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Lithium isotope composition of Western Anatolian volcanic rocks: insight into the lithiniferous potential of Turkey

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Western Anatolia (WA) is renowned for its borate deposits (≈70% of the world's B reserve). Those deposits formed after hydrothermal leaching of B-rich volcanic rocks from collisional tectonic zones, during the extensional phase. In 2004, Helvaci et al. [1] studied the clays occurring in WA borate deposits and found lithium concentration up to ≈ 0.70 wt%. Knowing that a concentration of 0.1 wt% is enough to mine Li as a by-product, WA borate deposits are worth investigating for Li mineralization.

To constrain the potential Li source, we report Li concentration and δ^7Li data from 42 samples from the range of age (Eocene to Quaternary) and types (calc-alkaline to ultrapotassic) of rocks that formed during collisional and post-collisional volcanism in WA. The Li concentration ranges from 2.58 to 46.86 ppm and the δ^7Li values range from -4 to +9 ‰, with most concentrations above 15 ppm and the lowest δ^7Li values being found in 20 – 15 Ma ultra-potassic rocks.

The Li enrichment happened contemporaneously and in the same rocks as the B enrichment [2] of the area. It is also during the Miocene that WA volcanics show light δ^{11}B [2] and the lightest δ^7Li. Those data show that subducted continental crust with light δ^7Li was detached from the subducting slab. This event led to the formation of melts/fluids with both light δ^{11}B and δ^7Li that metasomatized the overlying mantle. Slab roll back and tearing allowed upwelling of the asthenospheric mantle, which incorporated the metasomatized mantle and led to the enrichment of B and Li in ultra-potassic rocks that erupted in the Miocene.

Leaching of those ultra-potassic rocks led to the formation of WA borate deposits and further investigations are in progress to determine whether or not this same mechanism led to Li enrichment in the borate-hosting basins.

[1] Helvaci et al. (2004) *International Geology Review* 46:2, 177–190

[2] Palmer et al. (2019) *Geology* 47, 1079–1082