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Sr-Nd isotope characterization and U-Pb dating of mantle xenoliths from the Betic area (Spain): insights on the multi-stage evolution of the south Iberian lithosphere

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Mantle xenoliths from Tallante (Betic Cordillera, Spain) include samples recording a peculiar distinct style of metasomatism that induces orthopyroxene (opx), plagioclase (pl), phlogopite (ph) and amphibole (amph) crystallisation, forming mantle domains characterized by "hydrous" opx-rich peridotites, locally crosscut by felsic veinlets containing pl and opx + quartz + ph + amph, i.e. ph/amph-bearing anorthosites, diorites and gabbronorites (Beccaluva et al. 2004; Shimizu et al. (2004). This indicates that the causative agents were hydrous silica-oversaturated melts rich in alkalis, in turn related to the recycle - via subduction - of continental crust components within the mantle.

To find new evidences we sampled and carefully sliced ca 250 xenoliths finding 10 samples with clear evidences of felsic (gabbroic) veins/lenses cross-cutting the peridotite matrix. These are extremely variable in size, from millimetric up to centimetric. In general, we observed that thinner lenses (possibly representing apophyses of bigger veins) tend to have more complex mineral parageneses, also including traces apatite, zircon, Ti (Nb) oxide (rutile), and crystals mainly made by thorium +cerium, lanthanum, phosphorous (huttonite/monazite mineral groups).

Sr-Nd analyses are in progress at the IGG-CNR of Pisa on a) plagioclase carefully separated from distinct felsic veins and b) cpx separated from the surrounding peridotite matrix. The new data will be presented at the forthcoming EGU conference, in order to constrain a) the nature of the uprising magmas b) the magnitude of the related metasomatic aureola that surrounds the veins.

In situ U-Pb datings have been performed at the IGG-CNR of Pavia on zircons from two different samples by laser-ablation microprobe (GeoLas200Q-Microlas) coupled to a magnetic sector HR-ICPMS (Element from ThermoFinnigan), suggesting that the age of the veining event ranges between 4.4 and 2.2 Ma, thus implying a clear relation with the Tertiary subduction process that ultimately lead to the formation of the Betic Cordillera.

In this framework, we propose relationships between these exotic mantle lithologies and the Cenozoic subduction related magmas (including lamproites; Conticelli et al. 2009) that are widespread in the region.

Beccaluva et al. (2004) Lithos 75, 67-87.
Conticelli et al. (2009) Lithos 107, 68-92.
Shimizu et al. (2004) Trans Royal Soc Edinburgh: Earth Sci 95, 265-276.