HIGHLY SIDEROPHILE AND CHALCOPHILE ELEMENT BEHAVIOUR IN ABYSSAL-TYPE AND SUPRA-SUBDUCTION ZONE MANTLE: CONSTRAINTS FROM THE NEW CALEDONIA OPHIOLITE

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The New Caledonia Ophiolite hosts one of the largest obducted mantle sections worldwide, offering a unique opportunity to investigate key mantle processes. The mantle section is dominated by a harzburgite-dunite sequence but it also includes minor spl and pl lherzolites. Geochemical data indicate that the harzburgites suffered multiple melting episodes followed by localized interaction with fluids in a supra-subduction zone setting, while the lherzolites are akin to abyssal-type peridotites (Secchiari et al., 2016).

In order to constrain how these processes affected the behaviour of highly siderophile (HSE: PGE=Os-Ir-Ru-Rh-Pt-Pd+Au-Re) and chalcophile elements (S-Se-Te), a set of fully characterised peridotites (major, trace element, Sr-Nd-Pb isotopes) has been studied.

The lherzolites are slightly serpentinized and display chondritic to slightly suprachondritic $^{187}Os/^{188}Os_i$ (0.1273-0.1329 at 53 Ma). The gently sloping HSE patterns with increasing depletion towards Au are similar to other oceanic or continental lherzolites. These features were inherited from sulphide melt-silicate partitioning during partial melting, melt infiltration and mixing of different generation of sulphides. S contents (202-1268 ppm) were likely increased by serpentinization, whereas Se/Te are similar to other lherzolites.

The harzburgites can be grouped in two sub-types. Type-A ($+9.3 \leq \varepsilon_{Ndi} \leq +13.3$) have subchondritic $^{187}Os/^{188}Os_i$ (0.1203-0.1254), low Os (0.55-1.51 ppb) and very low Re/Os. Their HSE patterns display strong fractionations, enriched Os-Ir-Ru segments and Pt-Au positive spikes. S-Se-Te are often below the detection limit. These patterns can be ascribed to high melting degrees, leading to sulphide exhaustion and PGE alloys stabilization.

Type-B harzburgites ($-0.8 \leq \varepsilon_{Ndi} \leq +4.0$) show chondritic to suprachondritic measured $^{187}Os/^{188}Os$ (0.1273-0.1524), notably low Os-Ir contents (0.003-0.277 ppb) and highly variable $^{187}Re/^{188}Os$ (2-30). The "melt-like" HSE patterns exhibit strongly fractionated Os-Ir-Ru (Os_N/Ru_N=0.02-0.46), negative Pt anomalies and positive Au spikes. S-Se-Te are close to or below the detection limit. We interpret these compositions as reflecting localized modification of type-A harzburgites by subduction-related fluids and/or hydrous melts, leading to partial destabilization of Os-Ir rich alloys due to high f_{O2}.

Our work suggests that some of the features shown by arc lavas (e.g., positive Pt spikes) may mirror the geochemical signature of the sub-arc mantle.

REFERENCES

Secchiari, A., Montanini, A., Bosch, D., Macera, P., Cluzel, D. (2016): Melt extraction and enrichment processes in the New Caledonia lherzolites: Evidence from geochemical and Sr–Nd isotope data. *Lithos*, **260**, 28-43