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# Geochemical and isotopic characterization of mantle xenoliths from the back arc region of north Patagonia

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Mantle xenoliths brought to the surface by alkali basalts in north Patagonia, Argentina, were studied for their geochemical and isotopic compositions. Samples were collected at four different outcrops within the North Patagonian Massif in Rio Negro Province. The studied sample suite from Comallo (COM), Puesto Diaz (PD), Cerro Chenque (CH) and Prahuaniyeu (PRA) comprises anhydrous spinel-harzburgites, spinel-dunites, as well as one PRA spinel-garnet-lherzolite.
Bulk rock $Al2O_3$ and CaO compositions of the studied samples lie within a narrow range of 0.68 to 1.31 wt. % and 0.36 to 1.25 wt. %, respectively. $Al2O_3$ and CaO decrease with increasing MgO ranging from 44.7 to 48.0 wt. %. The single spinel-garnet lherzolite has a more fertile composition with CaO, $Al2O_3$ and MgO of 2.78 wt. %, 2.35 wt. % and 42.2 wt. %, respectively. With the exception of the PRA region, the studied mantle xenoliths represent an overall highly depleted lithospheric mantle underneath northern Patagonia (up to 25% melt extraction).
The rock forming minerals show concentrations typical for depleted peridotites with mg# that range from 0.91 to 0.92 for olivine and orthopyroxene and mg# from 0.91 to 0.95 for clinopyroxene.
Variably elevated clinopyroxene trace element compositions in all studied north Patagonian mantle samples indicate reactions with a chromatographically fractionated melt after the initial melt depletion event. A percolating melt reacts with a strongly depleted mantle peridotite as it propagates through the wall rock and subsequently changes its composition. These melt-rock reactions lead to a compositionally evolving melt and variably altered mantle sections, which is strongly reflected in primitive mantle normalized clinopyroxene trace element patterns. Bulk rock and mineral compositions, on the other hand, suggest that this melt percolation event has not significantly affected major element systematics. Contrary, isotope and HSE systematics also indicate melt-rock reactions. In terms of PGE compositions, this is reflected in a fractionation of the iridium-group PGEs and/or enrichment in the palladium-group PGEs and/or rhenium in many samples. Our studied north Patagonian mantle xenoliths yield rather narrow Sr and Nd isotopic compositions in the range from 0.72663 to 0.704835 and 0.512620 to 0.512952, respectively. Hf isotopic results of the same samples on the other hand, show a wide range in 176Hf/177Hf ratios leading to $\varepsilon$Hf values between +7.3 and +164.8. This decoupling of Sr and Nd from Hf isotopic compositions reflects variable susceptibilities of the individual systems to the suggested melt percolation process(es).
Osmium isotopic results suggest an at least late Paleoproterozoic (1.7 Ga) stabilization for the SCLM beneath Prahuaniyeu. The oldest calculated TRDs from Comallo and Puesto Diaz/Cerro Chenque yield with 1.3 Ga and 1.0 Ga, respectively, distinctly younger SCLM formation ages underneath these regions.