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Predicting changes in volcanic activity through modelling magma ascent rate.

Mark Thomas and Jurgen Neuberg

University of Leeds, Institute of Geophysics and Tectonics, School of Earth and Environment, Leeds, United Kingdom (m.e.thomas@leeds.ac.uk)

It is a simple fact that changes in volcanic activity happen and in retrospect they are easy to spot, the dissimilar eruption dynamics between an effusive and explosive event are not hard to miss. However to be able to predict such changes is a much more complicated process.

To cause altering styles of activity we know that some part or combination of parts within the system must vary with time, as if there is no physical change within the system, why would the change in eruptive activity occur? What is unknown is which parts or how big a change is needed. We present the results of a suite of conduit flow models that aim to answer these questions by assessing the influence of individual model parameters such as the dissolved water content or magma temperature. By altering these variables in a systematic manner we measure the effect of the changes by observing the modelled ascent rate. We use the ascent rate as we believe it is a very important indicator that can control the style of eruptive activity. In particular, we found that the sensitivity of the ascent rate to small changes in model parameters surprising.

Linking these changes to observable monitoring data in a way that these data could be used as a predictive tool is the ultimate goal of this work. We will show that changes in ascent rate can be estimated by a particular type of seismicity. Low frequency seismicity, thought to be caused by the brittle failure of melt is often linked with the movement of magma within a conduit. We show that acceleration in the rate of low frequency seismicity can correspond to an increase in the rate of magma movement and be used as an indicator for potential changes in eruptive activity.