



## **A multidisciplinary system for monitoring and forecasting Etna volcanic plumes**

Mauro Coltelli , Michele Prestifilippo, Gaetano Spata, Simona Scollo, and Daniele Andronico

Istituto Nazionale di Geofisica e Vulcanologia, sezione di Catania, Catania, Italy

One of the most active volcanoes in the world is Mt. Etna, in Italy, characterized by frequent explosive activity from the central craters and from fractures opened along the volcano flanks which, during the last years, caused several damages to aviation and forced the closure of the Catania International Airport. To give precise warning to the aviation authorities and air traffic controller and to assist the work of VAACs, a novel system for monitoring and forecasting Etna volcanic plumes, was developed at the Istituto Nazionale di Geofisica e Vulcanologia, sezione di Catania, the managing institution for the surveillance of Etna volcano. Monitoring is carried out using multispectral infrared measurements from the Spin Enhanced Visible and Infrared Imager (SEVIRI) on board the Meteosat Second Generation geosynchronous satellite able to track the volcanic plume with a high time resolution, visual and thermal cameras used to monitor the explosive activity, three continuous wave X-band disdrometers which detect ash dispersal and fallout, sounding balloons used to evaluate the atmospheric fields, and finally field data collected after the end of the eruptive event needed to extrapolate important features of explosive activity. Forecasting is carried out daily using automatic procedures which download weather forecast data obtained by meteorological mesoscale models from the Italian Air Force national Meteorological Office and from the hydrometeorological service of ARPA-SIM; run four different tephra dispersal models using input parameters obtained by the analysis of the deposits collected after few hours since the eruptive event similar to 22 July 1998, 21-24 July 2001 and 2002-03 Etna eruptions; plot hazard maps on ground and in air and finally publish them on a web-site dedicated to the Italian Civil Protection. The system has been already tested successfully during several explosive events occurring at Etna in 2006, 2007 and 2008. These events produced eruption columns high up to several kilometers above sea level and, on the basis of parameters such as mass eruption rate and total grain-size distributions, showed different explosive style. The monitoring and forecasting system is going on developing through the installation of new instruments able to detect different features of the volcanic plumes (e.g. the dispersal and sedimentation processes) in order to reduce the uncertainty of the input parameters used in the modeling. This is crucial to perform a reliable forecasting. We show that multidisciplinary approaches can really give useful information on the presence of volcanic ash and consequently to prevent damages and airport disruptions.