



## **The ash-rich plumes associated with explosive basaltic volcanism at Mount Etna, Italy**

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The recurring paroxysmal eruptions at Mount Etna (Italy) produce ash-rich plumes that can create potential hazards both locally and across the Mediterranean. The dynamics of these explosive basaltic eruptions differ from large silicic eruptions due to different underlying mechanisms such as the presence of a lava fountain. This leads to a hotter plume with a lower initial gas content and a coarser grain-size distribution. We investigate how these varying eruption source conditions affect the resulting characteristics of the plume and the subsequent spreading of the umbrella cloud using numerical modelling in combination with observations from video analysis and satellite imagery of selected recent Etna eruptions.

We determine how basaltic source conditions affect the spatial distribution of particle concentration as the plume rises in the atmosphere using a 1D plume model. These results are then used to initialize sedimentation and dispersion models. The newly developed sedimentation model allows producing isopleth maps and is expanded to create isomass maps on a proximal scale. We also use a volcanic ash transport and dispersion model (NAME) to explore volcanic ash transport on a regional scale. This approach enables us to integrate several types of observations that are available operationally at volcano observatories, but currently analysed independently, to investigate the dynamics of the plume. These include visible video imagery, ground deposit observations, satellite imageries and other additional remote sensing retrievals of plume height. We apply this procedure to analyse multiple recent paroxysmal eruptions at Mount Etna, including those where an ice-rich cloud is known to have impacted the satellite retrieval of the eruption column height.