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Formation and deformation of the Alboran-Rif sytem? Insights from 3D thermo-mechanical modelling.

L. Le Pourhiet (1), D. Do Couto (1), R. Labayed (1), E. d'Acremont (1), J. Smitt (1), A. Ammar (2), H. Jabour (3), and C. Gorini (1)

(1) UPMC, ISTEP, PARIS, France (laetitia.le_pourhiet@upmc.fr), (2) Univ. Mohamed V rabat-Salé, (3) ONHYM

The Alboran basin is a typical basin of the Mediterranean area in the sense that rapid extension followed a phase of thickening of the crust and is itself followed by a new shortening phase. In between these multiple phases of thickening and thinning of the crust, the thermal structure doesn't have the time to relax and participate as much as the faults and the reworked nappe stacked of different lithologies to the structural inheritage. The Alboran basin is however special because it presents the very deep (10km) basins as well as a very complex structure of the basements that features a multitude of accidents at short wavelength.

We will present first the modeling assumption and the results of a preliminary parametric approach assessing in particular the evolution of subsidence rates and main faults activity with time as a function of two parameters: the strength of the lower crust and the timing of the last inversion. Comparing the results of the 3D models with the current structure of the basement, we conclude that structural inheritance can explain the structure of the eastern alboran basin and the location and geometry of the main active faults.

However, the morphology of the western basin, as well as the rapid uplift that causes the Messinian Event are not captured within crustal/lithospheric scale models. We therefore use a second generation of upper mantle scale thermomechanical models to test different hypothesis concerning the formation of the western Alboran Basin and find that a two step removal of the mantle lithosphere from beneath the Alboran explains the structural data as well as the vertical displacement in the region.