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Calculation of Ash Plume Height from Ground Based Ultraviolet Scanning Stations

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Determining the source parameters of a volcanic eruption is vital for producing accurate predictions of how volcanic ash will be dispersed. One of these parameters is the plume height which can be difficult to measure at the source. Current methods for determining plume heights include visual and infrared cameras, LIDAR, radar and satellite observations, with each method having its own advantages and drawbacks. Here, we present a new technique utilising ground based ultraviolet (UV) scanning networks.

UV scanning networks are used around the world for monitoring volcanic SO_2 fluxes, for example the NOVAC project and the FLAME network on Mt Etna and Stromboli, Italy. As well as producing SO_2 flux measurements these networks record the original measured spectra, providing a large amount of data that could potentially be tapped for additional useful information, such as the height of a volcanic ash plume near to the source. Although ash does not have a clear UV signature like that in the infrared, the location of an ash plume in the scan arc can be inferred from significant changes in the UV transmission spectrum. By mapping the transmission spectrum with time and scan angle for two stations, the position, height and spatial extent of an ash plume can be determined.

We present measurements during lava fountaining episodes at Mt Etna volcano in Italy and compare the plume heights retrieved from the FLAME network to those from visual footage and from satellite data (SEVERI). These measurements could be used to improve the accuracy of input parameters for ash dispersal models, potentially reducing the economic and social impacts of future eruptions.