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Is The Iberian-African plates boundary well defined in the Alboran Basin of the Westernmost Mediterranean?

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The Alboran Basin (Westernmost Mediterranean) hosts the boundary between the Iberian and African plates. Traditionally, this boundary has been described as a wide deformation zone, in which the convergence is accommodated by several onshore-offshore tectonic structures. Extensional processes that led to the Alboran Basin formation took place from the Early to the Late Miocene, led by slab roll-back and slab tearing. During the Plio-Quaternary, the basin has been deformed due to the Iberia – Africa tectonic plates convergence, producing the contractive reorganization of some structures at the basin.

In this study, we estimate the total slip accommodated by the most prominent tectonic structures in the area of Earliest Pliocene in age. We use Pre-Stack Depth Migrated sections of the crustal structure, that allow us to analyzed the real geometry of these structures at depth and to measure strain. We use the deformation-related geometry of strata and faults to estimate slip on the main faults.

Results show that estimated total slip accommodated by the main fault system may be similar (with error bounds) to the estimated plate convergence value since the Messinian time (~24 km). Thus, slip on that faults may have accommodated most of the Iberian – African plate convergence during the Plio-Quaternary, revealing that the contractive reorganization of the Alboran basin is focused on a few first-order structures that act as lithospheric boundaries, rather than widespread and diffuse along the entire basin.