Geophysical Research Abstracts
Vol. 14, EGU2012-12929, 2012
EGU General Assembly 2012

Provenance and evolution of the western Mediterranean lithospheric mantle beneath the eastern Betics (S. Spain): insights from in-situ analyses of Os isotopes and platinum-group elements in sulphides from the Tallante mantle xenoliths

Z. Konc (1), C. Marchesi (1), C. J. Garrido (1), J. M. González-Jiménez (2), W. L. Griffin (2), O. Alard (3), K. Hidas (1), S. Y. O'Reilly (2), and N. Pearson (2)

(1) Instituto Andaluz de Ciencias de la Tierra, CSIC-UGR, Armilla, Spain (zoltankonc@iact.ugr-csic.es), (2) GEMOC, Department of Earth & Planetary Sciences, Macquarie University, NSW 2109 AUSTRALIA, (3) Géosciences Montpellier, Université Montpellier II & CNRS, Montpelllier, France

Pliocene alkaline lavas from Tallante (Betic cordillera, southern Spain) have entrained mantle xenoliths representing pieces of the subcontinental mantle beneath the westernmost SE Iberian volcanic province. Sulphides in mantle xenoliths ($\sim$30 to 100 μm in diameter) are Fe–Ni–Cu–S minerals being Ni-rich pentlandite the most common phase. Chondrite-normalized patterns of platinum-group elements (PGE) and Re analyzed by LA-HR-ICP-MS are similar in sulphides located in different microstructural positions (i.e., interstitial between silicates or included in them). Sulphides are enriched in IPGE (Os, Ir, Ru) compared to PPGE (Pt, Pd) and Re (Pt/Ir_N =0.01-0.57, Pd/Ir_N =0.02-0.88, Re/Ir_N = 0.09-0.63) supporting their origin as grains residual after partial melting. $^{187}Os/^{188}Os$ in sulphides, measured by LA-MC-ICP-MS, varies between 0.1096 and 0.1292 (γOs= -14.43 to 0.84 relative to the Enstatite Chondrite) but almost all the analysed grains (70/73) have subchondritic values (γOs up to -0.47). $^{187}Re/^{188}Os$ spans from 0.01 to 0.39 and no systematic correlations exist between $^{187}Os/^{188}Os$ or $^{187}Re/^{188}Os$ and the microstructural setting of the sulphides (i.e., interstitial versus inclusion-type). Re-depletion model ages (T_{RD}) range from -0.1 to 2.6 Ga and Os model ages (T_{MA}) are much more variable (-0.2-13.6 Ga) because of the large range in Re/Os. The meaningless future ages and ages older than 4.5 Ga reflect derivation of Os from a source more radiogenic than the Enstatite Chondrite and the local disturbance of the Re–Os isotopic system. The distribution of T_{RD} in sulphides clusters around two main peaks at ca. 0.6-0.7 and 1.1-1.4 Ga, coinciding with the values of both metasomatic and residual pentlandite in the Ronda massif, the largest exposure of subcontinental lithospheric mantle in the western Mediterranean. The dominant subchondritic $^{187}Os/^{188}Os$ composition of sulphides in the Tallante mantle xenoliths indicates that these grains have evolved for a long time in a low Re/Os environment, most likely the subcontinental lithospheric mantle. Considering the uncertainties inherent in model age calculations, the range of T_{RD} in sulphides is consistent with the extraction of melts and possible metasomatic events in the Mesoproterozoic and the Neoproterozoic, similarly to sulphides in peridotites from the Ronda massif. Despite Ronda was emplaced into the crust $\sim$20 Ma before the generation of the alkaline volcanism that entrained the Tallante mantle xenoliths, the Os isotopic record points to a similar Proterozoic evolution for the Ronda and Tallante mantle peridotites, suggesting their provenance from different portions of the same subcontinental lithospheric mantle. The similarity of the Os isotopic signature in two diachronic ($\sim$20 Ma) temporal samples of the lithospheric mantle in the Betic cordillera (i.e., the synorogenic Ronda mantle peridotite massif and the post-orogenic Tallante mantle xenoliths) supports the limited modification of the Os isotopic signature of the subcontinental lithospheric mantle in the Alboran domain, despite this region experienced important thinning, melting and extension during the Miocene.