Geophysical Research Abstracts,
Vol. 11, EGU2009-13809, 2009
EGU General Assembly 2009
© Author(s) 2009

Numerical tools for modelling the origins of seismic signals on volcanoes

C.J. Bean and G. O' Brien

UCD School of Geological Sciences, University College Dublin, Belfield, Dublin 4, Ireland (Chris.bean@ucd.ie)

Multi-phase fluids play an important role in generating volcano-seismicity. Water, steam, gas and rock melt are by-products of the physical and chemical processes at work at active volcanoes. The interaction of these fluids with the surrounding rock can generate a multitude of seismic signals which are generally recorded at the surface. If they can be quantitatively interpreted, seismic signals can be used to help infer the activity-type and state of the volcano. However many seismic signals produced by these processes are still poorly understood, in a quantitative sense. This in part is due to a lack of numerical tools capable of handling systems which exhibit such complexity. In this talk we take a step towards filling this gap. We outline a method for mechanical fluid-rock interactions capable of generating static and dynamic (seismic) signals, which incorporates multi-phase fluids. The method combines an elastic-lattice scheme for dynamic and static elastic deformation with a lattice Boltzmann method for multi-phase fluid flow. As an example we model gas slug ascent in a vertical conduit demonstrating that this process is capable of generating LP and VLP like signals. A moment tensor inversion is performed on these synthetic VLP signals retrieving a source mechanism equivalent to that of a pipe structure. Hence these emerging schemes will help us to define implicit volcano source models in terms of 'traditional' seismological source descriptions.