Geophysical Research Abstracts, Vol. 9, 10954, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10954

Numerical modelling of essentially 3D deformation of heterogeneous elasto-visco-plastic lithosphere

S.V. Sobolev, A. Petrunin and A. Popov
GeoForschungsZentrum Potsdam, Germany (stephan@gfz-potsdam.de)

Modelling of deformation of heterogeneous lithosphere at plate boundaries involving large strike-slip component is especially complicated because it requires 3D modelling approaches and needs to simulate strain localization phenomenon. We demonstrate two deferent techniques for coupled thermomechanical modelling of such processes in the case of lithosphere with realistic, strongly non-linear elasto-visco-plastic rheology. The first approach is appropriate for the common case, when variations of parameters and process-variables are much smaller in one particular direction (strike direction) than in other directions. In this case we use an explicit numerical technique which combines finite difference Eulerian integration scheme in strike direction and Lagrangian FEM method in other two orthogonal directions. This technique is relatively computationally inexpensive and allows efficient parallel computing. In general 3D case, we employ implicit FEM numerical method adopting efficient computational techniques used in engineering applications. We will demonstrate 3D modelling examples of continental break-up by transtention processes and of origin of the deepest depression of the Dead Sea pull-apart basin.