

Reconstructing the Eruption Source Parameters of the Avellino eruption, Vesuvius, Italy

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Motivation

In the last ten thousand years, Vesuvius volcano produced several Plinian eruptions. The Pomici di Avellino (Avellino eruption) occurred around 3,900 years BP and heavily impacted human settlements in the region during the Early Bronze Age. Previous field studies characterized Avellino eruption in terms of its eruption dynamics, volumes and intensities. The eruption consisted of three main phases: opening, magmatic Plinian, and phreatomagmatic.

Results

Here we focus on the EU3 unit associated to the climax of the magmatic phase. The estimated maximum column height of this phase was around 31 km and its bulk volume around 1 km³.

We present the first estimation of the Total Grain-Size Distribution (TGSD) of the tephra fallout unit EU3. The TGSD was calculated using the Voronoi tessellation method with 9 samples collected from the slope of the volcano (~ 5 km) up to Albania (~ 450 km). A sensitivity study on the influence of the tephra distribution, number of samples, and their locations was also carried out. The TGSD shows a bi-modal lognormal distribution with a coarser mode at $\Phi \sim 0$ and a finer mode at $\Phi \sim 6$. The reconstructed TGSD is consistent with other TGSD of Plinian and Sub-plinian deposits, such as that associated to the AD 472 (Pollena) Sub-plinian eruption.

The reconstructed TGSD and the available field observations are used to constrain a tephra dispersal model, allowing us to refine the estimation of the eruption source parameters and the tephra loading associated with the EU3 unit. Our results can be used to assess the dispersal of similar Plinian eruptions that could impact the region in case of renewal activity of Vesuvius volcano.