Geophysical Research Abstracts
Vol. 20, EGU2018-10279, 2018
EGU General Assembly 2018

Non-linear viscoelastic relaxation of pressure variations in rocks

Marcin Dabrowski (1,2), Jan Cornet (1,2), Maciej Trzeciak (1), and Marta Adamuszek (1)

(1) Computational Geology Laboratory, Polish Geological Institute - NRI, Wroclaw, Poland , (2) Physics of Geological Processes, University of Oslo, Norway

Large-strain deformation structures are widely observed in rocks and testify to their fluid-like behavior during solid-state deformation. The development of many such structures has been successfully reproduced using mechanical models based on the hydrodynamic approach for heterogeneous fluids. However, there are some caveats to conventional viscous models of rock flow. It is notoriously hard to extrapolate rheological data obtained during laboratory experiments to geological conditions. While the appearance of some structures hints to a non-linear viscosity of rocks at geological strain rates, other observations suggest the opposite. Most mechanical models of rock deformation build on isotropic fluids, although viscous anisotropy of rocks may play an important role in nature. Both laboratory experiments and modeling studies show that rocks are not necessarily simple fluids and their evolving microstructure often governs their rheological behavior. In addition, elastic effects may play an important role and some creeping rocks are more viscoelastic solids than fluids. The details of rock viscosity, or rather viscoelasticity, may have a large impact on technological and natural processes such as borehole closure in salt formations and residual pressure relaxation in metamorphic rocks.