Geophysical Research Abstracts
Vol. 21, EGU2019-15022, 2019
EGU General Assembly 2019

Laboratory evidence of thermo-mechanical shear localization

Claudio Madonna (1), Yury Podladchikov (2), and Jean-Pierre Burg (1)

(1) Geological Institute, ETH Zurich, Zurich, Switzerland (claudio.madonna@erdw.ethz.ch), (2) Institute of Earth Sciences, University of Lausanne, Lausanne

Temperature-dependent rheology controls geodynamic processes at various scales, e.g. viscous heating is considered to trigger intermediate-depth earthquakes along fault zones. Thermal softening can also affect the dynamics of magma flow within conduits and trigger volcanic activity. This is also considered to be an important weakening mechanism in subduction initiation and is recognised as a heat source during orogeny.

Few experimental studies investigated the effects of viscous heating on strain localization. This experimental investigation of the dynamics of thermally-activated strain localization employed homogenous and isotropic materials with a strongly temperature-dependent rheology. The spatial and temporal superficial temperature variation was captured with an infrared camera. Results from coupled thermo-mechanical uniaxial compression of glassy polymer samples with prismatic shape at room temperature and at different strain rate show a localised temperature increase due to viscous heating along planar zones that ultimately convert into fracture planes.

Experimental results were validated with a thermo-mechanical numerical model and extrapolated to geological relevant conditions where viscous heating affects large-scale shear zones.