Metasomatism and melt-rock interactions in spinel peridotites from Borée, Massif Central, France

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Major and trace element concentrations, and radiogenic isotopes in peridotite xenoliths can be used to model the degree and timing of partial melting/melt extraction in the mantle. However, the chemical signature of this primary melt depletion event can be obscured by secondary melt or fluid infiltration and melt-rock interactions, leading to refertilisation (crystallisation of secondary pyroxenes at the expense of olivine), modal metasomatism (crystallisation of new hydrous phases), or cryptic metasomatism (incompatible trace element enrichment without modal changes). Mass balance of lithophile trace elements may help to chemically identify any metasomatising agent(s), which when removed from the bulk-rock element budget, may constrain the primary melt depletion signature.

The sample suite is 14 spinel lherzolite and harzburgite xenoliths from the volcanic Maar de Borée in the French Massif Central, with predominantly protogranular textures and no petrographic evidence for modal metasomatism or infiltration of the host basalt. Bulk-rock major and incompatible trace element concentrations suggest the xenoliths are genetically related by varying degrees of partial melting/melt extraction, but elevated incompatible trace element ratios (e.g. La/Yb_N)[1] in some samples indicate cryptic metasomatism, and there is clear petrographic evidence for the presence of a melt phase of up to several modal per cent in veins and pockets. The lithophile trace element budgets of bulk rocks cannot be reconciled, even taking into account this melt phase; some elements remain in deficit while others show a surfeit.

Lithophile radiogenic isotopes (Rb-Sr, Sm-Nd) can be similarly perturbed by these secondary enrichment processes and provide further evidence for possibly multiple episodes of melt extraction and metasomatism, as well as the relative timing of these events.

[1] Palme & O'Neill (2004) *Treatise Geochem* **2**(01), 1-38.