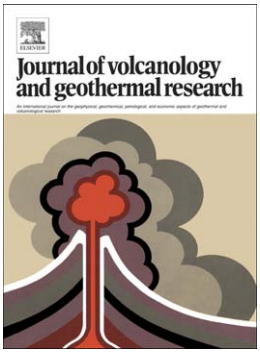

Numerical modeling of shallow magma intrusions with finite element method

Tielin Chen, Shaozhen Cheng, Qian Fang, Cheng Zhou

PII: S0377-0273(17)30027-6
DOI: doi:10.1016/j.jvolgeores.2017.01.008
Reference: VOLGEO 5987

To appear in: *Journal of Volcanology and Geothermal Research*

Received date: 17 March 2016
Revised date: 8 January 2017
Accepted date: 10 January 2017

Please cite this article as: Chen, Tielin, Cheng, Shaozhen, Fang, Qian, Zhou, Cheng, Numerical modeling of shallow magma intrusions with finite element method, *Journal of Volcanology and Geothermal Research* (2017), doi:10.1016/j.jvolgeores.2017.01.008

Numerical modeling of shallow magma intrusions with finite element method

Tielin Chen[1*] , Shaozhen Cheng [1] , Qian Fang [1] and Cheng Zhou[2]

(1. Department of Geology and Environment, Beijing Jiaotong University, Beijing 100044, China

2. State Key Laboratory of Hydraulics and Mountain River Engineering, College of Water Resource and Hydropower, Sichuan University, Chengdu 610065, China)

Key words: magma intrusion; numerical model; intrusion shapes; finite element method

Abstract:

A numerical approach for simulation of magma intrusion process, considering the couplings of the stress distribution, the viscous fluid flow of magma, and the fracturing of host rock, has been developed to investigate the mechanisms of fracture initiation and propagation in host rock during magma intrusion without pre-placing a set of fractures. The study focused on the dike intrusions filled with injected viscous magma in shallow sediments. A series of numerical modellings were carried out to simulate the process of magma intrusion in host rocks, with particular attention on the magma propagation processes and the formation of intrusion shapes. The model materials were Mohr-Coulomb materials with tension failure and shear failure. The scenarios of both stochastically heterogeneous host rocks and layered host rocks were analyzed. The injected magma formed intrusions shapes of (a) dyke, (b) sill, (c) cup-shaped intrusion, (d) saucer-shaped intrusion. The numerical results were