Geophysical Research Abstracts
Vol. 17, EGU2015-7639, 2015
EGU General Assembly 2015

Analogue and numerical modelling in Volcanology: Development, evolution and future challenges

Janine Kavanagh (1) and Catherine Annen (2)

(1) University of Liverpool, Liverpool, United Kingdom (janine.kavanagh@liv.ac.uk), (2) University of Bristol, Bristol, United Kingdom (Catherine.Annen@bristol.ac.uk)

Since the inception of volcanology as a science, analogue modelling has been an important methodology to study the formation and evolution of the volcanic system. With the development of computing capacities numerical modelling has become a widely used tool to explore magmatic process quantitatively and try to predict eruptive behaviour. Processes of interest include the development and establishment of the volcanic plumbing system, the propagation of magma to the surface to feed eruptions, the construction of a volcanic edifice and the dynamics of eruptive processes. An important ultimate aim is to characterise and measure the experimental volcanic and magmatic phenomena, to inform and improve eruption forecasting for hazard assessments.

In nature, volcanic activity is often unpredictable and in an environment that is highly changeable and forbidding. Volcanic or magmatic activity cannot be repeated at will and has many (often unconstrained) variables. The processes of interest are frequently hidden from view, for example occurring beneath the Earth's surface or within a pyroclastic flow or plume. The challenges of working in volcanic terrains and gathering 'real' volcano data mean that analogue and numerical models have gained significant importance as a method to study the geometrics, kinematics, and dynamics of volcano growth and eruption. A huge variety of analogue materials have been used in volcanic modelling, often bringing out the more creative side of the scientific mind. As with all models, the choice of appropriate materials and boundary conditions are critical for assessing the relevance and usefulness of the experimental results. Numerical simulation has proved a useful tool to test the physical plausibility of conceptual models and presents the advantage of being applicable at different scales. It is limited however in its predictive power by the number of free parameters needed to describe geological systems.

In this special symposium we will attempt to review the use and significance of analogue and numerical modelling in volcanological research over the past century to the present day. We introduce some of the new techniques being developed through a multidisciplinary approach, and offer some perspectives on how these might be used to help shape the direction of future research in volcanology.