Barium Isotopes Evidence of Recycled Metasomatized Mantle Wedge in the Mantle Source of Azores OIB

HUI-MIN YU[1,*], XIAO-YUN NAN[1], ELISABETH WIDOM[2], DAVID KUENTZ[2], FANG HUANG[1]

[1]Univ. of Science and Technology of China, Hefei, Anhui 230026, China, email: huy16@ustc.edu.cn
[2]Miami University, Oxford, Ohio 45056, USA

How subducted materials affect mantle compositions is an important question for understanding mantle evolution. Because Ba is a fluid-mobile and incompatible element, during subduction dehydration ± partial melting, the fluids or melts released from the subducted slab will be enriched in Ba. These fluids and melts might have heterogeneous Ba isotopic compositions, and affect the Ba isotopic signature of the overlying mantle wedge. Therefore, Ba isotopes are a potential tool to provide information for understanding subduction recycling of crustal materials and crust-mantle interaction.

Ocean island basalts (OIB) from the Azores Archipelago exhibit large radiogenic isotope variations, indicating they tap highly heterogeneous mantle sources. In this study, we analyzed Ba isotopes in Azores OIB from five islands: Faial, Pico, São Jorge, São Miguel, and Terceira. Samples from four of the islands (Faial, Pico, São Jorge, and São Miguel) exhibit homogeneous Ba isotopic compositions, despite having large variations in radiogenic isotope compositions.

In contrast, Terceira samples exhibit significant Ba isotopic variation, with a positive correlation between $\delta^{137/134}$Ba and Ba/Th, and a negative correlation between $\delta^{137/134}$Ba and $^{206}Pb/^{204}Pb$. These signatures are consistent with subduction-related fluids in the mantle source. However, because the Azores Archipelago is located in a triple junction setting far from active subduction, any such subducted fluids would have to reflect ancient addition into the mantle source. This signature could reflect a component of ancient metasomatized mantle wedge recycled into Terceira's source.