacial. MIS 3 samples support evidence for rapid change in sealevel during this period. Corals recovered from marine isotope stage 6 constrain the magnitude of the deglacial sea level rise at the penultimate deglacial. The timing of start of this deglacial is constrained by a series of corals that suggest a reef drowning event ~90m below sea level.

[1] Bard *et al.* (1996) *Nature* **282**, 241-244.