Geophysical Research Abstracts
Vol. 13, EGU2011-2991, 2011
EGU General Assembly 2011

Garnet Lherzolite and Garnet-spinel mylonite in the Ronda Peridotite: Vestiges of Oligocene Back-arc mantle lithospheric extension in the Western Mediterranean

Carlos J. Garrido (1), Frédéric Gueydan (2), Guillermo Booth-Rea (1,3), Jacques Precigout (4), Karoly Hidas (1), José Alberto Padrón-Navarta (5), Claudio Marchesi (1,6)

(1) Instituto Andaluz de Ciencias de la Tierra, Granada, CSIC-UGR, Fac. Ciencias 18002 Granada,Spain (carlosg@ugr.es), (2) Géosciences Rennes, Univ. Rennes 1, Campus de Beaulieu, 35042 Rennes, France, (3) Dep. Geodinámica Interna, UGR, Fac. Ciencias 18002 Granada, Spain, (4) Geologisches Institute, ETH-Zürich, Sonneggstrasse 5, CH-8092 Zürich, Switzerland, (5) Dep. Mineralogía y Petrología, UGR, Fac. Ciencias, 18002 Granada, Spain, (6) Géosciences Montpellier, UM II & CNRS, 34095 Montpellier, France

Uplift and exhumation of vast exposures of diamond facies, subcontinental mantle peridotite in the Western Mediterranean arc are attributed to tectonic scenarios including pure extension, transpression or subduction followed by delamination- or roll-back- driven stretching. In the Ronda peridotite (S Spain) the strong overprint of low pressure assemblages has precluded accurate determination of the P and T conditions for the onset of exhumation that formed the spinel tectonite and garnet-spinel mylonite domain in this massif. Here we report unequivocal petrographic evidence for the existence of prekinematic, coarse-grained garnet lherzolite assemblages from the garnet-spinel mylonite domain of the Ronda peridotite. Application of well-calibrated geothermobarometers yields prekinematic minimum equilibration conditions at 2.4–2.7 GPa and 1020–1100 ˚C, demonstrating that the Ronda peridotite equilibrated at ca. 85 km before shearing. We also show the existence of synkinematic garnet and spinel assemblages that overprinted garnet lherzolite assemblages at 800–900 ˚C and 1.95–2.00 GPa. The decompressive cooling path and high-pressure recorded by garnet-spinel mylonites rule out they were formed by near-isobaric cooling above a subduction-collision wedge or during (or after) the emplacement of the peridotite massif into the crust. Ronda garnet-spinel mylonites represent the vestiges of subcontinental mantle ductile shear zones formed at early stages of lithosphere extension during back-arc extension in the Western Mediterranean. South-to-westward retreat of the African slab during the Oligocene-Early Miocene accounts for intense back-arc lithosphere extension and development of Ronda extensional shear zone, coeval with extreme thinning of the Alborán domain overlying crust.