Geophysical Research Abstracts,
Vol. 11, EGU2009-1862, 2009
EGU General Assembly 2009

Scaled analogue models of dikes propagation and associated surface deformation

F. Corbi, G. Norini, F. Funiciello, V. Acocella, and E. Di Giuseppe
Univ. Roma Tre, Scienze Geologiche, Rome, Italy (fcorbi@uniroma3.it)

We present the results of analogue modelling designed to quantitatively investigate propagation of dikes in the upper crust and the resulting surface deformation. A range of scaled analogue materials and physical conditions of the models was tested, and pros and cons of every experimental setup were carefully evaluated to provide an enhanced methodological basis for simulation of dikes emplacement in brittle host rocks. Bingham (vegetable oil) and Newtonian (paraffin wax) fluids were used as analogues for magma. These were injected into both purely-brittle dry quartzose granular sand and elasto-brittle gelatine as host rocks. We performed a comprehensive rheological characterization of the analogue materials. Both the viscous and brittle materials we used in our tests provide to be suitable for precisely scaled analogue experiments of dike intrusion in the upper crust. Thus, the choice of the experimental setup for the modelling of shallow magma transfer is presented in a problem-solving oriented approach.
Topographical changes induced by dike propagation were measured for each experimental setup. We used a high resolution laser scanner to trace surface deformation as function of the rheological behaviour of the materials, injection rate, and dip and orientation of the intrusion. Results of the modelling show that the propagation of the dikes produces surface deformation which is clearly detectable and repeatable in the laboratory experiments. Measured topographical changes are consistent with theoretical predictions and observations of natural cases.