



Three-dimensional numerical modelling of crustal extension

Vaneeda Allken, Ritske Huismans, and Cedric Thieulot

Bergen university, Dept. of Earth Sciences, Bergen, Norway (cedric.thieulot@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, weak seed regions are introduced in a simple 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. 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.