Geophysical Research Abstracts, Vol. 7, 00197, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00197

Non-periodic regimes of lava dome extrusion.

O. Melnik(1,2), A. Barmin (1), R.S.J. Sparks (2)

(1)Institute of Mechanics, Moscow State University (melnik@imec.msu.ru/ +7-095-939-0165), (2)Earth Sciences department, University of Bristol (Steve.Sparks@bristol.ac.uk /+44-0117-925-3385)

Many lava dome building eruptions shows strong oscillations in extrusion rate that can be fairly periodic or non-periodic or transitions between pulsatory activity and periods of steady discharge. We have developed a transient model that accounts for degassing induced crystallization kinetics, gas exsolution and escape through ascending magma and rheological stiffening due to the crystal growth. The model of the flow inside the conduit is coupled with the model of replenished magma chamber. The model shows two types of behaviour for constant rate of magma replenishment, constant temperature and water content: steady discharge rate and periodic oscillations in discharge rate. The period of oscillations is a function of a chamber volume and magma compressibility inside the chamber. Transition between steady and pulsatory activity can occur as a result of variations in magma temperature, water content and replenishment intensity and other parameters. The model is extended to account for the presence of two magma chambers connected by a conduit. Heating of the magma in the upper chamber by injection of the fresh, hot magma form supplying system is considered. In this case eruption can evolve from steady discharge to pulsatory regime and back to sustained activity. Period of oscillations during pulsatory phase changes with time due to the change of magma temperature inside the chamber.