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Mantle Peridotites from the Rehafiye-Erzincan Ophiolite, NE-Turkey: REE and mineral chemical modeling of partial melting and refertilization processes

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We have identified two types of upper mantle peridotites; cpx-rich harzburgites and depleted harzburgites from the Refahiye-Erzincan ophiolite, NE Turkey. Less depleted, cpx-rich mantle harzburgites have higher concentrations of Al and Ca, and contain spinel phases with Cr# ranging between 33 and 38. These samples display Lanthanide Group Elements (LGE) patterns that are highly similar to those of abyssal peridotites, the low degree partial melting residues of primitive mantle. Some peridotite samples, on the other hand, are highly depleted in cpx and display extremely low contents of Al and Ca. Spinel phases in these samples have Cr# ranging between 57 and 73, indicating that they represent the residues of high degrees of partial melting.
The less depleted cpx-harzburgites can simply be modeled by $12^{-1}0\%$ melt extraction from a primitive mantle (PM). However, Cr# of spinel in these samples, indicate higher degrees of depletion, close to $\sim$18%, and cannot be explained with this model. This observation implies that the depletion ratios indicated by spinel Cr# and LGE abundances show an apparent contradiction. We, therefore, suggest a later, low-degree re-melting and refertilization of the old, MOR-type residue in a back arc environment that better explain the higher Cr# of spinel against their higher concentrations of LGE. Consistent with their low content of LGE, the depleted harzburgites contain spinel with high Cr#, and resemble highly depleted SSZ mantle residues. They can be reproduced by 17 to 22% melt extraction from the previously depleted ($\sim$12%) old, MOR-type mantle residue in a fore-arc tectonic setting. Some spinels in these samples contain Ti contents higher than those experimentally determined, and indicate interaction with Ti-rich bonititic melt.