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A long period (LP) event detected in the background seismicity at Mt. Vesuvius: its source characteristics investigated with array methods.

S. Petrosino , P. Cusano, E. Del Pezzo and F. Bianco

Istituto Nazionale di Geofisica e Vulcanologia – Osservatorio Vesuviano, Italy

simona@ov.ingv.it

A unique LP event was detected in the background seismicity of Mt. Vesuvius, mainly composed of VT earthquakes, since the start of operation of a small quadripartite array located close to the crater. The LP event was recorded on 2003 July 20^{th} at 9 stations of the Osservatorio Vesuviano seismic network. Its waveforms showed a nearly monochromatic frequency content, with a main spectral peak in the 3-4 Hz frequency band. The seismograms presented emergent onsets at all the network stations and a reliable picking of the P-wave first motion was consequently obtained by using cross-correlation techniques. The location was inferred from the application of a 3D-grid search algorithm, using a 3D velocity model recently derived by passive high-resolution tomography.

Array techniques both in time (Zero Lag Cross Correlation) and frequency (MUSIC) domain were used to infer the kinematic properties of the wavefield generated by this event. The obtained kinematic parameters indicate that the first wave packets propagate from the crater area with a relatively high apparent velocity (2800-3500 m/s). The polarization analysis performed by using the covariance matrix technique, shows several coherent seismic phases in the wavefield, evidencing the presence of body-waves in the first arrivals.

An autoregressive filter (Sompi method) was applied to the tail of the decaying harmonic oscillations, in order to recover the characteristic frequencies and the growth rate of the seismic signal. This information was used to estimate the quality factor Q of the source oscillator and to derive the Effective Excitation Function for moment

tensor inversion.