Provenance of zircons in ophiolitic chromitites from North America

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The presence of zircons of crustal origin in chromitite bodies hosted in the mante section of ophiolites is nowdays taken a tangible evidence for the recycling of crustal material within subduction zones. The mechanism of recycling of crustal material in to the mantle beneath arc systems are still under debate and they include: (i) oceanic crust and sediments dragged down by the subducting slab, (ii) subduction erosion of the fore-arc regions, or (iii) delamination of dense thickened lower crust beneath a volcanic arc. In this work we report a comprehensive study of zircon populations from suprasubdution zone (SSZ) ophiolites from eastern Cuba and NW Mexico, where volume of upper mantle mantle and corresponding oceanic-arc crust have been preserved. Chromitites hosted in the mantle section of the SSZ-type Mayarí-Baracoa Ophiolitic Belt (90-125 Ma) in eastern Cuba contain zircons that yield ages between 287 ± 3 Ma and 2750 ± 60 Ma. Similar ages ranging between 278 ± 4 Ma and 2263 ± 44 Ma are found in chromitites hosted in the mantle secion of the SSZ-type Puerto Nuevo ophiolite (250-221 Ma) in NW Mexico.

We interpret these chromitite zircons as sediment-derived xenocrystic grains that were delivered into the mantle wedge above subducting slabs by ascending partially-molten thermal-cold plumes. In this scenario, both assimilation of partially molten material and magma mixing occur. Orthopyroxene-consuming reactions in harzburgite generate basaltic/boninitic Cr-rich melts which can precipitate chromite during partial assimilation of Si-richer cold-plume-derived material. Mixing of the migrating Cr-rich basaltic melt/magma with Si-richer melt/magma evolved from the cold plume triggers further chromite crystallization in upper mantle.