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Nd, Sr and Pb isotopic composition of metasomatised xenoliths from the backarc Patagonian Mantle Wedge: Insights into the origin of the uprising melts

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Information about the geochemical composition of metasomatic melts migrating through the Patagonian mantle wedge is provided by the ultramafic xenoliths occurrence of Tres Lagos (TL; lat. 49.13°S, long. 71.18°W), Argentina. Such a locality is placed at the eastern border of the Meseta de la Muerte backarc basaltic plateau, where a post-plateau volcanic diatreme contains mantle xenoliths in both pyroclastites and lavas. Its latitude corresponds with the Northern limit of the Austral Volcanic Arc (AVZ), which is separated from the Southern Volcanic Zone (SVZ) by a gap in the arc magmatism ranging between 49° and 46°30′ latitude S. The analysed xenoliths have been distinguished into two groups (Group 1 & 2). Group 1 consists of lherzolites and harzburgites, whereas Group 2 is formed by harzburgites.

The texture of the Group 1 lherzolites varies from protogranular to granoblastic to porphyroblastic, whereas Group 1 harzburgites have always granoblastic texture. Group 2 harzburgites have granular texture, which may change to porphyroblastic owing to the random concentration of large olivine and orthopyroxene crystals.

The clinopyroxenes (Cpx) from Group 1 lherzolites have PM-normalised REE patterns ranging from LREE-depleted (LaN/SmN= 0.24-0.37), to LREE-enriched (LaN/YbN up to 4.08) and spoon-shaped: the latter have minimum at Pr and Pr-Yb concentrations similar to those shown by the LREE-depleted Cpx.

The Cpx from Group 1 harzburgites have lower REE concentrations with respect to the lherzolite ones and their REE patterns vary from HREE-enriched, steadily fractionated, (LaN/YbN = 0.21–0.35, Ybn $\sim$ 1-2) to spoon-shaped (LaN/SmN = 2.81; SmN/YbN = 0.89; YbN $\sim$ 3.

The Cpx from the Group 2 harzburgites have convex-upward (LaN/SmN = 0.31; SmN/YbN = 1.50) to LREE-enriched (LaN/YbN = 2.94) patterns.

The Sr, Nd and Pb isotopic compositions of the Group 1 clinopyroxenes form arrays spanning from DM to the field delimited by the TL basaltic lavas, pointing to EMI end-member. Conversely, Group 2 Cpx have much more radiogenic Sr and less radiogenic Nd values, approaching more closely the EMI and EMII end-members: these features are associated to unradiogenic lead isotopic compositions (206Pb/204Pb = 17.4-18.1; 207Pb/204Pb = 15.55-15.60; 208Pb/204Pb = 37.3-38.5). The combination of petrographic, trace element and isotopic features indicate that TL harzburgites are likely residua after melt-assisted partial melting triggered by melt/fluid migration in the hottest, and perhaps deeper, parts of the pristine DM lithosphere. The interpretation of the Pb, Sr and Nd isotope composition of Group 2 Cpx is not trivial. In analogy with the interpretation proposed for SWIR, it could unravel the occurrence of mantle sources which incorporated ancient crust and failed to homogenise with the DM mantle. Alternatively, it could be the evidence for ancient continental crust of the South America plate dragged down into the mantle by slab motion.