Geophysical Research Abstracts, Vol. 8, 03596, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03596

Estimation of long period volcanic sources by a frequency domain inversion approach

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The high interest of volcanologists to understand the physical phenomena which governs long period (LP) events is related to the fact that they may be directly generated by fluid transfer and could be indicators of the level of activity in the volcano and in some cases could act as precursor to eruptions. The wide variety of waveforms and spectral contents existing for LP events, as well as the existence of alternative models to explain the observations make it interesting to develop new inversion schemes. We propose an inversion methodology to determine source mechanisms and study these events through an exhaustive source inversion by using synthetic and observed data. Our method for source inversion is based on a frequency domain approach, which has its main advantage in reducing computational requirements. The resulting source mechanism is represented by the sum of two time-dependent terms: a full moment tensor and a single force. The method has been applied to different sets of synthetic and observed data, including data from Kilauea volcano. Green's functions have been calculated using different layered crustal models, which have been proposed for volcanic areas. Inversion tests are established to check the stability of the method and the possibility of retrieving all source components. The method has been finally applied to volcanic data and results are interpreted in terms of possible source models.