Geophysical Research Abstracts
Vol. 20, EGU2018-5108-1, 2018
EGU General Assembly 2018

Crustal detachment levels may control transmission of intraplate deformation: A lithosphere transect of North Iberia

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The objective of this study is to investigate the influence of a mid-crust and lower crust detachment levels in the transmission of stresses for along a N-S oriented transect corresponding to the Central System and the Basque-Cantabrian zone of the northern Iberian Peninsula. We consider geological structures inherited from the Variscan orogeny that localize the strain, producing the rising the Central System as a pop-up structure and the Bilbao anticline geostructure. We analyze what conditions are necessary to obtain the various shortenings estimations fromed in previous works for these areas. To do so, we present the results of perform thermomechanical modelling corresponding to geological interpretation of the area in Cretaceous times that suffers a compressive process with a constant velocity related to the convergence between Africa and Eurasian plates. The configuration of the transect includes a thin crust corresponding to the continent-ocean transition in the Bay of Biscay, and structures inherited as a body of high density in the mentioned thinned crust, or two weak zones with different angles acting as faults in the Central System which is a large granitoid block. The models to be compared include or not a detachment level acting on the middle crust. We include the rheological complexity associated with elasticity (Maxwell viscoelasticity), non-linear temperature and pressure- dependent power law for viscosity and plasticity criteria using the Byerlee law. For modeling we use Underworld-II, particle-in-cell finite element code tuned for large-scale geodynamics simulations. Depending on lithosphere rheology and viscosity and thickness related to the detachment level and inherited structures, may change significantly how the deformation rate is distributed, and therefore the stresses, giving rise to different scenarios of accommodation of the shortening in the Basque-Cantabrian transferring displacement southwards toward the Central System. Also, this southward transferring displacement changes the configuration of the Bilbao anticline and the pop-up structure in the Central System. This work is part of the project MITE (CGL2014-59516- P). We also thank to the project AECT-2017- 3-0008 of the Barcelona Supercomputing center (BSC-CNS).