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Inference of inhomogeneities from the analysis of Strombolian tremor in the band [0.1-0.5] Hz

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It is important to consider the effects of earth noise when we are studying seismic signals. These are visible within a very large frequency range. In particular, some frequencies may be strongly affected by the so called microseismic noise: it is associated with a peak at about 0.2 Hz and the frequencies close to this peak can be corrupted as well. Moreover, in this band the islands seem to have stronger effects of microseimic noise than the continental sites. Despite these evidences, in the volcanic tremor of Stromboli, De Lauro et al. [2005] found a source signal with frequency around 0.3 Hz, characterized by radial polarization and clear spatial and temporal coherency. They observed two distinguished states in [0.1-0.5]Hz (VLP tremor hereafter) with different properties. Polarization resulted the most important discriminating factor. Moreover, the polarization properties of VLP tremor was correlated with its energy: when this grows up the particle motion becomes elliptical; viceversa, VLP tremor series radially polarized shows lower energy level. The enhancement of energy can be ascribed to the presence of not negligible microseismic noise. Starting from these previous results, we have investigated in great detail the Strombolian tremor in the frequency band [0.1-0.5] Hz to understand how the microseismic noise can influence the seismic signals related to volcanic processes. We have used the data-set recorded by broadband seismometers during the field survey performed in the September of 1997. Firstly, we have applied the Independent Component Analysis to two different tremor series relative to the two different states of VLP tremor (radially and elliptically polarized). Two independent components are extracted when tremor is radially polarized: they show different spectra, with dominant peaks around 0.2 and 0.4 Hz, respectively, and their waveforms in time domain appear characterized by beats. During the elliptically polarized state, the previous components are not extracted and only one signal can be identified with almost flat spectrum restricted in the range [0.25-0.5] Hz and

without a characteristic waveform. We have applied the Kanasewich technique to perform the polarization analysis to the whole data-set composed of 60 hours of recording at nine stations to get more information by means of statistical analysis. We claim that VLP tremor is well polarized and points to craters when the energy in the band is relatively low. Moreover, the signals which compose the VLP tremor show the same polarization properties. When the energy grows up, the rectilinearity of motion decreases and a clear direction of polarization disappears. Actually, on statistical basis, a direction of azimuths pointing towards South-East direction can be isolated, probably linked to the blowing of Scirocco wind, that influences above all the flank of volcano directly exposed. Moreover, we have used the Zero Lag Cross Correlation, a technique based on cross-correlation function, suitably improved adding an hypothesis of circular wave front. This allows us to find an estimation of source region. We have found substantially only one source region around crater area. No differences are noted for VLP tremor with different polarization properties nor for the two independent signals constituting the VLP tremor. The estimation of apparent velocity has shown two maxima: one around 500-700 m/s, another corresponding to faster waves (˜2Km/s). We can conclude that there are two vibrating structures at Stromboli volcano which can produce the independent seismic signals extracted in the band [0.1-0.5] Hz. When the microseismic noise becomes important (and the energy of the band increases) it represents an additional source that excites such structures, interfering not linearly with the effects of volcanic source processes and often hiding them.

References

De Lauro, E., De Martino, S., Falanga, M., Palo, M. and Scarpa, R.: Evidence of VLP tremor in the band [0.2-0.5]Hz at Stromboli volcano, Italy , Geophys. Res. Lett., Vol. 32, L17303, doi:10.1029/2005GL023466, 2005.