Geophysical Research Abstracts
Vol. 12, EGU2010-11968, 2010
EGU General Assembly 2010

Three-dimensional numerical modelling of crustal extension

Vaneeda Allken, Ritske Huismans, and Cedric Thieulot
Department of Earth Science, University of Bergen, Norway (vaneeda.allken@geo.uib.no)

We focus on understanding the evolution and structural style of crustal extension in 3D using state of the art computational modelling techniques. To date very few 3D models exist that follow the evolution of tectonic processes into large deformation modes with sufficient resolution to resolve individual faults and shear zones. We use an Arbitrary Lagrangian Eulerian (ALE) fully parallel Finite Element code which solves for visco-plastic flows in 3D. Plastic materials weaken with accumulating strain. To localise deformation, a weak seed region is introduced at the base of a one layer model extended by velocity boundary conditions. Controls on the geometry and spacing of three-dimensional frictional-plastic shear zones in simple one and two-layer models are investigated. We study the effect of varying the offset between the weak seeds on the linkage between offset rift zones and the efficiency of rift propagation. In a second set of experiments, the brittle layer is coupled with a lower ductile layer for varying viscosity of the lower layer. The model results indicate primary controls of strain dependent frictional plastic rheology and rift offset on efficiency of rift propagation and style of rift segment interaction.