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Improvement of ash plume monitoring, modeling and hazard assessment in the MED-SUV project

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Volcanic ash clouds produced by explosive eruptions represent a strong problem for civil aviation, road transportation and other human activities. Since Etna volcano produced in the last 35 years more the 200 explosive eruptions of small and medium size. The INGV, liable for its volcano monitoring, developed since 2006 a specific system for forecasting and monitoring Etna's volcanic ash plumes in collaboration with several national and international institutions.
Between 12 January 2011 and 31 December 2013 Etna produced forty-six basaltic lava fountains. Every paroxysm produced an eruption column ranging from a few up to eleven kilometers of height above sea level. The ash cloud contaminated the controlled airspace (CTR) of Catania and Reggio Calabria airports and caused tephra fallout on eastern Sicily sometime disrupting the operations of these airports.
In order to give prompt and detailed warnings to the Aviation and Civil Protection authorities, ash plumes monitoring at Osservatorio Etneo, the INGV department in Catania, is carried out using multispectral (from visible to infrared) satellite and ground-based video-surveillance images; seismic and infrasound signals processed in real-time, a Doppler RADAR (Voldorad IIB) able to detect the eruption column in all weather conditions and a LIDAR (AMPLE) for retrieving backscattering and depolarization values of the ash clouds. Forecasting is performed running tephra dispersal models using weather forecast data, and then plotting results on maps published on a dedicated website. 24/7 Control Room operators were able to timely inform Aviation and Civil Protection operators for an effective aviation safety management.
A variety of multidisciplinary activities are planned in the MED-SUV project with reference to volcanic ash observations and studies. These include: 1) physical and analogue laboratory experiments on ash dispersal and aggregation; 2) integration of satellite data (e.g. METEOSAT, MODIS) and ground-based measurements (e.g., RADAR, LIDAR) of Etna's volcanic plumes to quantify mass eruption rate, grain-size distribution at source, and ash cloud concentration; 3) improvement of tools and automatic procedures for the short-term forecasting of volcanic ash dispersal by adopting a multi-model and multi-scenario approach; 4) development of short-term forecasting tools able to use direct measurements of the plume and ash cloud in almost real time (now-casting); 5) development of long-term probabilistic ash fallout maps at the supersite volcanoes.