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Unequivocal Garnet and Garnet-spinel Lherzolite Assemblages in the Ronda Peridotite (S. Spain) and their Implications for Exhumation of Subcontinental mantle in the Alboran basin

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Uplift and emplacement of subcontinental mantle peridotite in the Western Mediterranean is attributed to tectonic scenarios including pure extension, transpression or subduction followed by delamination- or roll-back-driven stretching. These discrepant geodynamic interpretations have been fostered by the lack of quantitative estimates of pre-shearing, primary conditions of equilibration of mantle peridotites due to the strong overprint of low-pressure assemblages and recrystallization in mantle peridotite massifs exposed in the area. Here we report unequivocal petrographic evidence for the existence of pre-shearing, coarse-grained garnet lherzolite assemblages from the spinel-garnet mylonite domain of Ronda peridotite (Betic Cordillera, S. Spain). Application of well-constrained geothermobarometers yield minimum equilibration conditionsof 1150 °C and 2.7 GPa that demonstrate that Ronda peridotite was equilibrated deeper than 85 km before shearing. We show further evidence for the existence of syn-shearing spinel-garnet assemblages that overprinted garnet lherzolite assemblages at 900 °C and 1.9 GPa. The decompressive path recorded in the Ronda spinel-garnet mylonites rules out that they were formed in a subduction-collision zone wedge or through (or after) the emplacement of the peridotite massif into the crust. On these bases, we propose that the Ronda spinel-garnet mylonite represents the vestiges of subcontinental mantle ductile shear zones formed at early stages of lithosphere ex-

tension. South-to-westward retreat of the African slab since Oligo-Miocene likely explains intense lithosphere stretching in a back-arc setting, where the Ronda extensional shear zone developed.