Mantle plume-supra-subduction zone mantle interaction: Evidence from chromitite (Loma Caribe ophiolite, Dominican Republic)

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The Loma Caribe peridotite belt (Central Cordillera, Dominican Republic) is the largest exposure of oceanic mantle in the island of Hispaniola. It consists of peridotites that record partial melting associated with the development of the Greater Antilles island arc during Early Cretaceous times. Small pods of massive chromitite (up to 10 m in length and <1 m thick) are hosted by serpentinized dunite, and saprolitic limonite (i.e., "floating chromitites"). These chromitite pods contain a suite of exotic minerals that inlude zircon, native elements (Fe), metal alloys (FeCo), carbides (WC), phosphides [Ni-(Cr,Fe)-P phase] and unidentified/unknown Ca-Fe-Si-O and Ti-Si-Ca-O mineral phases.

EMP and LA-ICP-MS analyses performed on individual chromite grains from the chromitite bodies reveal much higher Cr_2O_3, TiO_2, Fe_2O_3, Ga, V, Ni, Zn, Co, Mn and Nb contents than in typical chromitite hosted in the mantle section of ophiolitic complexes and in layered intrusions. Calculated parental melts in equilibrium with Loma Caribe chromitites indicate derivation from high-Ti tholeiitic basaltic liquids as oposed to Ti-depleted boninites related to formation of Cr-rich suprasubduction ophiolitic chromitites. Thus, even if formation of chromitite may be explained by interaction of island-arc melts with peridotite in a SSZ mantle, we propose that the unusual composition of Loma Caribe chromitites is the product of crystallization of Ti-rich deep-seated plume-derived melts and peridotite-melt interaction in a SSZ mantle, as suggested for some Tibetan chromitites.