



Influence of structural inheritance during inversion tectonics at lithospheric scale: the example of Pyrenean-Cantabrian mountain belt

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Local inherited weaknesses and regional inherited crust and mantle lithosphere structure are expected to control the structural style of tectonic inversion of rift zones and passive margins. However it is still unclear to which extent these structural inheritances play a role during inversion tectonics and contribute to the structural style of inversion. Here we focus in the context of the Topo-Europe project PYRTEC on the Pyrenean-Cantabrian mountain belt which is very well studied. The moderate inversion, the good preservation of both pre and syn-orogenic strata and the excellent geological and geophysical data set make this chain one of the best candidates to investigate these questions. We use 2D thermo-mechanical models constrained by geological observations to investigate the role of inheritance during lithosphere scale inversion and incipient mountain building.

We focus on two aspects of the inversion and collision process: 1) the role of structural inheritance and strength of the crust on the style of deformation, and 2) the role of pre-orogenic rift structure on inversion style. The numerical model includes a crustal layer of 35 km thick and a lithosphere of 125 km. All materials follow frictional-plastic strain softening, or thermally activated viscous flow laws. A first set of models evaluates the role of inherited structure (strength of the crust, strike slip inheritance, salt layer) and surface processes (sedimentation and erosion) on the style of deformation. A second set of models examines the role of pre-existing rift structure on the style of inversion and continental collision. The formation of rift basin or passive margin is explicitly modeled and the results are then used as initial condition for lithospheric scale inversion, a procedure which we coined accordion tectonics. Structural geological fieldwork performed provides constraints on the rift geometry, and the main inherited structures whose influence on the style of deformation in the Central Pyrenees can be tested using the numerical models.