Geophysical Research Abstracts, Vol. 7, 06847, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06847

Analysis of wavefield parameters of a sequence of long-period events recorded before the 2004 Etna eruption

I. Lokmer (1), G. Saccorotti (2), C. Bean (1) , G. Di Grazia (3), L. Zuccarello (3) and D. Patane (3)

(1) Seismology and Computational Rock Physics Lab, Geophysics Group, Geology Department, University College Dublin, Belfield, Dublin 4, Ireland (ivan.lokmer@ucd.ie), (2) Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Vesuviano, Via Diocleziano 328, 80124 Napoli, Italy, (3) Istituto Nazionale di Geofisica e Vulcanologia - Sezione di Catania(INGV-Catania), Piazza Roma 2, 95125 Catania, Italy

Since the installation (November 2003) of the new Mt. Etna broad-band seismic network, a sequence of long-period events (LP) has been recorded. More than 40,000 LP events had been detected until the onset of the last summit eruption started on September 2004. The new broad-band network consists of eight stations with a linear response of the sensors ranging between 0.025 and 100 Hz. The ECPN station located near the summit crater, at an altitude of 3000 m, was fully operational during the whole period and the maximum amplitudes of events recorded at this station were about 10 times bigger than those recorded at the other stations. The LP events were recognized by an automatic routine which compares their spectra with the reference spectrum obtained from a few hundred representative signals. For the purpose of the spectral and particle motion analysis, only the events above a given threshold are taken into account in order to ensure a high quality data set recorded at all the stations. At ECPN about 1500 events were recognized whereas a smaller number was observed at the other stations. Spectral analysis gives the main spectral peak at 0.5 - 1.0 Hz at all the stations and a considerable amount of energy at higher frequencies (up to 9 Hz) only at the ECPN station. Moreover, a weak very-long-period component (0.02 - 0.1 Hz), VLP, is also observed at the same station. Time evolution of the spectral components shows the gradual decrease of energy at the frequencies above 4 Hz at the ECPN station from the end of February to the beginning of April 2004. A secondary

peak appears at the beginning of April at frequencies of about 2 - 3 Hz at ECPN and at the stations located on the southern, western and north-western flanks of the edifice, while it is not observed at the eastern and north-eastern part of the volcano. This may be interpreted in terms of changes of the fluid physical properties within the plumbing system. Furthermore, particle-motion analysis has been performed within a few frequency windows. The main waveform (~ 0.5 Hz) is mostly linearly or elliptically polarized in the quasi-horizontal plane. The direction of polarization at some stations is pointing towards the source, while at the others it is nearly aligned with the topographical features. This observation may be explained in terms of the radiation pattern from a non-isotropic source overprinted by propagation effects associated with the rough topography and shear-waves trapping in shallow, soft layers. A linear, radial polarization of the VLP component is observed at the ECPN station and it could be related to a weak volumetric component associated with mass transport at the source.