Geophysical Research Abstracts
Vol. 15, EGU2013-8730, 2013
EGU General Assembly 2013

Modeling transport of crystal rich magmas

Kjetil Thøgersen (1) and Marcin Dabrowski (1,2)

(1) Physics of Geological Processes, University of Oslo, Norway (kjetil.thogersen@fys.uio.no), (2) Computational Geology Laboratory, Polish Geological Institute - National Research Institute, Wroclaw, Poland

Determining the effective viscosity of crystal rich magmas is essential to constrain the rate and dynamics of magma transport in dikes and sills. The presence of rigid magmatic crystals in the melt phase affects the rheology of the magma and hence its flow properties. We present a finite element formulation of two-dimensional incompressible Stokes flow with crystal suspensions, where the crystals are modeled directly as rigid inclusions embedded in a linear viscous fluid. The model includes complex channel geometries where self-affine surface roughness is generated with a random midpoint displacement method. We show how the flow profile in the dike is affected by crystal size and shape for a wide range of particle volume fractions. For large volume fractions where particle interactions become dominant. We further show how particles rotation is affected by particle shape and that particles tend to align with the direction of flow. In addition, we investigate particle migration across the channel, and the development of the cross-sectional particle distribution.