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The role of strike-slip faults on the origin and evolution of the northernmost Betic intermontane basins

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Two main problems persist when trying to evaluate the relative importance of strike-slip faulting in the formation of the Betic intermontane basins. The first one refers to the onset of the strike-slip faulting. Regarding this, some authors point to the Early Miocene based on the age of oldest sediments affected by the fault zones, while others propose a latemost Miocene-Early Pliocene age for the reactivation at strike-slip regime of former extensional faults (i.e. Crevillente and Alhama de Murcia faults). Interestingly, offshore seismic profiles crossing some fault zones (i.e. Carboneras fault) show no clear evidences of strike-slip faulting before the Early Messinian in the eastern part. The second problem concerns the displacement measured along the strike-slip faults, since they are sub-parallel to the main structures, thus lacking displaced markers at both sides. In order to elucidate the role of strike-slip faulting, we analyze the shape of sedimentary depocenters, the geometry and kinematics of the bordering faults, the subsidence history and the chronological relationships with the SW extension affecting both Internal and External Zones of the Betic Cordillera. ENE-WSW trending dextral strike-slip faulting is well documented from 13 Ma. These faults have played a critical role as transfers of the main southwestward extension. Differences in direction and magnitude of slip vector between adjacent blocks produce the Betic intermontane basins.

On the basis of these data, we propose that, at least, from Upper-Tortonian to Pleistocene the faulted edges of some basins have evolved in a general context of ENE-WSW dextral strike-slip faulting that formed rhombohedral shape sub-basins separated by basement highs. NE-SW transtensional left-lateral faults (i.e. northwestern border of Sierra Nevada) and the NW-SE conjugate ones illustrate this behaviour. All these faults have contributed to the deformation partitioning of this sector of the Betic Cordillera. A lithosphere-scale scenario, characterized by slab tearing of the Iberian slab, provides the framework to explain the formation of the northernmost Betic intermontane basins.