Geophysical Research Abstracts
Vol. 14, EGU2012-5534-1, 2012
EGU General Assembly 2012

Investigation of 2010 ash emission episodes at Mt Etna by combining volcanological and seismo-acoustic analyses

L. Spina (1), D. Lo Castro (2), M. Sciotto (1), and D. Andronico (2)

(1) Università di Catania, Dipartimento di Scienze biologiche, geologiche e ambientali, (2) Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Etneo - Sezione di Catania, Italy

Mt Etna is one of the most active volcanoes in the world due to its frequent and wide spectrum of eruptive activity that commonly occurs from the summit craters (North-East Crater or NEC, Voragine, Bocca Nuova or BN, and South-East Crater or SEC) but also from eruptive fissures which can open on its slopes. In the last 20 years, Etna has been renowned for its intense explosive activity ranging from episodic paroxysms to long-lasting, highly explosive eruptions able to produce tephra fallout for tens of km away from the volcano. Nonetheless, we witnessed also a number of ash emissions from the summit craters; these are characterized by low, dilute eruption columns rising up to less than 1 km of height above the summit which, after being laterally dispersed by the wind, cause tephra fallout down the volcanic slopes.

In this study, we will focus on three of the more than 30 ash emission events occurred in 2010, and in particular on the events originated from SEC on 8 April, BN on 25 August and NEC on 14-15 November. Our aim is to correlate the volcanological features of these events with the associated seismo-acoustic signals in order to throw light on dynamic conditions beneath the volcano, and particularly in the shallow plumbing system.

For each event, we first describe the eruptive dynamics (timing and eruption column) and the dispersal of the fallout deposit, and then we provide qualitative and quantitative analysis regarding the texture (grain-size, componentry and morphology) of the emitted tephra. In general, all the ash emissions exhibited a low quantity of sideromelane (fresh glass) clasts versus higher amounts of lithics, suggesting a dilution of juvenile particles in the old volcanic materials filling the crater bottom. The seismo-acoustic features of each ash emission episode were assessed by computing the associated acoustic and seismic energy as well their ratio (VASR). The NEC episode shows VASR values strongly higher than the eruptions from SEC and BN, indicating that almost no seismic content is associated to the eruptive activity. Furthermore, the location of infrasound events (recorded during such episodes) was carried out using a semblance-brightness combined method. Finally, the volcanic tremor recorded from March to December 2010 was analyzed. The locations, carried out by using the decay amplitude method, showed the shifting of the volcanic tremor source centroid below the summit area between April and November 2010, in good agreement with the shifting of the explosive activity from SEC/BN to NEC.

The joined volcanic activity and seismo-acoustic data analysis allowed us to characterize the 2010 ash emissions and classify them into two main eruption types, thus defining that explosions from SEC and BN (type a) were more hazardous and impulsive than the ash emission event from NEC (type b).