Lithium and oxygen isotope compositions of basaltic glasses from ridge axes and off-axis seamounts in the northern EPR (10-15ºN)

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Geochemical variations in mid-ocean ridge basalts (MORB) have been attributed to the presence of compositionally distinct mantle components in their source, which may include subduction zone processed oceanic sediment, crust and upper mantle material. The light stable isotopes of lithium and oxygen could be potential tracers of the return of the subducted materials to the surface of the earth via basaltic magmatism since these are strongly fractionated by low-temperature water-rock interactions (e.g., seafloor alteration and subduction processes). We present a study of lithium and oxygen isotopes on a group of well-characterized basaltic glasses from both ridge axes and off-axis seamounts in the northern East Pacific Rise (EPR) between 10°N and 15°N. The samples range from normal-MORB to enriched-MORB in composition.

Our results show that the δ^7Li values of these glasses vary from 3.1 to 5.2‰, which systematically correlate with other geochemical indices of mantle heterogeneity, forming trends toward a more enriched composition. In detail, heavier Li isotopic ratios are associated with higher highly/moderately incompatible element ratios (e.g., K_2O/TiO_2 and Ba/Y), more radiogenic $^{87}Sr/^{86}Sr$ and less radiogenic $^{143}Nd/^{144}Nd$. On the other hand, the oxygen isotope compositions display a fairly narrow range of 5.44 to 5.68‰ (equal or lower than upper mantle whole rock values), do not correlate with other geochemical indices and, thus, could not provide clear information on the nature of mantle heterogeneity. Previous studies have shown that lateral compositional variability exists in the upper mantle beneath the EPR; this lateral compositional variability is reflected by the lithium isotope variability of axial and off-axis seamount volcanism. Moreover, lithium isotopic data seem to record the incorporation of a heavy-Li-enriched component, most likely a recycled subduction-metasomatized mantle [1], into the suboceanic mantle in the eastern Pacific.

[1]. Elliott *et al*. (2006), *Nature* **443**, 565-568.

Enriched mantle source and petrogenesis of the Miocene ultrapotassic rocks in western Lhasa block, Tibetan Plateau: Lithium isotopic constraints

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The authors have successfully applied lithium isotope to the typical study of Sailipu, Dangreyongcuo, Xurucuo and Chazi ultrapotassic rocks in southwestern Tibetan Plateau. Lithium concentrations of 33 whole-rock samples show a range from 11.2 ppm to 46.1 ppm. Lithium isotopic compositions exhibit a variable range of δ^7Li values (-3.9 to +3.5 ‰) with an average δ^7Li of 0.1 ‰ that corresponds to the average of upper continental crust (Teng *et al*., 2004). Lithium isotopic compositions of UK from SW Tibet do not show any significant correlations with the degree of magmatic differentiation, as inferred from various compositional parameters (e.g., SiO_2, Li, Rb and Ga). This suggests insignificant Li isotope fractionation during ultrapotassic rock differentiation, reflecting the source characteristics (Teng *et al*., 2009). Lithium isotopic compositions of these samples vary by 7.4 ‰ and do not correlate with radiogenic isotopic compositions or chemical and mineralogical parameters. The Li isotopic heterogeneity therefore likely reflects heterogeneous source rocks (Teng *et al*., 2009). Based on calculation modeling and a comparison with the previous similar results (Agostini *et al*., 2008; Janousek *et al*., 2009), the authors hold that the most probable metasomatic agents were melts or fluids derived from subducted Indian crust instead of from Tethyan crust (including sediments). Therefore, the authors put forward a petrogenetic model of ultrapotassic rocks in southwestern Tibetan Plateau.

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