Geophysical Research Abstracts
Vol. 19, EGU2017-506, 2017
EGU General Assembly 2017

What controls lateral dike propagation and arrest along rift zones? Insights from analogue and numerical models

Stefano Urbani (1), Valerio Acocella (1), Eleonora Rivalta (2), and Fabio Corbi (3)

(1) University of "Roma Tre", Department of Sciences, Rome, Italy (stefano.urbani@uniroma3.it), (2) Deutsches GeoForschungsZentrum GFZ, Potsdam, Germany, (3) Géosciences Montpellier Laboratory, University of Montpellier, Montpellier, France

Recent diking events at Dabbahu (Afar, 2005-2010) and Bardarbunga (Iceland, 2014) showed lateral propagation for tens of kilometres and arrest before topographic reliefs. Here we use analogue and numerical models to investigate a) why dikes propagated laterally for so long; and b) why they arrested in front of reliefs. In the analogue models we used dyed water and pig-skin gelatin as magma and crustal analogues, respectively. We shaped the gelatin surface to reproduce the topography of the Dabbahu and Bardarbunga intrusions. Analog models show that the lateral propagation of dikes occurs only below a gentle slope (< 3°) associated with stiffness contrasts between two gelatin layers. Conversely, density contrasts between the upper and lower layer play a negligible role in our experiments. Finite Elements models mimicking the analog models reveal that the low relief area, where dikes arrest, is characterized by vertical least compressive stress. Stiffness contrasts and topographic variations may thus explain the propagation and arrest of dikes recently observed along divergent plate boundaries respectively. These results should be considered in forecasting lateral dike propagation and assessing volcanic hazard along rift zones.