Operational volcanic ash monitoring during Etna volcanic crises

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Operational systems able to monitor volcanic ash in real time and provide both critical eruption parameters and useful warnings to emergency responders and government agencies should be implemented in most volcanic observatories worldwide. Over the past ten years, more than fifty lava fountains occurred at Mt. Etna (Italy) that produced eruption columns more than 10 km a.s.l. and generated large tephra fallout around the volcano flanks. For civil protection purposes, there was the need to improve the already existing monitoring systems daily run at the Istituto Nazionale di Geofisica and Vulcanologia, mainly based on eruption scenarios (weak and strong plume scenarios). We present a new upgraded system that has multiple objectives: i) to have a fast system able to best identify the type of eruptive scenario; ii) to forecast the tephra deposit in near real time, i.e. within a few hours from the eruptive event; iii) to determine the area impacted by clasts larger than 5 cm that could severely injure hikers, guides, and volcanologists and damage infrastructures in proximity of Etna summit craters. This new system is based on the real-time estimate of column height from the analysis of images taken by SEVIRI satellite and by new calibrated cameras and using meteorological parameters obtained by local models.