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Tectonic constraints on the development and individualization of the intermontane Ronda basin (external Betics, southern Spain): a structural and geomorphologic approach.

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As a result of progressive shortening and orogenic wedge thickening, marine foreland basins tend to emerge and divide. We have analyzed possible recent tectonic activity within the late evolution stage of the Ronda basin, an intermontane basin located in the external wedge of the Gibraltar Arc, formerly connected with the Betic foreland basin and infilled by marine Upper-Miocene sediments. We analyze (1) the structures responsible for the basinward relief drop along the arc strike and the different topography of their boundaries; (2) qualitative and quantitative geomorphologic indices to asses which structures could present recent activity; and 3) the structures causing the division of the former Betic foreland basin and the isolation of the Ronda basin.

Within the deformational history of the Ronda basin, late structures that control high topographic gradients and generate remarkable fault scarps group into three main types: (a) Extensional structures represented by NW-SE striking normal faults, clustered close to the current SW and NE boundaries of the basin. They usually dip towards the basin and their vertical displacement is maximum up to 1,5 km. These structures partially affect the basal unconformity of the Upper Miocene basin infill and are scarcely developed inside the basin infill. (b) Shortening structures developed both in the basin infill and in the outcropping basement near the Northeastern and Southwestern basin boundaries. They are represented by NE-SW directed plurikilometric box-folds and reverse faults, responsible for the alternation of sierras (altitudes 1000-1500 m) and valleys. (c) Strike-slip dominated structural associations where WSW-ENE lateral faults combined with folds and normal and reverse faults defined a NE-SW directed deformation band constituting the NW basin boundary. This band includes some sierras up to 1.100 m.

Regarding the relief of the Ronda basin area, the abrupt slopes of the outcropping basement (heights between 500-1500 m) contrast with the relief inside the basin, a relative low-lying relief varying between 400 and 700 m. The drainage network is dendritic, although some 2nd-3rd order streams show a significant deviation to NW-SE , probably controlled by normal faults.

The calculated geomorphologic indices (SLk, Vf, Smf) show anomaly zones in the footwall of normal faults, reaching their highest values in the Northeastern basin boundary (SlK > 6, Vf = 0-0.5, Smf = 1-1.15), where, additionally, the hypsometric curves display convex trajectories with HI > 0.5. Anomalous values of geomorphologic indices (SlK > 10, Vf 0-0.75, Smf 1-1.25) together with convex hypsometric curves with HI > 0.5 have also been obtained for shortening structures, such as hanging wall of reverse faults and folds.

Structural criteria show that extensional and shortening structures in the Ronda basin are coetaneous and active since the Upper Miocene. Geomorphologic analyses suggest that some of these structures could continue active up to the Quaternary with low-to-medium deformation rates. Our results, together with previous sedimentological data suggest that, from the Messinian on, the Ronda basin became disconnected from the Betic foreland basin as the result of the tectonic uplift of its NW boundary.