

Uranium elemental and isotope systematics of a closed-system HP metamorphic cycle: A case study of metabasic Mariánské Lázně Complex, Bohemian Massif

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Global geochemical cycling of uranium (U) is critically dependent on oxic versus anoxic conditions of oceans throughout Earth's history [1]. Subduction may impart significant modification to U elemental and isotope budgets from U fluid-mobility via percolation of fluids released from serpentinites and/or incorporation of U into secondary phases [2, 3] although utility of serpentinites as archives of U isotope systematics of seawater has been questioned [4].

The metabasic pre-Variscan Mariánské Lázně Complex (MLC), W part of the Bohemian Massif, belongs to several worldwide recognized occurrences of HP metamorphism. Together with nearby non-altered and weakly low-T seawater altered ocean floor basalts and tholeiites with MORB affinity, it represents an example of subducted and prograde metamorphic segments of ocean–continent collision.

Preliminary results for the entire suite show a near two orders of magnitude range in U contents (0.02–1.2 ppm). Serpentinites and serpentinitized peridotites display the lowest U contents, typically <0.04 ppm, suggesting U loss during the serpentinization process. Likewise, spilites generally have <0.2 ppm U, indicating a limited U uptake from seawater into neoformed secondary phases. Prograde eclogites generally have between ~0.2 ppm and ~0.4 ppm U whilst retrograde eclogites display systematic loss of U (<0.1 ppm), which may indicate U loss, providing additional constraints on oxidation/reduction status of percolating fluids. Amphibolites, an intermediate stage between serpentinites and eclogites, show a range in U contents from 0.1 ppm to 1.2 ppm, perhaps reflecting changing conditions of subduction, dehydration and interaction with ambient fluid phases. Uranium isotope systematics should provide additional control over exchange or loss of volatiles.

[1] Andersen et al. (2015) *Nature* 517, 356-359. [2] Freymuth et al. (2019) *EPSL* 522, 244-254. [3] Gaschnig et al. (2021) *ChG* 581, 120416. [4] Pavia et al. (2023) *EPSL* 623, 118434.

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