



Scaling explosive activity at Stromboli Volcano

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Ordinary explosive activity at Stromboli volcano is sometimes interrupted by Paroxysms and more often by Major Explosions. Major explosion represent a primary element of risk, given the large amount of material ejected, able to reach Pizzo Sopra la Fossa and the other summit trails, and the frequency of occurrence (2.1 events/year). However, while paroxysms are easy to be identified and there is a general consensus on their occurrence this does not necessarily hold for Major Explosions.

Generally, Major Explosions are defined as based on the amount of material emitted and on the area covered by the ejecta dispersal, as well as on the properties of material emitted, but this is not always possible nor suitable for a near-real time information delivery to Civil Defence Authorities.

With this purpose we have analyzed the seismic, tilt and infrasonic data collected at Stromboli since 2008 for a total database >400000 events to provide a geophysical classification of major explosions.

We assumed that seismic (in the VLP band), ground tilt, and the acoustic excess pressure are efficient signals to discriminate different explosive energy.

We show how ordinary activity is confined below a seismic VLP ground displacement of 8×10^{-6} m, a deformation of $0.25 \mu\text{rad}$ and an infrasonic excess pressure of 100 Pa. A separate cluster of events, characterized by tilt and seismic displacement significantly larger than these threshold are defined as Major Explosions. Here we propose these threshold can be used to quantitatively discriminate between ordinary activity and Major explosions. While above these precise threshold we have several explosions which can be considered as Major Explosions, the two paroxysms are associated to orders of magnitude (ground displacement of 10-3 m and tilt of $10 \mu\text{rad}$) larger ground tilt and seismic VLP displacement. Besides our classification is suggesting the existence of a possible energy gap between Major and Paroxysms explosive dynamics which has not been filled yet.