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A revision of the main active fault systems of the Alboran Basin: their significance in plate tectonics and a first appraisal of its seismogenic and tsunamigenic potential.

Laura Gómez de la Peña¹, César R. Ranero², Guillermo Booth-Rea³, José Miguel Azañón³, Eulàlia Gràcia¹, Francesco Maesano⁴, Roberto Basili⁴, and Fabrizio Romano⁴

¹Barcelona-CSI, Institute of Marine Sciences, CSIC, Barcelona, Spain (lgomez@icm.csic.es)

²ICREA at CSIC, Barcelona, Spain

³Facultad de Ciencias, Universidad de Granada, Granada, Spain.

⁴Istituto Nazionale di Geofisica e Vulcanologia (INGV), Rome, Italy.

The Alboran Basin is located in the westernmost Mediterranean Sea. This basin was formed during the Miocene, and since the late Miocene, has been deformed due to the Iberia – Africa tectonic plates convergence, producing the contractive reorganization of some structures at the basin. Thus, the Alboran Basin is a seismically active area, which hosts the plate boundary between the European and African tectonic plates. This plate boundary has been traditionally considered a wide deformation zone, in which several small faults are accommodating the deformation.

Based on a modern set of active seismic data, we were able for the first time to quantify the total slip accommodated by the most prominent tectonic structures of the area, late Miocene - early Pliocene in age. Our results show that the estimated total slip accommodated by the main fault systems 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.

These results have implications not only for kinematic and geodynamic models, but also for seismic and tsunami hazard assessments. Using the most complete dataset until the date, we performed a revision of the geometry and characteristics of the main fault systems offshore. Based on this data, we perform a first appraisal of the seismogenic and tsunamigenic potential of the main fault systems offshore. Our simulations show that the seismogenic and tsunamigenic potential of the offshore structures of the Alboran Basin may be underestimated, and a further characterization of their associated hazard is needed.