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Behaviors of Li and B and their isotope ratios in subduction zone processes: Perspectives from a geochemical forward mod

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7Li/6Li and 11B/10B stable isotope ratios have been used as tracers of slab derived fluids in the arc magmas. Temperature dependent isotopic fractionation releases heavier fluids from the subducted slab, hence leaves righter residual solids in the slab. As slab fluid dehydration undergoes in the prograde metamorphism with increasing pressure and temperature, fractionation profiles of these isotopes from the slab is not simple. Moreover, release of Li and B from the slab is controlled by varying mineral assemblages in the prograde metamorphism so that adding further complexities in the element behaviors thus isotopic fractionation. Several works have dealt with the models in elemental behaviors of Li and B and their isotopes for slab dehydration. However, entire dehydration profiles of the subducted slab sediment and altered oceanic crust have not yet been studied. Moreover, interactions between slab fluids and overriding mantle peridotite form arc magmas and are also the factor that alters element abundances of Li and B and their isotopic ratios found in the arc magmas. This work examines the elemental and isotopic behaviors of Li and B and 7Li/6Li and 11B/10B in the slab and released fluids under prograde metamorphism and reactions between the released slab fluids and mantle to form arc magmas. A geochemical forward mode Arc Basalt Simulator ver.3 modified from Kimura (2012) (EarthChem Library http://www.earthchem.org/library) was used for the modeling and results presented in comparison to the reported values from arc magmas. The model calculations reasonably reproduced across arc variations of the Li and B isotope ratios found in the arc magmas. Calculated fluid compositions would also be useful in predicting the non-volcanic slab-derived fluid compositions potentially observed in the fore arc settings.

Keywords: Li, B, isotopes, subduction zone, arc magma