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Petrological features of suprasubuction mantle: evidence from northern, central and southern Patagonian mantle xenoliths

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Patagonia has a number of outcrops where xenoliths-bearing lavas can be found. It thus represents a good opportunity to study mantle material in supra-subduction environment both on arc and back-arc position, from as near as 300 km to as far as 600 km from the Chile trench. A wealth of data is nowadays available on these xenoliths, starting from petrographic observations, whole-rock and mineral major and trace element analyses plus few isotopic analyses on whole rock and mineral separates. To this already large dataset the petrological features of another locality (Estancia Sol de Mayo, ESM) were added, allowing a comparison between as much as eight localities coming from northern (Cerro Aznare, Praguaniyeu, Cerro Rio Chubut, Cerro de los Chenques), central (Cerro Clark and Gobernador Gregores) and southern Patagonia (Pali Aike), covering approximately an area of 1000 x 300 km. Most xenoliths are harzburgites, with minor amount of lherzolites, wehrlites and dunites.
In the $Al2O_3$ vs mg# [MgO/(MgO+FeO) mol %] diagram clinopyroxene (cpx) compositions highlight three different trends, with orthopyroxene (opx) compositions plotting on two of these. In the first trend $Al2O_3$ content increases at almost constant mg# mol % (trend 1). The second trend comprises only cpx from wehrlites (trend 2) and is situated between the first and the third trend. In the third trend the slight increases of $Al2O_3$ is associated with a remarkable decrease in mg# (trend 3).
LREE and LILE abundances in cpx from Tres Lagos and Cerro Rio Chubut are directly correlated to the $Al2O_3$, while they are inversely correlated at Cerro de Los Chenques and Cerro Fraile. In the first case it is likely that a metasomatic process affects the mantle domains beneath those areas, while in the second case a refertilization event caused by a tholeiitic melt is favorite. In other cases, as for Gobernador Gregores, a more complex situation is recorded, with two groups of samples showing both negative and positive correlation.
Isotopic composition of Patagonian cpx ranges from 0.702704 to 0.704297 for 87Sr/86Sr and from 0.512694 to 0.513087 for 143Nd/144Nd. In the Sr-Nd diagram they spread from DM (Depleted Mantle) toward EMII (Enriched Mantle II) fields, with some samples plotting near HIMU field. This large range of isotopic composition can be modeled by adding a maximum of 10% of an EM II component to a DM source.