Origin of chemical and Nd-Hf isotope heterogeneity in depleted mantle domains from the Alpine-Apennine ophiolites

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Here we present geochemical and Nd-Hf isotope data for three depleted mantle bodies from the Northern Apennine (Internal Ligurian, IL), Tuscany (Monti Rognosi, MR) and Western Alps (Monte Civrari, MC) ophiolites. IL and MR peridotites register low to moderate degrees of depletion and bear diffuse mineralogical and geochemical evidence of melt/rock interaction. Their clinopyroxene compositional variation may be related to reactive percolation of residual peridotites by depleted, MORB-type (Opx-saturated) melts in the plagioclase-stability field. The melt infiltration partially reset both Sm-Nd and Lu-Hf isotope systems, but preservation of highly radiogenic ε_{Nd} (up to +15) at the time of the associated MORB-type magmatism (162 Ma) suggests ancient mantle reservoirs that experienced long-term depletion. The MC peridotites are residual spinel harzburgites to cpx-poor lherzolites characterized by TiO_2 (0.05-0.15 wt. %) and Na_2O (< 0.1 wt.%)-poor Cpx, with prominent LREE depletion (Ce_N/Sm_N = 0.004-0.005), low HREE abundances (Yb_N ~ 5-6) and fractionated HREE (Gd_N/Yb_N = 0.4-0.5). Their highly radiogenic Nd-Hf isotope compositions (initial ε_{Nd} and ε_{Nd} up to +29 and + 41, respectively) may be due to incorporation of refractory SCLM in the oceanic lithosphere of the Jurassic Alpine Tethys. However, thermal evolution of the MC mantle body indicates rapid cooling and exhumation from asthenospheric conditions, similar to modern abyssal type peridotites, which argues against a long residence time in the SCLM after the melting event (e.g. Muntener and Mc Carthy, 2015). REE and Nd-Hf isotope compositions of the MC peridotites are consistent with Jurassic low degree melting of an asthenospheric source that underwent a first melting event, starting in the garnet stability field, in Palaeozoic times (> 300 Ma). The Nd-Hf isotopic contrast between magmatic products (Barry et al., 2015) and associated mantle rocks in the Jurassic Ligurian Tetyhs strengthens the notion that ancient depleted domains may be a significant constituent of the convecting upper mantle.