Goldschmidt 2024 Abstract
https://doi.org/10.46247/gold2024.22397

From Cadomian accretion through subduction to Variscan exhumation of the Mariánské Lázně metaophiolite Complex (Bohemian Massif): Potassium isotope perspective

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Potassium (K) has become an increasingly used tracer, applicable to a wide range of areas of geochemistry [1]. Subduction and dehydration of seawater-altered ocean floor represents one of key geotectonic environments where large $^{41}K/^{39}K$ variations may be generated [2–5] whereby amphibolites and eclogites can record a complete loss of volatile inventory. Yet, it remains unclear what is the ultimate K isotope path from low-temperature seafloor alteration to HP metamorphic realm.

The metaophiolitic Mariánské Lázně Complex (MLC), W part of the Bohemian Massif, hosts numerous exposures of serpentinites and amphibolites to eclogites, providing a near-complete record of a subduction sequence from accretionary wedge lithologies to dehydrated HP oceanic plate facies. In addition, weakly altered ocean floor basalts of MORB affinity exist in close vicinity of MLC, representing analogs of subducted oceanic plates. This study provides first-order constraints on cycling of K from pillow-lava spilites (seawater altered MORB) to prograde and retrograde eclogites.

Spilites are mostly confined towards heavy end of the range ($\delta^{41}K > -0.3‰$), indicating fractionation between seafloor basalts and seawater resulting from low-T alteration. The $\delta^{41}K$ values in MLC samples vary from −1.63‰ to −0.14‰. Eclogites are partly confined towards heavier K isotope compositions (−1.29‰ to −0.30‰) but retrograde and recrystallized eclogites are dominated by low $\delta^{41}K$ values < −1.2‰. These low values are consistent with $\delta^{41}K$ of −1.6‰ found for trondhjemites originated by melting of HP rocks, thus representing a potential ^{41}K-depleted end-member composition. Serpentinization imparts intermediate $\delta^{41}K \sim -0.8‰$ and may thus be a less likely composition for fluid percolation through MLC. The largest $\delta^{41}K$ variability is associated with amphibolites whose $\delta^{41}K$ values (−1.59‰ to −0.63‰) clearly are below BSE range. This implies that composition of fluids during prograde metamorphism can generate sizeable $^{41}K/^{39}K$ fractionation and regional lithologies can supply isotopically light K during exhumation.

[1] Wang et al. (2021) *Geochemistry* 81, 125786. [2] Santiago-Ramos et al. (2020) *EPSL* 541, 116290. [3] Liu et al. (2023) *GCA* 360, 16-35. [4] Liu et al. (2021) *GCA* 311, 59-73. [3] Liu et al. (2020) *GCA* 277, 206-233.

Funded by the Czech Science Foundation project 23-07625S.