



Propagation of a fold-and-thrust belt vs. timing of flexural basin formation: a case-study in the Betics (Gibraltar Arc System)

Alejandro Jiménez-Bonilla (1), Taija Torvela (2), Inmaculada Exposito (1), Juan Carlos Balanya (1), Manuel Diaz-Azpiroz (1), Leticia Barcos (1), and Ana Crespo-Blanc (3)

(1) University Pablo de Olavide, Utrera Road, km. 1, 41013 Seville, Spain, (2) University of Leeds, Leeds LS2 9JT, UK, (3) University of Granada, Campus Fuentenueva, C/ Severo Ochoa, s/n, 18071 Granada, España

Tectonic load associated to the progressive fold-and-thrust belt (FTB) building in the external zones of orogens commonly leads to the lower plate lithosphere flexure, subsequent foreland basin formation, and syn-sedimentary deposits.

In this contribution, we focus on a case-study situated in the northern branch of the Gibraltar Arc System. The interpretation of seismic sections together with updated structural data from the Subbetic FTB, formed by paleomargin deposits detached from the South Iberian basement, and the central to eastern Guadalquivir foreland basin, permit us to characterize the variations of deformational style across the Subbetic and the spatial and temporal relationships between the Subbetic and the foreland basin infill, in particular in terms of migration of the FTB deformation front.

From the most internal FTB to foreland basin, various structural styles have been characterized:

- (1) The inner FTB is formed by buckle folds, WSW-ENE striking, kilometre-scale and non-cylindrical, controlled by a detachment within Triassic evaporites.
- (2) The central FTB is characterized by a thrust system, detached also in Triassic evaporites and whose direction varies from NE-SW to E-W towards a more external position. Ramp geometries and associated fault-bend folds show that this thrust system has N-ward vergence. Syn-compressional Serravallian to Langhian sediments deposited during the back and fore-thrusting permit to constrain the age of the deformation.
- (3) The frontal FTB is characterised by a tectonically complex area without dominant vergence. The Subbetic competent rocks are surrounded by a clayey matrix, attributed to Langhian-Serravallian age. Finally, seismic lines in the Guadalquivir foreland basin show that the Langhian-Serravallian units were thrust onto a younger Tortonian to Messinian, post-deformational sequence.

Our data suggest that the compressional deformation observed in the inner and central FTB corresponds mostly with a Lower to Middle Miocene compressional event. Both the orogenic front and the flexural basin were well-developed by the Langhian, evidenced by the gravitational/erosional processes toward the frontal part of the FTB and by the basin infill. The Langhian sequence, therefore, corresponds with the first depositional sequence of the Guadalquivir foreland basin, dated at c.16 Ma [1]. The main shortening in the central Subbetic took place c.4 Ma earlier [2]. Finally, a post-Serravallian shortening event caused local deformation in the frontal Betics and in the Guadalquivir basin infill. These results permit to constrain the time of response of the crustal thickening of the external orogenic wedge and the flexural basin formation, and give some clues to the late orogenic deformation and migration of the deformation front.

Acknowledgements: RNM-415 and CGL-2013-46368-P

References:

- [1] Roldan, F.J., 1995. Evolución Neógena de la Cuenca del Guadalquivir. Ph.D., Univ. of Granada, Granada, Spain.
- [2] Crespo-Blanc, A., 2007. Superposed folding and oblique structures in the paleomargin-derived units of the Central Betics (SW Spain). *J. Geol. Soc.*, 164, 621-636.