Geophysical Research Abstracts, Vol. 8, 07047, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07047

Preliminary analysis of the seismicity at Vulcano Island (Italy) through a seismic array.

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Vulcano Island has been affected by hydromagmatic to magmatic eruptions with variable energy, the most recent of which occurred in 1888-1890 at “La Fossa” cone. More recently, this crater has been the site of volcanic unrest (most notably, an increase of the fumarolic activity) which began around 1985 without culminating in an eruption. Since the late 70’s the continuous seismic activity monitoring on this volcano has been performed by a local permanent seismic network composed by few analogical 3C stations. At the end of the 2003 the Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Catania (INGV-CT), began a project for the unification, standardization and modernization of the Eastern Sicily Seismic Network (ESSN), which also comprise the complete substitution of the old equipments on Vulcano Island. At present one new digital 24-bit seismic station equipped with broad-band (0.2-40 sec) Nanometrics Trillium has been installed in the southern part of the island and by the end of the current year the complete substitution of instrumentations will be terminated. On November 2005 a temporary small-aperture array of 3 broadband stations was installed on the North rim of the volcano crater (La Fossa) in addition to the permanent network. This array has been deployed in order to investigate the origin and source mechanisms of the local shallow seismicity ($<$1.5 km) occurring under "La Fossa" cone. Micro and ultra micro-earthquakes (M$<$2) originating in this area are continuously recorded with variable intensity and rate of occurrence. They have been associated with both fracturing and degassing mechanisms. Till now, however, this seismicity has been mainly detected by the Vulcano Crater station (IVCR) deployed on the "La Fossa" cone, thus hindering any detailed analysis of the source location and mechanisms. In this work

we show some preliminary analysis obtained by the new array recordings, from which we hope to get additional insights about the nature and wavefield properties of the local seismicity at La Fossa crater. A first characterization of the large variety of seismic signals thus fare recorded is performed by classical spectral analysis. This reveals that the main energy spans the 0.5-15 Hz frequency band, with a main peak close to 2.0 Hz at all stations. Furthermore, particle motion azimuths are frequency-dependent, suggesting the action of a complex source mechanism overprinted by complex propagation effects. Near 2.0 Hz the particle motion trajectory is mostly linearly-or elliptically-polarized in the quasi-vertical plane, and show a polarization direction's towards the "La Fossa" crater. For the higher frequency band, instead, the polarization ellipsoids generally depict a transverse orientation with respect to the direction pointing to the "La Fossa" crater. We retain that the high quality data collected by the installation of this first small aperture array, integrated in future by a further one located in the southern part of the cone, will be useful to study the internal dynamics of the volcano in turn providing additional data for surveillance activities.