Melting processes and fluid enrichment in mantle rocks of the Troodos Ophiolite, Cyprus

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The Troodos Ophiolite on Cyprus is a remnant of 91 Ma Tethyan oceanic lithosphere obducted onto the Anatolian Plate. Although one of the best-preserved and most-studied worldwide, the origin of this supra-subduction zone ophiolite is still debated. Most previous geochemical studies of the Troodos Ophiolite were carried out on volcanic rocks. This work focuses on the mantle peridotites of Troodos, which yield complementary information about melting processes [1]. We measured olivine, spinel, clinopyroxene and orthopyroxene major element compositions, and trace element concentrations of clinopyroxene and orthopyroxene in peridotites from the Troodos Ophiolite. Major element compositions of spinel, and rare-earth element concentrations of residual clino- and orthopyroxene, indicate incongruent dynamic melting with highly variable degrees of melt depletion of 10-18% (lherzolites), 16-20% (harzburgites) and 18-21% (dunites). Mineral relations and compositions imply initial partial melting within the garnet stability field followed by high degrees of spinel-field melting. Troodos peridotites record similar degrees of melt extraction to fore- and back-arc peridotites, whereas abyssal peridotites from slow to intermediate spreading axes display generally lower degrees of melt extraction. Light rare earth element enrichment in all Troodos clino- and orthopyroxenes indicate pervasive melt/rock interaction during ascent and/or subsequent melt percolation events. Troodos pyroxenes are also variably enriched in fluid-soluble trace elements (Li, Rb, Th, Pb, Sr) compared to those from abyssal peridotites.

These geochemical characteristics imply an origin by complex melt depletion and re-enrichment events beneath a spreading centre in the vicinity of a subduction zone. Our results will be combined with trace element and water concentrations in Troodos volcanic glasses [2], in order to examine the role of fluid addition on decompression melting and mantle depletion at a supra-subduction zone spreading axis.

[1] Batanova and Sobolev (2000) *Geology* **28**, 55-58. [2] Woelki *et al.* (2018) *EPSL* **498**, 203-214.