Zircon inheritance in a young intra-oceanic arc system: The southern Lesser Antilles arc

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The Lesser Antilles intra-oceanic arc constitutes one of the best examples to examine the effects of crustal and subducted sediment involvement in the generation of arc crust. Our study in the islands of Grenada and Carriacou shows for the first time SHRIMP-dated, Late Eocene to Pleistocene (~0.2-35 Ma) magmatic zircons in addition to Late Triassic to Paleo-archean (~208–3422 Ma) inherited zircons. Predominantly Early Jurassic to Precambrian (~158-2667 Ma) grains were also recovered from beach and river sands. Most inherited grains are euhedral with rounded terminations and exhibit complicated internal zoning in CL images.

All Late Eocene to Pleistocene zircon REE-patterns are similar with weak negative Eu anomalies, in agreement with whole-rock REE data, and suggest that zircons crystallized from a melt after minor plagioclase fractionation. The trace element chemistry of these zircons implies crystallization from mantle-derived magmas contaminated by continental material.

Except for one sample with a low initial εNd value (-0.29), all other dated whole-rock samples show moderately positive εNd(t) values (2.28 to 4.74). The xenocrystic zircons have negative εHf(t) values (-16 to 0) suggesting derivation from continental protoliths with a significant crustal history. We suggest that transfer from the subducting slab to the mantle wedge source region of the magmas is the main mechanism explaining contamination of the lavas from Grenada and Carriacou.