Geophysical Research Abstracts
Vol. 20, EGU2018-13023-2, 2018
EGU General Assembly 2018

From small and cold to large and hot orogens: Investigating the influence of extensional inheritance and surface processes

Sebastian G. Wolf (1), Ritske S. Huismans (1), and Peter van der Beek (2)

(1) University of Bergen, Earth Sciences, Bergen, Norway, (2) ISTerre, Université Grenoble Alpes, Grenoble, France

During recent years, geodynamic models have underpinned our understanding of the growth of a mountain belt from a small, cold to a large, hot orogen as a function of the amount of convergence. Additionally, studies have demonstrated that the structural style of a mountain belt is strongly influenced by inherited weak (extensional) structures, the amount of erosion and deposition, as well as the distribution of shallow detachment horizons. We use upper-mantle scale plane-strain thermo-mechanical models coupled to a 2D, mass conserving surface process model (FastScape), to investigate the long-term evolution of mountain belts and the influence of extensional inheritance and surface processes thereon. We find that the increase in lithospheric pull is the main driver for the evolution from a monovergent to a bivergent orogen and finally to an orogenic plateau. However, internal loading through reactivation of extensional structures has a strong impact on the style of the mountain belt, especially in small, cold orogens. Erosion, deposition, and a weak décollement lead to the development of thin-skinned foreland fold-and-thrust belt(s). This influences orogenic taper and has a strong feedback with the locus of deformation. To verify and discuss our generic modeling results, we present a comparison of the models with natural systems, with a particular focus on the Pyrenees.