Lithium isotope evidence for direct assimilation of hydrothermal fluid to magma beneath oceanic large igneous provinces

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Li isotopic compositions of fresh basalts from two oceanic large igneous provinces (LIPs), the Shatsky Rise and Ontong Java Plateau, fall within those of the mid ocean ridge basalt (MORB) and ocean island basalt (OIB). In contrast the basalts from the two oceanic LIPs show Li enrichment compared to the MORB and OIB; Li contents are obviously higher at a given MgO. Among basalts from the two oceanic LIPs, one fresh glass sample from the Shatsky Rise has a distinctly enriched composition with high K/Ti and Nb/Ti. The delta^{7} Li value of the enriched sample is near the highest end (+6 permil) of the MORB and OIB values, implying that the sample may have been affected by recycled mantle that metasomatized by slab-derived fluids. However, no clear systematic relationship between the delta^{7} Li and the enrichment components are found in the other basalts from the two oceanic LIPs. On the other hand, obvious linear relationships exist between delta^{7} Li and Yb/Li, Y/Li, and Dy/Li of samples from the Shatsky Rise. The linear relationships are explained by binary component mixture between pristine magma and hydrothermal fluid beneath the oceanic LIPs. The direct assimilation of hydrothermal fluid to magma is the best mechanism to explain the Li enrichment with little shift of delta^{7} Li in basalts from the oceanic LIPs.