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Hydrous metasomatism and melt percolation in the lithospsheric mantle wedge underneath Comallo, Rio Negro Province, Argentina

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Xenoliths from Comallo, N. Patagonia, are sp-lherzolites, sp-harzburgites, dunites, wehrlites and clinopyroxenites. The rock-forming minerals are olivine, ortho- and clinopyroxene and spinel. Amphibole and phlogopite are present as relicts, suggesting that the region was affected by modal metasomatism. The majority of xenoliths show a dominant well-equilibrated equigranular texture. Small rounded spinels and sulfides enclosed within olivine as well as amphiboles enclosed in clinopyroxenes indicate that these xenoliths are recrystallized. The recrystallized samples show secondary protogranular textures. The amphibole inclusions in clinopyroxenes indicate that the peridotite has experienced a dehydration reaction during the recrystallization process. Amphibole and phlogopite, where present, have been destabilized and show breakdown reactions at the margin, forming secondary ol, cpx and sp.

The clinopyroxene REE patterns display a concave-up shape in LREE and MREE whereas the HREE abundances are low. Depending on the presence or not of amphibole and/or phlogopite the cpx REE patterns can be divided into two different groups, both of which show absence of Sr- and weak Zr, Hf and Ti-negative anomalies. These features combined with the REE patterns highlight a cryptic metasomatism due to melt infiltration of alkali basaltic composition. The differences occuring between the two groups may indicate a differentiation at distance from the percolation front. A third group with steep patterns, negative slope and slightly positive Eu anomaly shows a progression from LREE enrichments to depleted HREE. A carbonatitic metasomatism is evidenced by the LREE enrichment as well as a positive Eu-anomaly combined with a negative Ti-anomaly.

Calculated equilibrium temperatures at 1.5GPa using the cores of crystals range between 790 and 950°C, whereas the estimated temperatures using rims are ∼70°C higher. Such temperatures are relatively low for the lithospheric mantle below Comallo indicating a cold environment which, combined with the fact that spinel and amphibole are frequently enclosed within olivine and clinopyroxene, suggest that recrystallization and re-equilibration took place at relatively low temperatures. Based on the calculations, lherzolites show lower equilibrium temperatures than most of the harzburgites, suggesting transport of harzburgites due to convection flows to deeper mantle areas, where the rocks have experienced a hydration process. This can be supported also by the fact that the modal metasomatism represented by the occurrence of disseminated amphibole and/or phlogopite appears to be related to the downgoing subducted Pacific slab. A model for peridotite phase melting trends in opx shows that the studied xenoliths have been affected by partial melting ranging between 18 and 25%.