Sr-Nd-Hf isotope constraints on lithospheric mantle evolution beneath Olot, NE Spain

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Mantle xenoliths exhumed by alkaline basalts in the Olot volcanic field, provide a bi-modal population consisting of LREE-depleted protogranular lherzolites (cpx 12-14%, and traces of pargasite) and LREE-enriched harzburgites (cpx < 1-2 %) showing secondary recrystallization textures. New TIMS and MC-ICP-MS analyses carried out on cpx separates show the following compositional ranges:

εSr= -15 – -26, εNd= +9 – +11, εHf=+18 – +68 for lherzolites that approach the DM isotopic end-member; εSr= -10 – +13, εNd= -1 – -6, εHf= +3 – +8 for harzburgites that approach the EM(1) isotopic end-member. On a Nd-Hf isotope diagram all the cpx plot close to or significantly above the mantle array, i.e., they are typical of lithospheric mantle in general. These isotope compositions are closely comparable to those recorded in other xenolith suites from European Cenozoic volcanic fields. The petrological features of Olot lherzolites are also similar to those of the External Liguride peridotite massifs, while the Olot harzburgites share the EM1 component with cpx-poor peridotites from the Lanzo, Lherz and Ronda. These analogies with Massifs-peridotites (some of which were exhumed before the Middle Mesozoic) suggest that similar petrogenetic processes were effective over a wide area at the paleo-European margin during pre-Middle Mesozoic times. An isochron-like correlation, probably reflecting the timing of melt depletion, is evident for the Lu-Hf system (450 Ma), although 3 of the samples have subchondritic Lu/Hf. In the only unmetasomatized sample (lherzolite Olt4f) both the Sm-Nd and Lu-Hf systems still appear to record Lower Paleozoic depletions.