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Three-dimensional numerical modelling of crustal extension

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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) thermo-mechanically coupled fully parallel Finite Element code which solves for visco-plastic flows in 3D. Plastic materials weaken with accumulating strain. To localize 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 specifically focus on factors controlling rift propagation and rift obliquity for varying weak seed extent and obliquity with respect to far-field extensional boundary conditions.