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Wrench tectonics at the eastern end of the Western Gibraltar Arc: en echelon pressure ridge uplifts in a highly partitioned brittle-ductile shear zone

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External Betic and Rif chains show lateral variations in their structural trend-line pattern that defines alternating concave (recesses) and convex (salients) segments towards the foreland. Internal-External zone tectonic boundary also draws comparable deflections. The Western Gibraltar Arc (WGA) corresponds to the hinge zone of the entire Betic-Rif Arc, being bounded to the east by two recessing zones. The northeastern ending zone of the WGA corresponds to a concave segment located between the intermontane Ronda and Granada basins. Within it, a conspicuous 70 km long, high topographic lineament (called Alta Cadena), separates the Alboran Domain (internal zones) from the external thrust and fold belt.

The Alta Cadena has several distinctive tectonic and topographic features in comparison with neighbouring areas: a) differences in the structural order of the main tectonic units; b) lack of cartographic connection between the main outcrops; c) the topographic lineament strikes nearly E-W, but the relief is made up by a set of non connected small ranges (up to 1.110-1.400 m) each one trending generally NE to ENE; d) the region falls within one of the main epicenter clusters of the Betic-Rif chains.

A revision of the previous geological maps taken together with new kinematic data

has allowed us to better define the structure of the zone and to interpret it in terms of strain partitioning. The main structures, developed from the Middle Miocene onwards, include: a) upright and asymmetric N40º-75ºE folds; b) N45º-75ºE striking reverse faults and thrusts; c) conjugate NW-SE normal faults; and d) nearly E-W strike-slip faults. All these elements depict a general structure of en echelon ranges where the relative deeper tectonic units (Internal Subbetics) crop out.

The resulting kinematic map suggests that the entire zone correspond to a set of pressure ridge uplifts built within a major dextral brittle-ductile shear zone in which strain was highly partitioned. Focal mechanism solutions also indicate the region has active vertical E-W trending faults with dextral movement located in the upper crust. Earthquake data and landscape development in the neighbouring drainage basins suggest that deformation is still active.

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