Deep crustal contamination of the lithospheric mantle source to Variscan ultrapotassic magmas – geochemical and geodynamic consequences

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Voluminous late syn- to post-collisional ultrapotassic plutons intruded the Moldanubian Zone (Variscan orogenic root) in Vosges, Schwarzwald and Bohemian Massif [1–3]. They have a mixed mantle–crustal chemistry; high mg# and contents of transition metals are accompanied by strong LILE enrichment and HFSE depletion. The Bohemian 'durbachitic' plutons show mantle-like compatible-element isotopic signatures (δ^{26}Mg), while those of incompatible elements resemble mature crust (^{87}Sr/^{86}Sr$_i$, $\varepsilon^{Nd}{}_i$, δ^7Li, Pb isotopes); the δ^{18}O values span the whole mantle–crust range.

A genetic model invokes deep subduction of a mostly felsic metaigneous slab, polluting the depleted (harzburgitic) mantle lithosphere directly, or via (U)HP melts/fluids derived therefrom [1,4]. Soon after, the metasomes melted yielding ultrapotassic primary magmas, whose incompatible element inventories and related isotopic systems were swamped by the subducted crust signal. Crustal contamination/hybridization with leucogranitic melts during ascent and emplacement into the migmatized Moldanubian upper plate further obscured the original chemistry. As the lower plate was isotopically more evolved than the upper one, this resulted in highly unusual mixing arrays, e.g. a negative correlation of MgO with $\varepsilon^{Nd}{}_i$.

In general, the inferred contamination of the lithospheric mantle source to the ultrapotassic primary melts precludes conventional detection and quantification of their contribution to orogenic magmatism ("cryptic crustal growth" *sensu* [5]). This can result in substantial underestimation of the mantle-derived input in hot collisional orogens. Instead, the fate of each of the elemental systems needs to be assessed separately, as a complex function of net contributions from depleted mantle and continental crust (lower–upper plates).

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[1] Janoušek & Holub (2007) *Proc. Geol. Assoc.* **118**, 75–86. [2] von Raumer *et al.* (2014) *Terra Nova* **26**, 85–95. [3] Tabaud *et al.* (2015) *JGSL* **172**, 87–102. [4] Schulmann *et al.* (2014) *Geology* **42**, 275–278. [5] Couzinié *et al.* (2016) *EPSL* **456**, 182–195.