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Along-strike variations of the External Betics basal detachment: Implications on the evolution of a curved FTB

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Analogue models have successfully tested the role of different parameters on the orogenic curvature. Among them: (1) along-strike variations of the frictional properties of the detachment layer, (2) the topography of the basement, (3) the syn-tectonic sedimentation and/or erosion and (4) the indenter shape. Previous works have pointed out that, across-strike the central Betic fold-and-thrust belt (FTB), northern branch of the Gibraltar Arc, a change on the structural style and on the topographic envelope (α) coincide with the pinch-out of Triassic evaporites and with a change in the basement dip (β) that induced changes on the wedge geometry and the basal friction (Jiménez-Bonilla et al., 2016). In this work, we tried to constrain the external orogenic wedge geometry to study the evolution of the western Betics FTB and, comparing it with the central Betics FTB, to delve into the structural variations along-strike the Betic chain.
In the present work, field data together with reflection seismic interpretations permit us to constrain the across-strike variations on the structural style of the western Betics FTB. The internal FTB is deformed by SW-NE, kilometric-scale, and non-cylindrical folds detached within Triassic evaporites. The middle FTB is characterized by the profusion of allochtonous Triassic mudstones and evaporites and it is deformed into a dextral transpressive band. In the frontal FTB, a Middle Miocene package, the Olistostromic Unit, is deformed by foreland-verging thrusts overlying paleomargin-derived units. Accordingly, these differences on the structural style across the western Betics FTB could be attributable to the variations on the frictional properties of the detachment level.
Regarding the wedge geometry, the topographic relief envelope (α) of the western Betics FTB is similar to that one of the central Betics. However, β is significantly lower than in the central Betics (ca. 2º vs >4º). Moreover, neither Triassic pinch-out nor basement threshold is observed in the western Betics FTB. Thus, while the deformation front stagnated during Langhian in the central Betics because of the change of the basal friction, it would have experienced slight or no stagnation in the western Betics. Finally, the along-strike differences on the basal detachment of the Betics FTB could have contributed to the quick protrusion of western Gibraltar Arc during the Upper Miocene that has been evidenced by previous works (Crespo-Blanc et al., 2016).

Crespo-Blanc A., Comas, M., Balanyá J.C. (2016): Clues for a Tortonian reconstruction of the Gibraltar Arc: Structural pattern, deformation diachronism and block rotations. Tectonophysics, 2016, 683, 308-324. doi:10.1016/j.tecto.2016.05.045

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