



Temporal evolution analysis of the Stromboli volcano seismicity

T. Caputo, F. Giudicepietro, M. Martini, L. D'Auria, A. M. Esposito

Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Napoli (Osservatorio Vesuviano),
Napoli, Italy

tcaputo@ov.ingv.it / Phone: +39-081-6108322

Stromboli is the northernmost island of the Aeolian Archipelago. Its persistent activity consists of medium-low energy explosions at different craters, in summit area, lasting few seconds with ejection of incandescent fragment magma (lava spatter, bomb, scoriaceous lapilli and ashes). These products can reach different heights, up to some hundred of meters. The strombolian explosions occur due to the ascent and outbreak of gas slugs, and have the typical frequency of occurrence of 7-10 event/hour, reaching peak values of 30 event/h. Occasionally, effusive eruptions can also occur and even more rarely, explosions with higher energy have been observed.

The Stromboli volcano has been affected by an effusive eruption started on December 28th 2002 and terminated on July 22nd 2003. This eruption occurred after an increase of the strombolian activity. Because of the emergency related to the eruptive crisis, a permanent seismic network consisting of 13 digital three-component broadband stations was installed on the island. This monitoring system is aimed to record and analyze the seismicity connected to the eruptive processes in order to better understand the dynamics of the volcanic system.

The analysis carried out in this work deals mostly with the so-called *Very Long Period* (VLP) events. These signals have been evidenced on volcanoes since less than 20 years ago, through the installation of broadband sensors, because their frequency is generally between 0.01Hz and 1Hz, beyond the range of the common short period sensors. Previous studies carried out on the events with period ranging between 2 and 20 second, showed that their origin is very shallow and that it is strictly related to the dynamic of the strombolian explosions.

The aim of this analysis has been to enhance possible small variations in the source location of the VLP signals during the passage from the effusive activity back to the normal explosive strombolian activity.

The dataset under examination contains approximately 170.000 VLP events recorded during two years of observations (17 January 2003-27 January 2005). The picking has been carried out with a semi-automatic procedure that provides an accurate detection of the VLP events. The polarization analysis has been performed on all the dataset for each station of the network. The results of the analysis show a great stability in time both in the azimuth and in the incidence angle, during the normal strombolian explosive activity, especially for the stations located in proximity of the crateric terrace, for which the signal/noise ratio is very high. On the contrary, the analysis of the data related to the effusive period activity shows slight variations of both azimuth and angle of incidence. In particular, it has been shown that during the passage from the effusive activity to the strombolian one, the polarization parameters of the VLP seismic signals displays a variation of the order of few degrees that can correspond a change in their location of few tens of meters.