Geophysical Research Abstracts
Vol. 13, EGU2011-8321, 2011
EGU General Assembly 2011

Rethinking moment tensor inversion methods to retrieve the source mechanisms of low-frequency seismic events

Sandra Karl, Juergen Neuberg, and Thomas Roome
IGT, University of Leeds, Leeds, UK

Forecasting volcanic eruptions is a fundamental objective of volcanology. In recent years, the study of volcano seismic signals has grown in importance and has resulted in significant advances towards the understanding of the internal dynamics of active volcanic systems. However, the potential to use these signals for better forecasting the eruptive behaviour of volcanoes is somewhat limited, unless a better understanding of the exact role of the trigger mechanisms in a wider volcanological context is gained.

Long period (LP) seismic events are one class of volcano seismic earthquakes that have been observed at many volcanoes around the world, and are thought to be associated with resonating fluid-filled conduits or fluid movements (Chouet, 1996, Neuberg et al.). While the seismic wavefield is well established, the actual trigger mechanism of these events is still poorly understood. In an attempt to better understand the driving forces of LPs, inversions for source mechanisms have become increasingly common.

This approach uses synthetic LP seismograms to invert for source mechanisms on Souffriere Hills volcano using a moment tensor (MT) inversion procedure. The receiver distribution represents the real distribution as it is installed and active on Montserrat island. The synthetic seismograms generated represent the free surface response to a chosen source embedded in a homogeneous half space with $v_p = 3.5km/s$, $v_s = 1.86km/s$, and $\rho = 2.32kg/m^3$. The source mechanism for this study, slip on a ringfault structure at a realistic depth, was approximated by a set of 8 double couple sources in an octagonal arrangement.

Previous studies have commonly assumed a point source for waveform inversion. Knowing that applying a point source model to synthetic seismograms representing an extended source process does not yield the real source mechanism, it can, however, still lead to interesting results. Therefore, this study investigates the effects of changing the source parameters on the apparent moment tensor elements. In future, point source inversion based on higher-order tensors might have to be considered to improve our understanding of the source mechanisms of low-frequency earthquakes in volcanic settings.