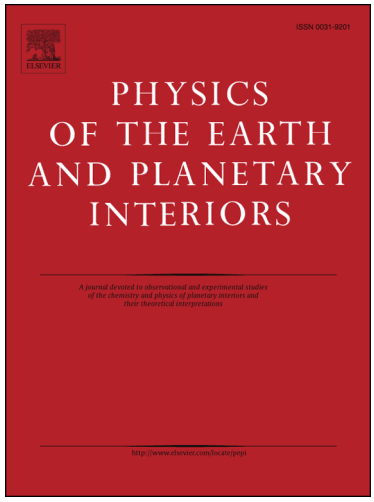

The Burgers/squirt-flow seismic model of the crust and mantle

Short title: Burgers/squirt flow model of seismic waves

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Abstract Part of the crust shows generally brittle behaviour while areas of high temperature and/or high pore pressure, including the mantle, may present ductile behaviour. For instance, the potential heat source of geothermal fields, overpressured formations and molten rocks. Seismic waves can be used to detect these conditions on the basis of reflection and transmission events. Basically, from the elastic-plastic point of view the seismic properties (seismic velocity, quality factor and density) depend on effective pressure and temperature. Confining and pore pressures have opposite effects on these properties, and high temperatures may induce a similar behaviour by partial melting. In order to model these effects, we consider a poro-viscoelastic model based on the Burgers mechanical element and the squirt-flow model to represent the properties of the rock frame to describe ductility in which deformation takes place by shear plastic flow, and to model local and global fluid flow effects.

The Burgers element allows us to model the effects of the steady-state creep flow on the dry-rock frame. The stiffness components of the brittle and ductile media depend on stress and temperature through the shear viscosity, which is obtained by the Arrhenius

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