The New Caledonia mantle section: tracking source depletion and contamination processes in a supra-subduction setting

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The New Caledonia Ophiolite (NCO) hosts one of the largest obducted mantle sections worldwide, offering a unique opportunity to investigate key mantle processes. The ophiolite includes refractory harzburgites, locally overlain by mafic-ultramafic cumulates, and minor lherzolites. Here we present the results of our recent geochemical and Sr-Nd-Pb isotopic studies on fresh or slightly serpentinized peridotites. The lherzolites display a moderately depleted, abyssal-type signature which may be reproduced by small amounts of fractional melting of a garnet lherzolite precursor (~4%), followed by 4%–5% melting in the spinel peridotite field. Nd isotope compositions are consistent with derivation from an asthenospheric mantle source that experienced a recent MORB-producing depletion event. The harzburgites are Cpx-free highly refractory rocks characterised by remarkably low REE concentrations (<0.1xCh) and "U-shaped" REE profiles. HREE composition can be reproduced by a first phase of melt depletion in dry conditions (15% fractional melting), followed by hydrous melting in a subduction zone setting (up to 15%-18%). Nd isotopic ratios range from unradiogenic to radiogenic and negatively correlate with Sr isotopes. Pb isotopes cover a wide range, trending from DMM toward enriched, sediment-like, compositions. Enrichment in FME, LREE-MREE and Nb, Zr, Hf, coupled with the presence of secondary interstitial phases, may be explained by syn- and post-melting interactions with different subduction-related components. Contamination may have occurred both as result of fluid influx from the subducted slab and through subsequent interaction with subduction-related melts carrying a component of sedimentary origin. A recent HSE and Os isotope study [1] provides additional insights on the evolution of the NCO mantle section. (Presentation sponsored by PRIN2017 Programme, Project 2017KY5ZX8)

[1] Secchiari *et al*. (2020) *Lithos* **354-355**