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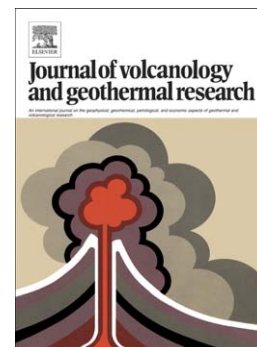
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Numerical modeling of shallow magma intrusions with finite element method

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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

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