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# Crustal structure and gravity anomalies beneath the Rif, northern Morocco: implications for the current tectonics of the Alboran region

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Topography in orogenic belts results from complex interactions between crustal tectonics, mantle dynamics and surface erosion, all processes leading to more or less important isostatic readjusments. The Alboran region in Western Mediterranean is characterized by curved mountain belts (Rif and Betics) surrounding the Alboran Sea basin, which is composed of an extended continental crust. Several indices advocate for a recent, and possibly still active uplift of the internal Rif units. Current horizontal kinematics of the Rif region are markedly different from the global Iberia-Africa convergence vectors, which has led some authors to propose complex plate boundary geometries in this area, or to infer the presence of a westward-directed, increased basal traction beneath it. Given the protracted geodynamic history of this region, both global plate kinematics and crust and mantle dynamics may actually play a role in the present-day horizontal and vertical movements. In this study, we focus on the role of crust and mantle dynamics on the present-day structure and kinematics of the Rif region. We first analyze Bouguer gravity data together with published Moho depths computed from receiver functions in order to determine the amount of isostatic compensation or un-compensation of the Rif topography. Finally, isostatic anomalies are compared with GPS data and with recently obtained tomographic images, and a schematic model of the current structure and kinematics of the Rif domain is presented. We show that the Rif is characterized by an over-compensated (i.e. too deep Moho) topography west of 4.5°E, suggesting a crustal overthickening associated with a negative dynamic topography. Comparison with kinematic data suggests that lithospheric mantle removal associated with a viscous flow of the lower crust beneath the Rif could explain the deep crustal root as well as the active uplift and westward motion of the Rif region.