Geophysical Research Abstracts
Vol. 20, EGU2018-7285, 2018
EGU General Assembly 2018

Numerical modelling investigating the role of magma-poor rifted margins structure in mountain building

Anthony Jourdon (1), Frédéric Mouthereau (1), and Laëtitia Le Pourhiet (2)

(1) University of Toulouse, CNRS, Geoscience Environnement Toulouse, France (jourdon_anthony@hotmail.fr), (2) University of Pierre et Marie Curie, ISTeP, Paris, France

Geophysical imaging of magma-poor rifted margin structure show that hyper-extended domains, between the necking zone and the exhumed lithospheric mantle, represent 70 to 200 km. When inverted as a result of collision, these domains form the internal parts of mountain belts. In this study, we investigate how the structure and the laterally changing nature of rifted margins (composition, temperature) contributes to the temporal and spatial localization of deformation observed in mountain belts. In particular, we performed a parametric study to test the influence of the width of hyper-extended domain and initial changes in the mechanical coupling in the rift system on the strain localization, final structure and temperature evolution of collision belts. The introduction of mineralogical phase changes using thermodynamics stability fields of serpentine allows transformation of olivine during mantle exhumation in extension. We also compute predicted low-temperature thermochronological ages by tracking the temperature-time evolution of particles combined with a kinetics correction used in Pecube (Braun, 2002) which allows comparison with constraints from a variety of thrust belts. Moreover, we investigate the influence of weakening prosses on strain localization mechanisms (dislocation creep, diffusion creep) and final structure of margins and mountain belt. We investigate whether the initial asymmetry during rifting related to lower and upper plates configuration remain the same during compression. We also observed that rifting events are playing a significant role during the first steps of inversion until the underthrusting of continental lithosphere and thermal re-equilibration which then lead the most important part of strain localization.

This study is included to the Orogen research project, a tripartite partnership between academy and industry (Total, BRGM, CNRS).