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New field evidence for the emplacement of the Ronda peridotite

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The Betic-Rif orogen forms the westernmost part of the Alpine orogenic system and results from the closure of the Tethys Ocean between Africa and the Iberian Peninsula. Subduction and crustal thickening leading to the formation of high-pressure and low-temperature (HP/LT) metamorphic complexes were followed by a late-orogenic extension stage in an overall convergent setting. Plate kinematic reconstructions indeed reveal a continuous convergence between Africa and Eurasia from Late Cretaceous times currently characterized by slow convergence rates that add in complex ways with body forces stored during crustal thickening stages and subsequently released during crustal thinning. If this large-scale scenario is now broadly admitted, some first order questions remain opened. Among these questions, the timing and kinematics of the emplacement of the Ronda or Beni Bousera peridotite massifs remain particularly unclear.

Due to the numerous published early Miocene ages, the emplacement of the Ronda or the Beni Bousera massifs is classically considered a very fast event before the high-temperature event. In this scenario, peridotite bodies are emplaced by overthrusting onto the continental crust within a compressional context. Based on new detailed field observations along the contact between the Ronda peridotites and the high-temperature continental basement and high-temperature marbles of the Dorsale Unit, as well as a metamorphic petrology approach, we reconsider this interpretation. We argue that this contact could instead be an early detachment, possibly active during the Mesozoic or before. A few old ages found in the western part of the chain could indeed be linked with such an episode of extreme thinning. This event is consistent with the opening of the Tethyan Ocean and associated with oceanization in the eastern part of the chain. In this work, we will argue for an emplacement as old as the Triassic, at least, thus much older than the Miocene thrusting event.

This study is part of the Orogen Project, an academic-industrial collaboration between CNRS, BRGM and Total.