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Foreland seismicity associated to strike-slip faulting (Central Betic Cordillera, SE Spain): geodynamic implications

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Several seismic swarms have taken place since 2010 in the eastern Guadalquivir foreland basin (the northern limit of the Betic Cordillera) that revealed the presence of active faulting in the area. The last seismic sequence has occurred in the northern Guadiana Menor river region since April 2016, with a nearly N-S elongated shape, and a major event of magnitude m(bLg) 4.1 on 18 October 2018. Earthquake focal mechanism data show strike-slip faulting, with nodal planes striking NNE-SSW (sinistral) or WSW-ENE (dextral). Thus, N-S to NE-SW active sinistral faults deform the foreland basement. Nevertheless, previous GPS data show a westward displacement of the basin infill and nearby Betic ranges in respect to the foreland, which disagree with the kinematics of the proposed faults. New geophysical data have been obtained (Bouguer anomaly data and electric resistivity tomographies, ERT) and combined with previous seismic data and geological surface surveys, in order to improve the knowledge of the deep structure of the area. Surface signs of active tectonics are poor: N-S oriented straight river segments and small vertical faults that cut Quaternary sediments. These faults have been studied through shallow ERT profiles, which show sinking of the western block. These data point to a mechanic detachment of both Guadalquivir basin infill and External Zones, which move westward as the Central Betic Cordillera, from the Iberian basement. In this setting, Iberian crust must be coupled to the Alboran Domain and is undergoing NNW-SSE Eurasia-Nubia convergence and orthogonal extension. This stress field is in agreement with the presence of N-S strike-slip faults, probably in an initial development stage, which propagate upward reaching the sedimentary infill. At regional scale, this setting may be considered as the initial stage of an indentation tectonics affecting to the basement, similar to those better developed in eastern Betic Cordillera and in central Alboran Sea.