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Petrostructural evolution of the Beni Bousera peridotite massif (Rif belt, Morocco)

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We present detailed structural and petrological mapping microstructural study of the Beni Bousera orogenic peridotite (Rif Belt, N Morocco) to constrain deformational processes in the subcontinental lithospheric mantle of the proto-Alboran domain. We have mapped four tectono-metamorphic domains in Beni Bousera showing consistent kinematics but with contrasting microstructures. From top to bottom, these domains are: (i) garnet-spinel mylonite domain; (ii) Ariègite subfacies, fine-grained porphyroclastic peridotite domain; (iii) Ariègite-Seiland subfacies porphyroclastic peridotite domain; and (iv) Seiland subfacies coarse-porphyroclastic to coarse-granular peridotite domain. Microstructures and well-developed Crytal Preferred Orientations (CPO) in all domains are consistent with decreasing work rates. Structurally downsection, the average olivine grain size increases and the recrystallized volume fraction decreases. Olivine CPOs in all domains exhibit axial-[010] symmetries resulting from the simultaneous activation of [100](010) and [001](010-slips under high-stress, moderate pressure, low-temperature in the garnet-spinel mylonites and Ariègite subfacies fine-grained porphyroclastic peridotites, and high-temperature, low-stress, melt present, dominant simple shear deformation in the Ariègite-Seiland subfacies porphyroclastic- and Seiland subfacies coarse-porphyroclastic to coarse-granular peridotites. To account for the consistent kinematics at the scale of the massif and the large temperature gradient (ca. 100ºC/km) preserved in Beni Bousera, we propose a model for the Tertiary tectonic evolution of Beni Bousera where it represents a transtensional, lithospheric mantle shear zone, arrested at a depth of ca. 60 km. In this scenario partial melting in the Ariègite-Seiland and Seiland domains is produced by decompression melting and does not require an exotic heat source.