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A new way to reduce the impact from tephra fallout during Etna explosive eruptions

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The frequent number of explosive events at Mt. Etna, in Italy, over the last ten years, has made necessary the improvement of volcanic ash monitoring and forecasting system at the Istituto Nazionale di Geofisica e Vulcanologia, Osservatorio Etneo (INGV-OE). Tephra fallout produced during Etna lava fountains largely impact the population living on the volcano flanks. In addition, during one of the most powerful paroxysms, large clasts fell in proximal areas injured tourists and hikers. To reduce risk, the Italian Department Civil Protection (DPC) asked and funded INGV-OE to do a research project finalized to three specific objectives. First, identify the plume scenario (i.e. weak plume scenario (WPS) and strong plume scenarios (SPS)) based on 1-D plume model. Second, forecast characteristics of tephra deposition using near real time observations. Third, identify the region possibly impacted by large clasts (>5 cm). Two algorithms were developed to measure the column height. One from the calibrated images of two visible cameras installed on the S and W flanks of the volcano, respectively; and the other one from satellite data using a procedure based on the computation of the volcanic plume-top brightness temperature at 10.8 mm. The analysis of lava fountains that occurred between 2011 and 2015 provided the opportunity to differentiate between weak, transitional and strong plumes. The uncertainty associated with eruption source parameters, while maintaining a fixed plume height, was also assessed. In the near future the implementation of these products into the INGV-OE - monitoring room will guarantee a better and timely information to civil protection authorities charged of risk prevention at different levels of responsibility.